

# THE ELECTRICIAN

Vol. CXXXV. No. 3519. Friday, November 9, 1945.

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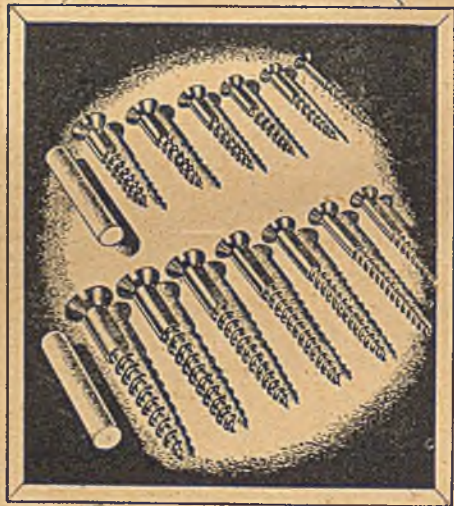


# Round plugs

## in queer

## holes

Can you always jump an accurate hole? Always? Then, you're a better man than I am... Not many people will guarantee a perfect hole every time in concrete or really old plaster, for instance. Thank goodness it doesn't matter with these pre-formed plugs. For all screws sizes 3-16 there are only two sizes of Philplug Adapta necessary. Those two will fill any hole completely and for keeps. And of course you don't need a whole range of hole-jumpers. Just two for the two Philplug Adapta. What time-savers!



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PHILPLUG PRODUCTS LTD., LANCELOT ROAD  
WEMBLEY, MIDDX. 'PHONE WEMBLEY 0140-1

*the plug  
that fills  
the hole*

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Our Technical Department will at all times gladly consult with you on the production of Welding Plant to suit special circumstances as well as advise on all welding problems.

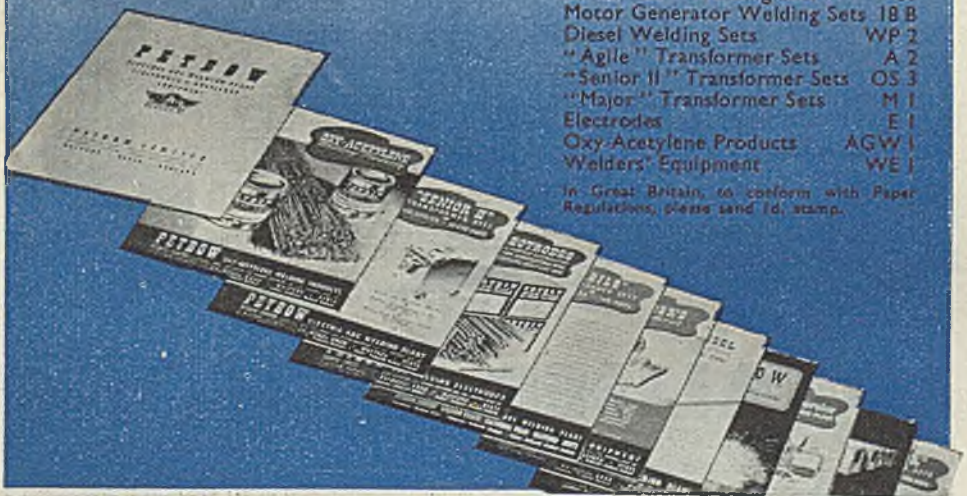
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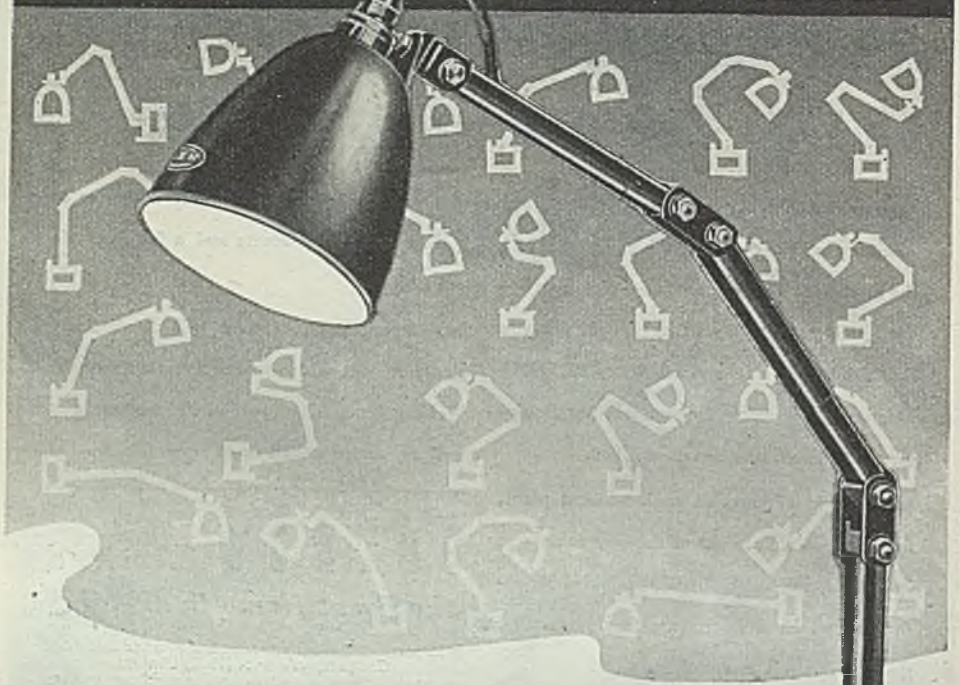
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Diesel Welding Sets	WP 2
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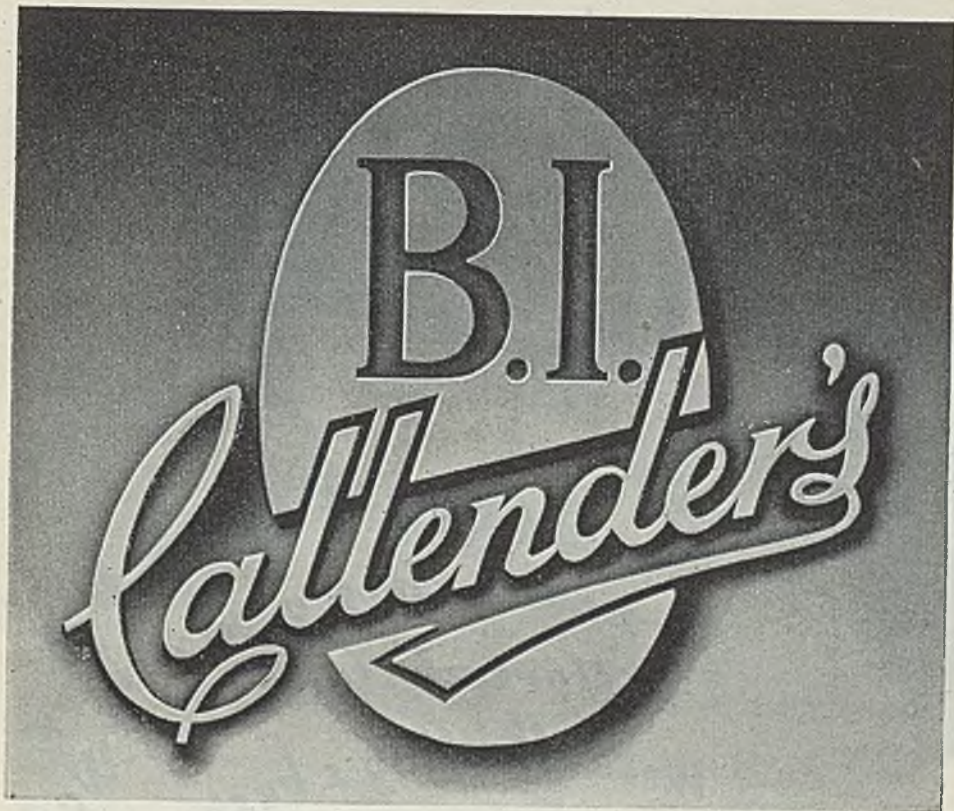


**MEM**

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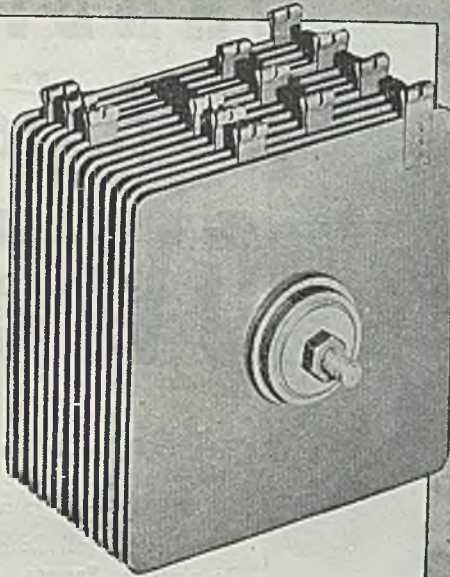
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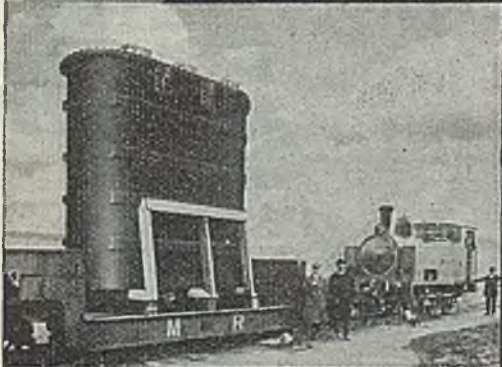
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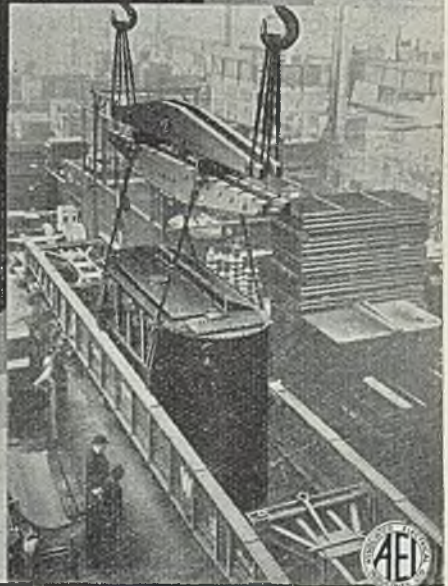


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# METROVICK TRANSFORMERS

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NOV. 10



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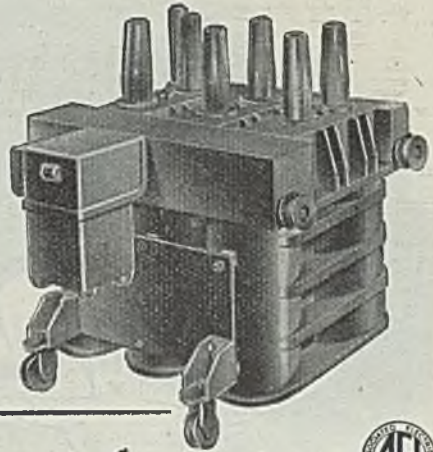
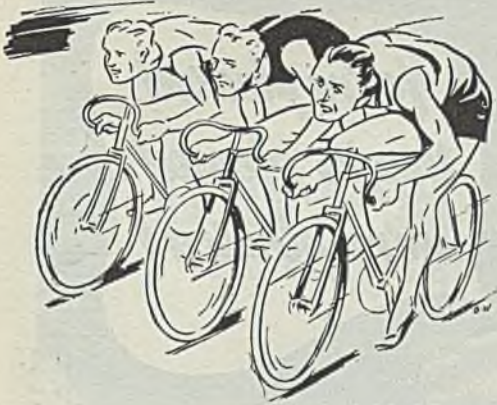
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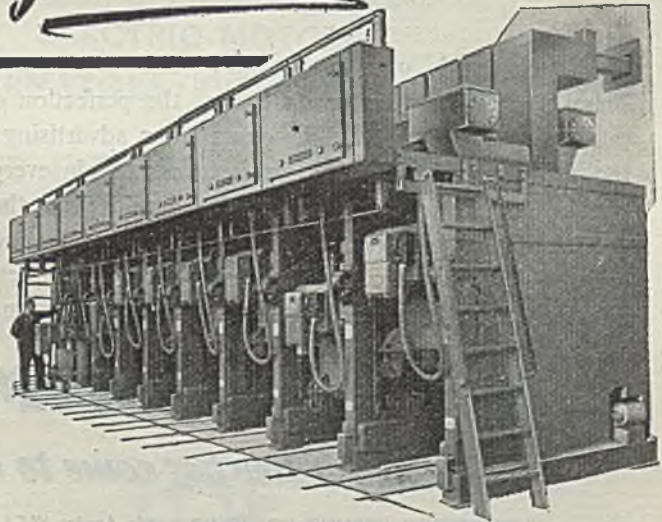
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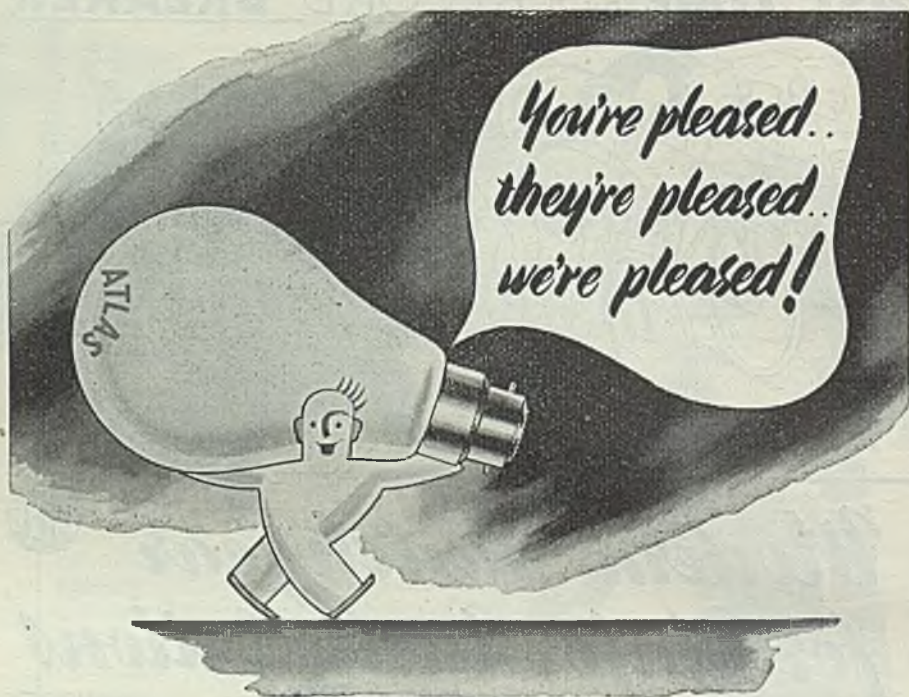
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Milton

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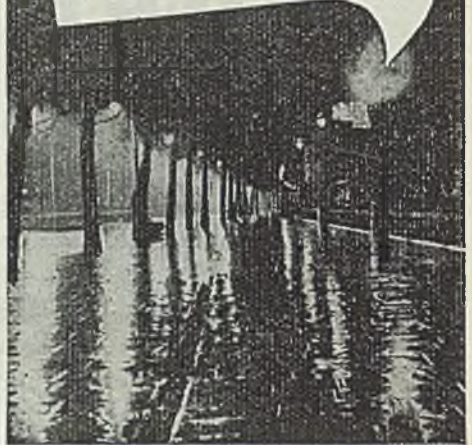
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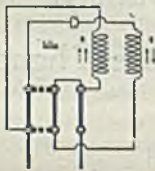
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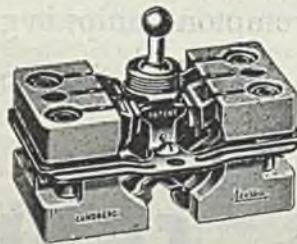
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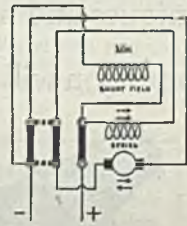
3 A. at 400 V. & 5 A. at 250 V.



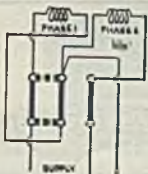
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(With Centrifugal)  
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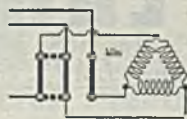
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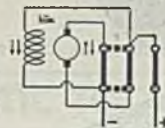
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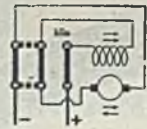
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**NOV. 10**

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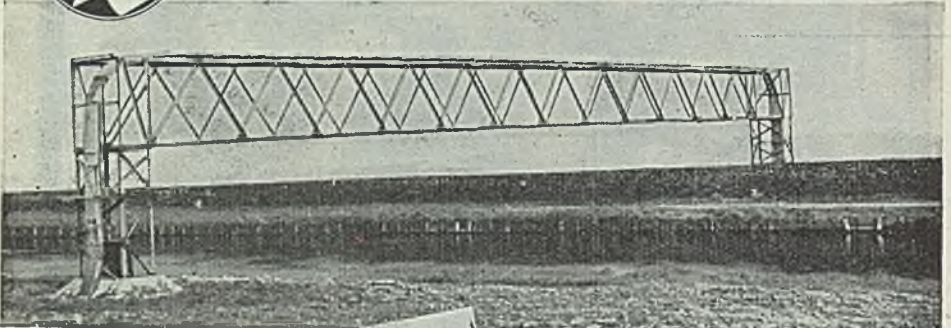


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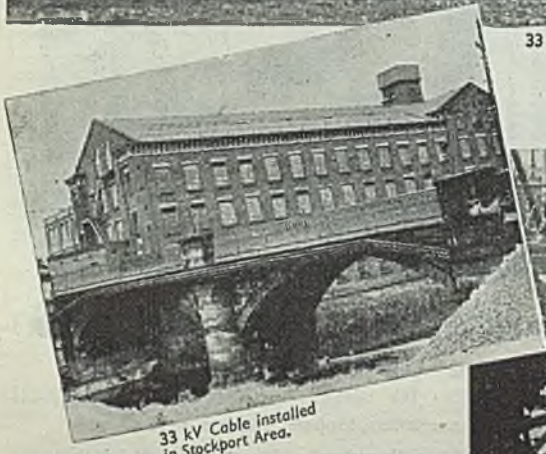
40, Broadway, London, S.W.1.



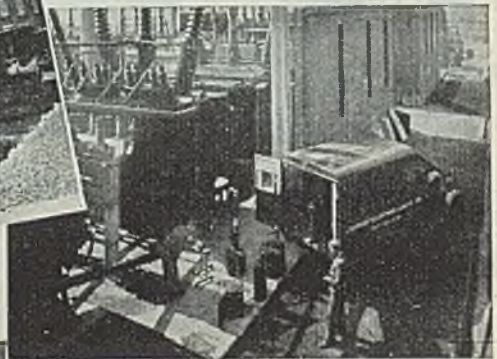
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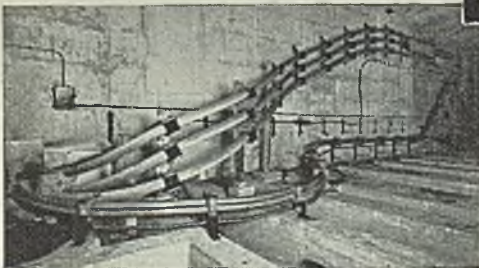
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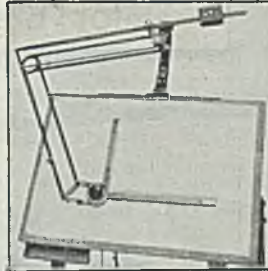
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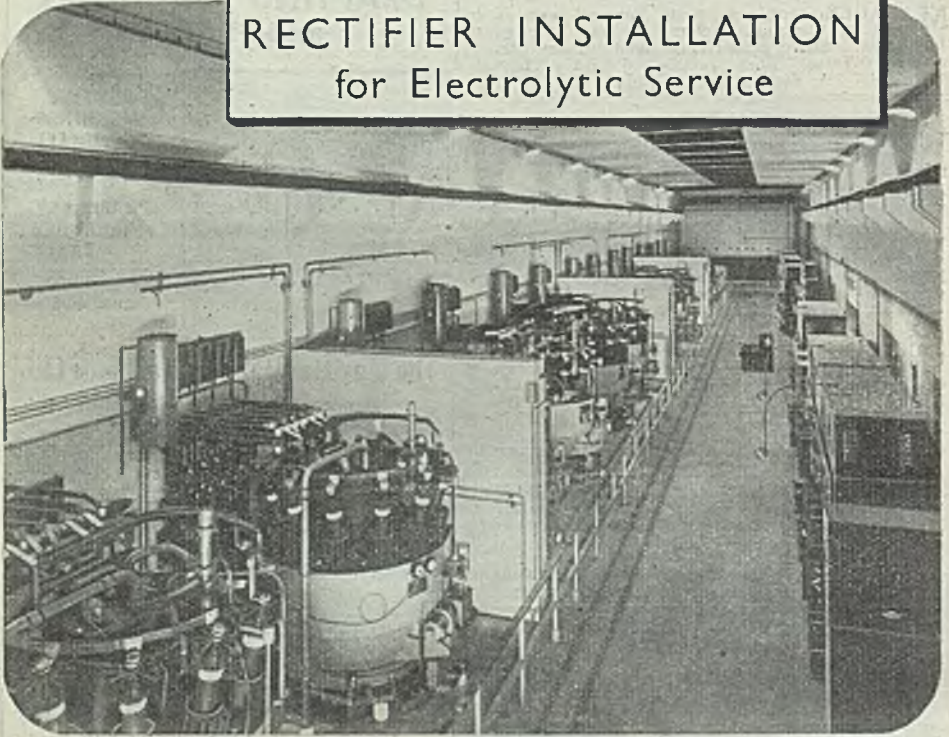
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effect the plans recommended by the Commonwealth Telegraph Conference of 1942, the Commonwealth Communications Council at its meeting in 1944, the Reith Report and the Empire Telecommunications Conference held this summer—recommendations which were largely influenced by Australian, New Zealand and Indian opinion. At this stage it is interesting to recall that the Australian and New Zealand Governments have for some time made it clear that it was their wish to have full sovereignty over communications in their territory, while the position has been aggravated to some extent by disagreement with Cable and Wireless with respect to rates, services and policy—accentuated perhaps by the competition set up by American interests operating communication services in Australasia during the war years.

The reason for the change in status and the details of any disagreement are, however, at this juncture beside the point, for we are more concerned with the outcome of the altered circumstances and its effect upon communication efficiency.

The history of Cable and Wireless is one of expanding services, even during the war years, until to-day the public is served in a manner undreamt of a decade ago; that the progress has been maintained despite geographical complications due to the war, to casualties among operatives, and difficulties of acquiring new equipment during the last six years, is indicative of the fact that the new organisation has been set an example which will not be easy to excel.

The British Commonwealth is such that it depends upon an adequate system of communication, in a way incomparable with any other group of nations. Such adequacy is in its turn dependent, not only upon technical efficiency but also

## Cables and the State

THE Government entered into office bearing the banner of nationalisation and it is not allowing the more urgent domestic problems of rehabilitation and reconversion to bar its way. Apart from the Bank of England Bill, discussions with the coal mining industry are now taking place, and on the same day last week were made known the decision for an all-Government air policy and the transference to public ownership of our telecommunication services with the Empire. The last will mean the end of Cable and Wireless (Operating), Ltd., as a factor in imperial communications, and the acquisition by the State of a system with an enterprising and progressive record.

This change in status, though made without any particular publicity, cannot, however, have been altogether unexpected for the transference puts into

upon co-operation. By the establishment of separate state-owned bodies at the various termini in place of company units economically sympathetic to each other, is created a system comparable in some measure with the department organisation of a government—with the difference that each department, or state, is responsible to no one but itself. Where operating procedure and traffic handling are concerned, such an arrangement is little different from that existing between this country and nations outside the Commonwealth, but when technical developments and expansion are to be considered from purely British aspects, unless the various State-owned units keep in step, as well as did the company-owned units, the ultimate efficiency of the Commonwealth telecommunications system as a whole may be impaired.

#### **Proud Record of Private Enterprise**

**E**XPERIENCE of various communication systems throughout the world has led us to the opinion that where company operation is permitted to compete with State-controlled operation, the technical efficiency set by private enterprise is higher than that of the Government systems, as also is the willingness to pioneer any new adventure. By taking over the service of Cable and Wireless, the Government has acquired an organisation which has behind it a history steeped in electrical tradition, going back beyond the days when the Atlantic was forced to yield to private enterprise in the laying of the first cable between the eastern and western hemispheres; when those grey waters were first bridged by radio signals between Signal Hill, Newfoundland, and Poldhu in Cornwall, as a result of the patience and conviction of a group of individuals, supported by private enterprise; when the "beam" to all parts of the world was pioneered, not by the State but by company engineers. In the circumstances, let us hope that the new organisation will be worthy of the trust it is to assume.

#### **E.L.M.A. Illumination Design Courses**

**O**NE of the most popular educational courses before the war was that conducted by the E.L.M.A. Lighting Service Bureau in connection with illumination design. In the circumstances, therefore, the industry will welcome the resumption of this series of lectures on Novem-

ber 21, but will regret that the accommodation even at this early date is already booked. The programme for this first post-war course is up to the high standard set in pre-1939 days and in order to meet the wishes of those who will be unable to attend this month, we understand, from Mr. E. B. SAWYER, of the Bureau, that he is hoping to repeat the courses in the very near future. Important as were these courses before the war, the new outlook on lighting resulting from war-time factory and other lighting experiences, has made the subject of illumination design of even greater concern. In the circumstances the accommodation at the Bureau is likely to be taxed beyond its capacity for some time, but as the courses are centred about the practical demonstration equipment included in the Bureau, the problem is not easy of solution. Lighting has assumed in the industry as important a place as any phase of electrical science, and with so much to be done in the way of familiarising the lay public with its utilitarian and decorative possibilities, the illumination engineer is facing a future fuller of opportunities than at any time in the history of the industry.

#### **Industrial Design Exhibition**

**P**LANNING of the exhibition to be held in London next year by the Council of Industrial Design has made appreciable progress since our mention of it a month ago, and at a luncheon, given last week, inaugurating the exhibition, Sir STAFFORD CRIPPS, President of the Board of Trade, appealed to industry generally to give it every support. This, no doubt, industry will do to the best of its ability, but no matter how great may be the willingness to participate, the extent to which industry will be able to exhibit is dependent upon the degree with which Government departments are prepared to co-operate with respect to men and materials. On this point, Sir STAFFORD offered little more than hope, in that he could promise nothing more substantial than an assurance that his department would do everything possible to help. In the circumstances we must remind the President of the Board of Trade that the theory may be good, but a few practical examples of that help would be more useful. At present the scarcity of skilled labour is a serious obstacle to industrial reconstruction for



if industry is to provide new designs and new products it must have designers, craftsmen and tool-makers, many of whom are still in the Armed Forces doing work which could be done equally well by less specialised personnel.

#### Civil Defence Preparedness

THE presidential address which Sir PEIRSON FRANK delivered before the Institution of Civil Engineers on Tuesday, shows that this country, though ill-prepared for war in 1939, was nevertheless, commendably defence-minded. In standing up to the bombing of London, the public took it for granted that the underground railways would run with little interruption, that the main drainage would still function despite the attention of the Luftwaffe—and in that attitude of mind they paid the engineer a compliment he well deserved. Sir PEIRSON FRANK first made contact with the defence preparations for London in July, 1934, when with the Chief Engineer of the L.P.T.B., he was called upon to report on some of the most vulnerable points in the city, and in his presidential address he dealt with the protective measures taken. The effectiveness of these precautions is well known to Londoners, though the severity of the air-attacks, particularly during the last three months of 1940, was greater than had been expected. The experiences of the electricity supply industry in those days were dealt with in the *THE ELECTRICIAN* of May 11 last, and in giving publicity to the record of other public services during the war, Sir PEIRSON FRANK has completed a picture which is good to look upon.

#### War Activities Exhibition

THE tasks undertaken by electrical manufacturers in war are to all intents and purposes completed, and that the capacity of one of them to shoulder the equally arduous burdens of peace has been enhanced by its war-time activities will be demonstrated at an exhibition to be opened by the English Electric Co., Ltd., on November 19, in London. Some of the company's war-time achievements have already been recorded in these pages but apart from revealing others, the exhibition will be of special interest in that there will be shown some fifty groups of products for peace-time application, in both the industrial and domestic fields. At a preview of the exhibition on Wednesday, it

was made abundantly clear that as great as was the contribution of electrical industry to the nation's war effort, even greater will be its tempo and expansion to meet the needs of peace.

#### Radio Components of 1946

THE Radio Component Manufacturers' Federation propose holding an exhibition of radio and communication components at the Grosvenor House, London, during the third week in February of next year. This should be a most enlightening display for though security requirements will still have to be observed, the scope permitted to exhibitors to show the broadness of their skill will be wide. The exhibition, as in previous years, will not be open to the public, but the attendance will, it is hoped by the promoters, include a considerable number of visitors from overseas. The post-war component designs will, doubtless, incorporate many of the improvements brought about by war-time development, and to overseas visitors these will present something beyond normal conception, in that with the lead which this country established in war-time radio technique no other country is able to offer comparable advancement.

#### Research and Training

TWO topics of special interest to the electrical industry this week, concern Government assistance to the finances of research associations, and the findings of the Percy Committee on the problem of higher technological education. The first was dealt with by Mr. HERBERT MORRISON at a luncheon in connection with an industrial research associations' conference on Tuesday, and in his remarks the Lord President of the Council made it clear that at long last, at least some of the views expressed in these pages with respect to the value of industrial research, is beginning to be appreciated by the Government. His promises of more understanding financial aid, as explained on another page, will be welcomed by the whole industry. The second point of interest, the report of the Percy Committee, will receive careful attention by the industry, for among the recommendations made are many which have already materialised in the industry's training schemes, while others have for many years been put forward as necessary changes in our technological educational system, but which have hitherto fallen upon deaf ears.

# Electrically Operated Goods Traffic

## Equipment at New L.M.S. Shed at Birmingham

**E**XTENSIVE mechanical and electrical equipment will facilitate the sorting and movement of goods traffic in the new goods shed, claimed to be the most modern in the world, which has been erected in place of the one destroyed by fire in 1937 at the Lawley Street L.M.S. Goods Station, Birmingham. It was opened by the Lord



An electrically-driven wagon traverser in operation

Mayor of Birmingham on October 29 in the presence of many leading representatives of the city's business and civic life. He also unveiled a commemorative plaque.

Incoming wagons are positioned in the shed by electric capstans, which give a pull on the rope of one ton at a speed of 150 ft. per minute and are each powered by a 15 h.p. motor. Each moving deck conveyor, on to either of which the goods are discharged from the wagons, is 360 ft. long and 3 ft. wide, and is formed of hard wood slats attached to steel chains driven at a speed of 40 ft. per minute. The driving unit in each case is situated below deck level, i.e., at the delivery terminal of each conveyor. The 15 h.p. electric motor transmits its motion to the chains through a fluid coupling and gearing. Should a package be inadvertently left on either conveyor until it reached the end terminal, it would strike a vertical plate and stop the conveyor.

The "flats" on to which the traffic for town delivery is then sorted, are 14 ft. by 6 ft. 6 in., and are mounted on flanged wheels running on a 3 ft. gauge track, the axles being mounted in roller bearings. They are designed to carry a maximum load of 30 cwt. The fully loaded "flats" are then transported as complete units to the appropriate cart loading bays by means of a unique mechanism known as

a "flat" traverser. Three of these machines are provided. The traversers are designed to travel at 500 ft. per minute along their tracks and incorporate a cross traverse carriage, which can be projected under the "flat" to be moved, and an elevating mechanism which raises the "flat" clear of its supports. The loaded cross carriage can then be retracted into the centre position for travelling. The traverser is driven by a 20 h.p. electric motor through the intermediary of a variable speed hydraulic gear.

The cross traverse movement is effected by hydraulic power obtained from an independent unit driven by the same motor as for the long travel motion. The elevating motion is by an independent 3 h.p. electric motor and hydraulic unit mounted on the cross traverse carriage. Each loaded "flat" having arrived at its appropriate cart bay, is deposited on its wheels at the reception end of the cart bay. The creeper chain conveyors used for loading consist of a number of flat shoes carried by a steel chain travelling at 100 ft. per minute, the overall length of each conveyor being approximately 278 ft. The conveyors are driven by 5 h.p. electric motors through fluid couplings and worm reduction gears situated in pits in common with the deck conveyor driving units.

### A 20-ton Wagon Traverser

To facilitate the setting of individual wagons at the shed, a 20-ton capacity self-propelled wagon traverser is provided on a track 343 ft. long, right across the east end of the shed. The traverser travels at a speed of 350 ft. per minute and is powered by a 30 h.p. electric motor supplied from overhead collector wires. Control is effected from either one of two positions, so that an unobstructed view of the track ahead is obtained. The traverser is fitted with a capstan of similar design to that described earlier. As the traverser operates entirely in the open, special consideration has been given to the enclosure for the electrical equipment, which is housed in a weather-proof cabinet situated on the driving platform.

The electric power supply for the whole depot is obtained from the Birmingham Corporation at 11 000 V, 3-phase, 50 cycles. This is transformed at a sub-station on the premises to 400 V, 3-phase, 50 cycles, for power and 230 V for lighting. Alternative high tension supplies are given and there are two transformers, each of 200 kVA capacity, either of which is capable of supplying the full demands of the depot.

# Willow Holme Power Station

## Details of War-time Extensions and Increased Capacity

THE completion of extensions at Willow Holme, Carlisle; generating station at a cost of about £2½ millions was marked by a luncheon attended by Corporation officials and the North-West England and North Wales Centre of the I.M.E.A. on October 25. The extensions, started in 1940, were during the war on the secret list, and after referring to the fact, Mr. J. R. Potts, chairman of the Electricity Committee, said at the luncheon that whereas 25 years ago Carlisle's area of supply extended only two miles beyond the centre of the city, to-day the area covered 400 square miles and included a high percentage of rural area.

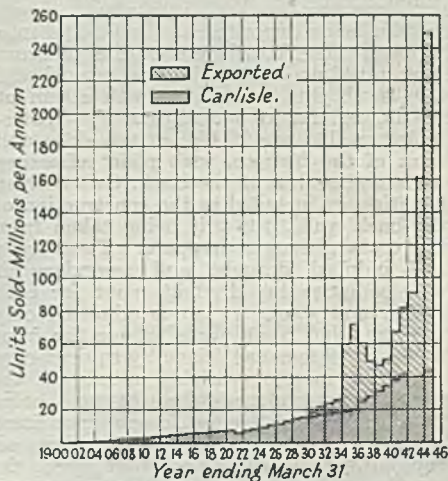
Direction for the present extension was received from the Central Board in May, 1940, and allowed for the installation of a 30 000 kW turbo-alternator with a 750 kW house service set, and two 150 000 lb./hr. boiler units. Work was started on the site in the following August. In May, 1942, a further direction from the Central Board provided for the installation of a second 30 000 kW set with three additional boiler units of the same evaporative capacity as above.

The first new set with one boiler unit was put into service in January, 1943, and its full load of 30 000 kW was reached when the second boiler unit became available in the following March. The second set was put into service in December, 1944, and by January last, with four boilers available, the full 60 000 kW was in service.

The whole of the work comprising the extension was designed and supervised by Mr. A. C. Thirtle, city electrical engineer and manager, with his technical staff, in collaboration with the consulting engineers Messrs. Kennedy and Donkin. All the main and auxiliary buildings of the extension are of the reinforced concrete

structural type, with brick panneling and finishing, and a 250 ft. brick chimney is of such cross-sectional area as will allow ample scope for handling the gases from five boilers.

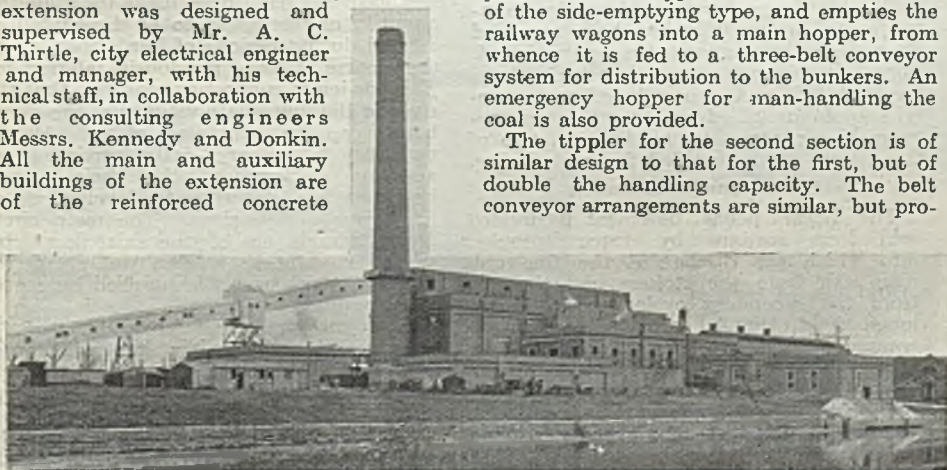
Two coal-handling plants are installed, one at the south end of the station and associated with original railway sidings, and the



These curves show the units sold per annum by the Carlisle undertaking

other at the east end, incorporating a new set of sidings of sufficient capacity to deal with the coal requirements of 120 000 kW of plant. The coal tippler for the first section is of the side-emptying type, and empties the railway wagons into a main hopper, from whence it is fed to a three-belt conveyor system for distribution to the bunkers. An emergency hopper for man-handling the coal is also provided.

The tippler for the second section is of similar design to that for the first, but of double the handling capacity. The belt conveyor arrangements are similar, but pro-



Willow Holme power station as it appears to-day

vision has been made for the future installation of a coal crusher. A drag scraper equipment for spreading the coal on to and reclaiming it from a new coal store has been incorporated in the run of the belt conveyors.

Coal is delivered by gravity through two traversing chutes, each fitted with automatic weighing machines having magnetically-vibrated feed trays, into the stoker hoppers of each boiler. Twin-driven variable speed chain grate stokers, operating under a balance draught system, convey the coal into the furnace, the ash being deposited at the far end into hoppers. The boilers are of the tri-drum type, rated at 120 000 lb./hrs. normal and 150 000 lb./hrs. maximum with steam at 625 lb./sq. in. at 840 degrees F. Water-cooled walls are fitted at the sides and front of the furnace, with plain refractory walls and arches at the back. Grit refiring facilities are included in the construction of the back walls, the grit being taken from the economiser grit hoppers. Two forced and induced draught and secondary air fans comprise the draught plant for each boiler, and secondary air is admitted only through the front walls above the front arches. All fans are driven by squirrel-cage induction motors, variable speeds on the forced and induced draught fans being obtained through hydraulic couplings fitted with scoop control. The secondary air fans are driven at a constant speed, the supply of secondary air to the furnaces being controlled by means of dampers. The fans are arranged to collect the grit in the flue gases and are implemented by secondary grit cyclones. Automatic boiler control is fitted to all boilers, and arrangements for automatic soot blowing have been installed for three of them. Manually operated soot blowing only has been provided on the first two units to be commissioned. Superheaters, each arranged in two halves, are provided, and also included are economisers of the gilled-type, and rotary regenerative contra flow air heaters, two of the latter being provided for each boiler.

#### Boiler House Basement

The boiler house basement is divided into four sections by three troughs, into which are discharged the fine and main ash from the stokers and the grit from the secondary cyclones. The three longitudinal troughs are collected into a common transverse trough, which is connected to an ash sump situated below ground level outside the boiler house. Copious supplies of water are introduced at the remote ends of each of the longitudinal troughs, and an ash sluicing system for ash removal which is thus obtained sweeps the ash and grit into the ash sump. A pump

house is located adjacent to the ash sump, and the water from the sump, after passing through screens, is pumped to the remote ends of the longitudinal troughs. A water recirculating system is operated in this manner, make-up water being added as required.

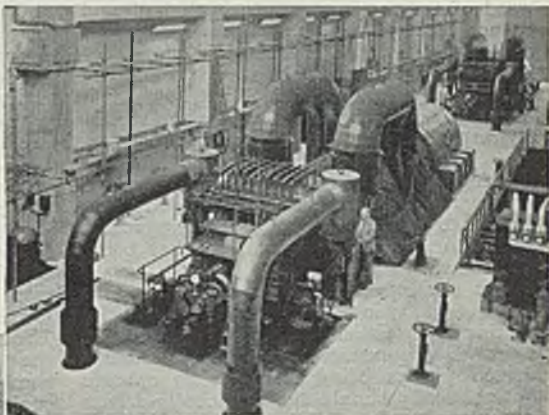
The ash is removed from the ash sump by means of a grab, operated from a telpher machine and deposited into lorries for removal from the site. Two telpher machines have been provided, one to act as a standby. A manually-operated emergency ash handling plant is also provided.

#### Water Supplies

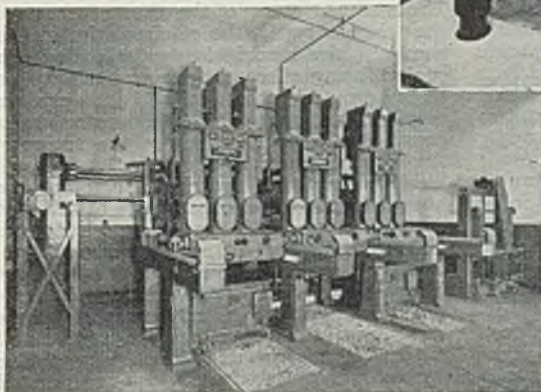
The nearby river Eden can at all times of the year supply sufficient water for a station having an ultimate generating capacity of 120 000 kW, and the level of the turbine condenser is arranged so as to take advantage of the syphonic assistance which can be obtained under these conditions. To do this a pump house is located on the river bank, and four main circulating water pumps are installed to deliver the river water to the turbine condensers and oil coolers, and to the alternator air coolers. The river water, before reaching the main pumps, passes firstly through coarse static screens and secondly through vertically-travelling endless band screens fitted with narrow protuberant buckets, which stretch over the whole width of the screen, into which leaves and other debris fall as the screen with the buckets attached rises out of the water. The water discharged from the turbine condensers is delivered into a common circulating water discharge main, which normally discharges the warmed water back into the river at a point on the down stream side of the pump house, but arrangements have been made for a limited quantity of this water to be discharged as desired during periods of hard frost, on to the coarse screens previously referred to. This de-icing connection ensures that the river in the immediate vicinity of the pump house can be kept clear of ice. All the necessary pumps are of the vertical type, and are so arranged that their suction branches are below water level under all conditions of the river. The main circulating pumps are of the axial flow type, while the station service water and the screen washing water is supplied by centrifugal pumps.

High pressure and temperature steam is delivered by the boilers into solid forged steam receivers situated in the basement of the turbine house, whence it flows through duplicate steam pipes to the stop valves of each of the turbines. The latter are of the impulse-reaction twin-cylinder type, with duplicate overhead steam pipes between the ends of the h.p. and the l.p.

**WILLOW HOLME  
POWER STATION  
IN PICTURES**

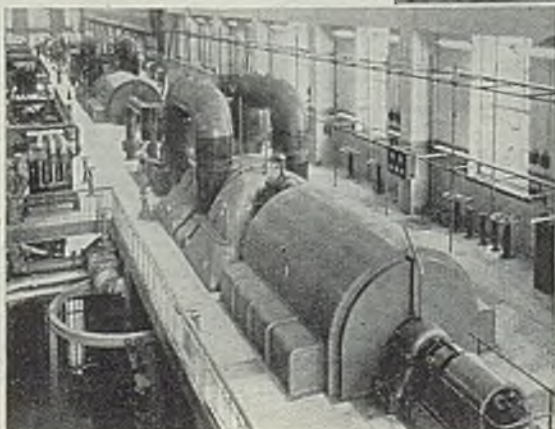
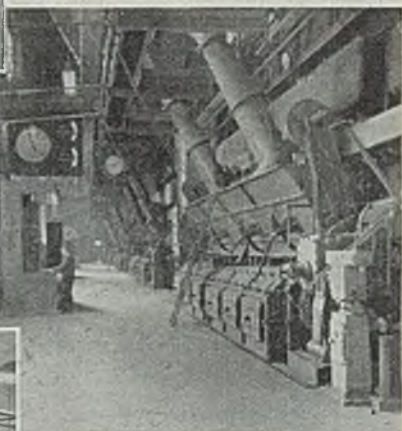


Above : The two new 30 000 kW turbo-alternators at the Carlisle undertaking



Above : Section of the 33 000 V, 750 kVA switchgear at Willow Holme

Below : View of the complete turbine room showing the new sets in the foreground



These pictures, together with the others reproduced from photographs loaned to us by Mr. A. C. Thirtle, city electrical engineer and manager, give some idea of the modern layout adopted at Carlisle

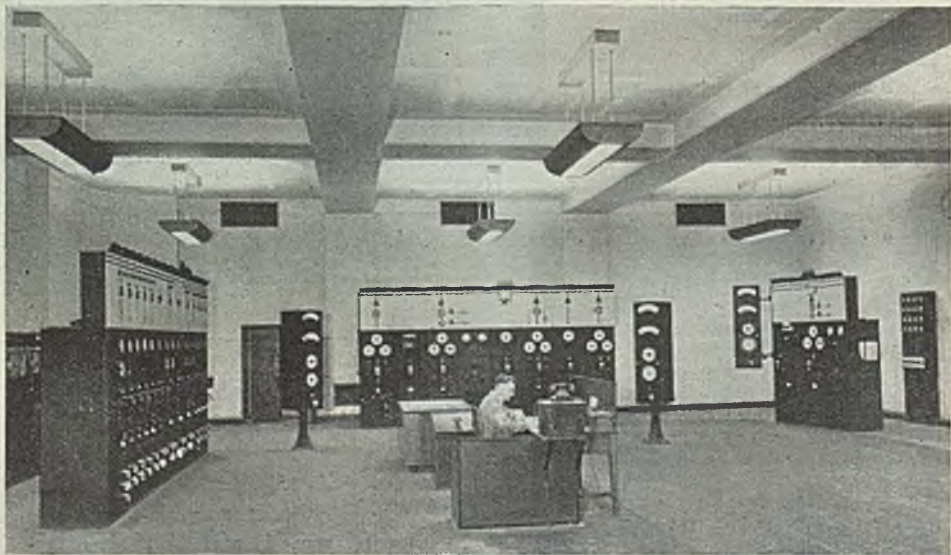
cylinder. Each l.p. cylinder is arranged in two halves, and the steam flows outwards from the centre into each half and thence through the exhaust ends into twin condensers located beneath. These condensers are maintained at a vacuum of 29.1 in. at economic rating, with a normal barometer of 30 in. by means of steam-operated air ejectors, two full duty ejectors being provided for each turbine. Barring gear is provided to slowly rotate the shaft systems of the turbines and alternators to prevent hogging of the spindles and rotors as the sets cool off after being shut down.

The condensed steam in the condensate wells of the twin condensers is piped to the suction of either electrically-driven or steam-driven extraction pumps, the steam-driven pumps being arranged to operate automatically should the electrically-driven pumps fail. Low pressure steam is bled from four stages of each of the turbines, two of the connections being used to supply steam to l.p. feed water heaters, the other two supplying steam to h.p. feed water heaters on the discharge side of the boiler feed pumps. All the heaters are of the horizontal type. From the extraction pumps the condensate passes through the ejector cooler, the l.p. condensate heaters, and drain water coolers before being delivered to the suction of the boiler feed pumps. Make-up water is delivered from crude water tanks, supplied by the water service pumps in the pump house. Five full duty boiler feed pumps, situated in the basement are provided, three electrically-

driven and two steam-driven. Desuperheaters are provided to enable the exhaust steam from the steam-driven extraction pumps and boiler feed pumps to be recovered, and finally delivered into the condensers. The boiler feed water heaters, the condensate heaters, the bled steam evaporators and the boiler feed pumps are all disposed on the basement floor of the turbine house. The air ejectors and the operating pedestals of the steam receiver valves are located at turbine floor level, which is 18 ft. 6 in. above the basement floor.

The 30 000 kW alternators generate at 11 kV, cable connections being provided from their terminals to 33 kV step-up transformers situated outside the turbine house. The cooling systems of the alternators are of the closed type, the re-circulation of air through the associated water-cooled air coolers being effected by means of fans on the alternator rotor shafts. D.c. exciters mounted on extensions of the rotor shafts provide excitation current to the rotors of the main alternators.

The main 33 kV switches controlling the output from each alternator are of different design. Both are of the same capacity and voltage and are of metal-clad construction, but one is of the single busbar type incorporating low oil content and single break for each phase and complete phase separation, the other being a modernised duplicate busbar switch of older design. The control panels are situated in a new control room, sufficiently large to accommodate all the future panels required for a similar purpose in the ultimate development of the



The control room

station. The control of the turbines and alternators is also effected from these panels, automatic voltage regulators having been installed for normal operating conditions of the sets. The relay panels are located in separate rooms in the switch houses, and complete emergency controls for the sets have been embodied, the switch-over from the control panels in the control room to the control facilities on the relay panels being effected in the relay panel rooms.

A bank of 11 kV metal-clad duplicate busbar switchgear has been installed to enable the undertaking to facilitate through step-down transformers the transfer of power from the 33 kV generator switchgear to the distribution system.

Two banks of 400 V auxiliary switchgear are mounted at turbine floor level in the turbine house annexe. Three half-duty auxiliary transformers are connected to one or other of these switchgear banks. In addition, a steam turbine-driven emergency alternator has been installed and connected to either of the banks of switchgear as may be desired. The turbine operates with steam from the main boilers at full temperature and pressure, and is controlled by push-buttons mounted on the turbine instrument and gauge panels. All the switches are of the cubicle mounted air-break type, some being electrically-operated. Distribution boards, fitted with air-break switch fuses located in various parts of the station, are connected by feeder cables to the main banks of switchgear. The distribution boards are cabled to the starters of all the station auxiliaries, the majority of which are of the direct-on type. The main circulating water pump motors and the electrically-driven boiler feed water pump motors are operated by auto-transformer starters, the recirculating water pump motors for the ash sluice system and the extraction pump motors being controlled by star-delta starters.

#### Starting Gear

The starters, with the exception of those for the main circulating pump motors, are of the electrically-operated latched-in contactor type, tripping being effected by direct current circuits automatically, or by remote or local manual control. In order that the station auxiliaries may not be disturbed unnecessarily, due to voltage surges, arrangements have been made either for the starters to remain latched in for a short time should the electrical supply fail or to fall out and reclose automatically if the supply fails and is restored shortly afterwards.

The steady increase in the output of the undertaking is shown by reference to the curves reproduced on p. 493; since 1929 this has been wholly from the Willow Holme

station. For the twelve months ending September 30, 1945, the output was 288 793 300 kWh, of which 18.5 per cent. was used within the undertaking's area of supply, and 81.5 per cent. was exported to the grid.

#### Contractors

Among the contractors and sub-contractors were:—Civil Engineering: John Laing and Son Ltd.; Heating, Ventilating, Plumbing and Lighting: David Thomson and Sons Ltd.; Air Ducting and Chequer Plating: Porter Engineering Co. Ltd.; Lift: Evans Lifts Ltd.; Chimney: The Steeplejack Engineering Co. Ltd.; Roller Shutters and Fire Doors: Mather and Platt Ltd.; CO. Fire Protection: Atlas Sprinkler Co. Ltd.; Boiler Plant: The Stirling Boiler Co. Ltd.; Stokers, Ash Handling Plant, Winch and Drag Scraper Plant: The International Combustion Ltd.; Coal Handling Plant: Babcock and Wilcox Ltd.; Conveyor Belt Idlers: Mavor and Coulson Ltd.; Conveyor Belts: Goodyear Rubber Co. Ltd.; Economisers: E. Green and Son Ltd.; Air Heaters: James Howden and Co. Ltd.; Fans and Dust Extraction Plant: Davidson and Co. Ltd.; Motors: British Thomson-Houston Co. Ltd.; Motor Starters: Brookhirst Switchgear Ltd.; High Pressure Pipework: Aiton and Co. Ltd.; Valves and Mountings: Hopkinson's Ltd.; Pumps: G. and J. Weir Ltd.; Feed Regulators: Cope's Regulators Ltd.; Instruments: Cambridge Instrument Co. Ltd., Bailey Meters and Control Ltd., Electroflo Meters Co. Ltd., James Gordon and Co. Ltd.; Weigh-bridges: W. and T. Avery Ltd.; Hydraulic Coupling Fan Drives: Hydraulic Coupling and Engineering Co. Ltd.; Rectifiers for Stoker Drive: Hewettie Electric Co. Ltd.; Automatic Coal Weighers: Richard Simon and Sons; Refractory Rear Arch: Liptak Furnace Arches Ltd.; Soot Blower Automatic Control: British Thomson-Houston Co. Ltd.; Soot Blowers: Babcock and Wilcox Ltd.; Automatic Boiler Control: Electroflo Meters Co. Ltd.; Telpher Structure: W. J. Jenkins and Co. Ltd.; Turbine Plant: British Thomson-Houston Co. Ltd.; Condensing Plant, Feed Heating Plant, Evaporators, Circulating Water Pumps and part Pipework: Mirrlees Watson Co. Ltd.; Screens and Valves: J. Blakeborough and Sons Ltd.; Turbine Oil Purifiers: Alfa-Laval Co. Ltd.; High Pressure Pipework: Aiton and Co. Ltd.; CO. Fire Fighting Plant: Walter Kidde Ltd.; Desuperheater: Drayton Regulator and Instrument Co. Ltd.; Instruments: Cambridge Instrument Co. Ltd., George Kent Ltd., Electroflo Meters Co. Ltd., W. Crockett and Sons Ltd.; Water Conditioning Equipment: The Candy Filter Co. Ltd.; Pipework: Aiton and Co. Ltd.; High Pressure Valves: Hopkinson's Ltd.; Circulating Water Piping: David Thomson and Sons Ltd.; Main Switchgear Transformers, Auxiliary Transformers, Cabling, etc.: British Thomson-Houston Co. Ltd.; Accumulators: Tudor Accumulator Co. Ltd.; Loudaphone, Ordasign, and Synchronial Equipment: Clifford and Snell Ltd.; Main Switchgear No. 6 set: English Electric Co. Ltd.; Main Cable Work: British Insulated Cables Ltd.; Transformer Fire Fighting Plant: The Atlas Sprinkler Co. Ltd.; Power Wiring (Pyrotenax): David Thomson and Sons Ltd.; Vacuum Cleaning Plant: Sturtevant Engineering Co. Ltd.

**Wigan.**—It was announced at a recent meeting of the T.C. that directions had been received from the Central Electricity Board to proceed with a new generating station.

# Research Association Grants

## Government Interest in Industrial Application of Science

THE Lord President of the Council, Mr Herbert Morrison, announced in an address at a luncheon in London on Tuesday, to the conference of industrial research associations that grants to such associations are to form a permanent part of the activities of the Department of Scientific and Industrial Research.

Mr. Morrison declared that after the new Budget industry would be ploughing back money gained by relief from taxation, and it was essential that some of these funds should be invested in research. Large concerns would, he trusted, establish or extend research departments of their own. To smaller concerns, which could not be expected to maintain adequate individual research departments, research associations were of special importance.

Research was useless to industry unless its results were applied, and Government support of industrial research must be backed by a readiness to use its results. Firms which could not maintain fully-equipped research staffs of their own should all employ at least some trained scientists who could co-operate with their associations and help in the interpretation and application of their work. Expenditure on scientific research should be regarded not only as desirable but as an essential cost.

Mr. Morrison then turned to the question of finance. Bigger incomes, he said, would enable research associations to carry their work further into the development stage than was possible before the war. Much development could be carried in their stride; but it was expensive, and it was here that the Government would help. The original plan had been that monetary grants should cease when a research association had grown to a proper stature. Now it had been decided that in the national interest grants to research associations would form a permanent part of the activities of the D.S.I.R.

Until a research association attained an appropriate scale the present system of a block grant and an additional grant would continue. When the appropriate scale was reached the additional grant would now cease, but a new block grant would be made and would continue indefinitely so long as the D.S.I.R. was satisfied with the activities of the association.

The Government had decided that in suitable cases they would make single grants to finance capital expenditure for such special purposes as buildings and

re-equipment, the purchase of particularly expensive apparatus, or the provision of semi-scale plant.

Sir Edward Appleton, secretary of the Department of Scientific and Industrial Research, proposing the toast of the research associations, said that the research association movement provided, in his opinion, the only effective way in which smaller firms could reap the benefit of industrial research.

## Technical Training

THE findings of the Committee which, under the chairmanship of Lord Eustace Percy has been considering the problem of higher technological education were published on Wednesday, by the Stationery Office, and the main conclusions reached are that if Great Britain is to keep her place as a leading industrial nation, there must be larger output of qualified men from the universities and the technical colleges, and that the greatest deficiency in British industry is the shortage of scientists and technologists who can administer and organise, and who can apply the results of research to development.

The Committee considers that the need on the part of industry for men of high quality and qualifications is of extreme importance. To meet it, not only must the best products of the secondary schools be encouraged to enter industry, but there must be close co-operation between industry and education on the one hand and between universities and technical colleges on the other.

The report includes among its recommendations, the selection of a limited number of colleges as colleges of technology to provide full-time courses, as well as facilities for post-graduate studies. For engineering, about six colleges are suggested, excluding the London area; others might be selected for other branches of technology.

The report is unanimous, except on the question of the title of the award to be given at the end of the full-time courses at the selected colleges. Some members think that the National Council of Technology should be empowered to confer degrees with the title of Bachelor of Technology (B.Tech.); and others hold that it should lead to a different title, such as Diploma in Technology.



# 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*

After 53 years' service with the General Electric Co., Ltd., **Mr. H. G. Nicholls** retired on October 31. He joined the company in 1892, and from his initial position as office boy his training included some years in the electrical accessories department. In about 1902 he was transferred to the newly-formed export department where he spent the next fourteen years. He was then transferred to the Government and



**Mr. H. G. Nicholls**

railways department in which he attained the position of assistant manager.

The retirement of Mr. Nicholls was marked by a gathering in his honour at the Waldorf Hotel, London, on October 31. It was an informal affair inspired by Mr. R. C. Giggins (manager of the G. and R. department) who was supported by other members of the staff, and also by Major-General A. W. Sproull (Ministry of Supply), Captain T. S. Babb (Air Ministry), Mr. A. G. Ramsey (Ministry of Works) and Mr. P. Dale-Bussell (late of the Admiralty). Mr. R. E. Cox, of the G. and R. department, presented to Mr. Nicholls a cheque subscribed by his G.E.C. friends, and representing one pound for every year's service with the company. Mr. Nicholls thanked everyone for their kindness.

**Mr. E. Barnard** is to be deputy secretary of the Department of Scientific and Industrial Research.

**Mr. Wm. Tyson**, who worked at Nelson electricity department as shift charge engineer until recently, has celebrated his golden wedding.

Tynemouth Electricity Committee is to extend for 12 months the services of **Mr. J. B. Glen**, the electrical engineer and manager, who is due to retire at the end of the year.

**Mr. Noel Ker Lindsay** has been appointed the first director of the British Non-Ferrous Metals Federation. He will take up his appointment on December 1.

**Ald. Sir Thomas E. Higham**, the veteran chairman of Accrington Electricity Committee with over 44 years' service, will be "Father" of the new Accrington Town Council.

**Colonel Arthur Jerrett** has accepted an invitation to join the board of Guy Motors,

Ltd. He has had a long association with the operation of motor transport.

**Sir Geoffrey Peto**, Regional Controller, Southern Region, Ministry of Supply, has been released as from October 31. He was a director of the Morgan Crucible Co., Ltd.

**Mr. R. T. Gregory**, chief superintendent of traffic, London telecommunication region, centre area, has been made a freeman of the City of London in recognition of service with the Fire Guard.

Southport Electricity Committee reports that **Mr. W. E. Masters**, consumers' engineer, has tendered his resignation upon obtaining another appointment, but the Committee is opposing his release.

**Professor J. D. Cockcroft, F.R.S.**, Chief Superintendent, Air Defence Research and Development Establishment, Ministry of Supply, has been appointed Director of the Didcot Atomic Energy Station, in Berkshire.

**Mr. F. Tonge**, assistant mains engineer at Willesden, has been appointed mains assistant in the Chipping Wycombe electricity department, and **Mr. G. A. Studd**, of Ipswich, has been appointed wiring department foreman.

Congratulations to **Major A. R. ("Peter") Warrilow** on the birth of a daughter on November 5. He is the youngest son of Mr. and Mrs. W. E. Warrilow, Nancy Down, Oxhey, Herts, who now have four grandchildren, two grandsons and two granddaughters.

We are informed by **Mr. N. B. Coop**, of British Electric Meters, Ltd., who moved from Mitcham to Two Gates Works, Darwen, Lancs, that the company are extending their activities in the electrical field and the Daimler aero engine factory at Bangor has been allocated to the organisation.

**Dr. J. M. Meek** has been appointed to the David Jardine Chair of Electrical Engineering (Electronics) at the University of Liverpool. After an apprenticeship with the Metropolitan-Vickers Electrical Co., Ltd., he held research positions in industry, and was the author, jointly with Professor Loeb, of "The Mechanism of the Electric Spark." He has worked on problems of radiolocation. More recently, he organised the teaching in the research training scheme of Metropolitan-Vickers, Manchester, and has been lecturing in the University of Manchester.

**Mr. J. S. Parkinson**, formerly deputy electrical engineer and manager, St. Helens, and since October 1 electrical engineer and manager at Leigh, has been presented

by the members of the St. Helens Gas and Electricity Recreation Club with a rose bowl as a parting gift. Mr. Parkinson had been associated with the club for eight years.

**Mr. M. A. C. Gorham**, whose appointment to take charge of the B.B.C.'s television service when it is re-started was announced on Monday, was educated at Stonyhurst College and Balliol College, Oxford. He is 43 years of age. He joined the B.B.C. as assistant editor of the "Radio Times" in 1926, and in 1933 was appointed editor, which post he filled until 1941, when he became director of the North American service. He was appointed director of the Allied Expeditionary Forces' programme on its institution on May 23, 1944, and has been in charge of the B.B.C. light programme since it began this year. At a Press conference Mr. Gorham said it was hoped that still pattern television would be available before the end of the year.



**Mr. M. A. C. Gorham**

**Colonel S. J. Emerson**, H.M. Electrical Inspector, Manchester area, who joined the Forces in 1939, has now returned to the electrical branch of the Factory Department, after service with the Royal Engineers in France, India and Burma. He has taken over the post of H.M. Electrical Inspector for the South-Eastern area with headquarters in London.

After five years' service in the Army **Mr. E. Glanvill Benn** has this week returned to Benn Brothers, Ltd., proprietors of THE ELECTRICIAN and 14 associated journals. He temporarily relinquished his duties as managing director to join the East Surrey Regiment, later went through the Staff College at Camberley, and for the last two years has been a Brigade Major in Italy. He comes back to Benn Brothers to take up new duties as chairman of the company.

Recent changes in the organisation of the British Thomson-Houston Co., Ltd., include the following: In addition to appointments already held, **Mr. H. Jack** becomes chief electrical engineer; **Mr. A. A. Pollock**, chief mechanical engineer; **Mr. G. S. C. Lucas**, assistant chief electrical engineer; and **Mr. K. R. Hopkirk**, assistant chief mechanical engineer. These arrangements do not affect the turbine engineering department, of which **Mr. R. H. Collingham** remains chief engineer.

**Mr. W. A. H. Parker** has been appointed electricity consultant to the N.F.U. He will help members with the negotiation of terms and conditions of electricity supply and advise them on the application of electricity to their farms, both in regard to lay-out and machinery. Well known as an electricity consultant, Mr. Parker has had a life experience of electrical designing. He was chairman of the E.D.A. Farm Sub-Committee which provided the first electrical exhibit at the Royal Show at Bristol. After completing an apprenticeship on electrical machinery design with Electromotors, Ltd., Manchester, he served in the electricity departments of the Farnworth U.D.C. and Heywood Corporation. Then he was appointed meter and testing engineer with the Lancashire Electric Power Co. In 1922 he became sales engineer to the West Gloucester Power Co.

**Mr. W. F. Bishop, C.B.E.**, a director of W. T. Henley's Telegraph Works Co., Ltd., and its subsidiaries, has received a number of valuable gifts as tokens of esteem on the occasion of his completing fifty years with the company. **Sir Montague Hughman**, chairman of Henley's, who made the presentations, paid



**Sir Montague Hughman making the presentations to Mr. W. F. Bishop**

a tribute to the work of Mr. Bishop, who had been general manager during some of the company's record years. He handed to him a framed copy of a resolution of the board extending congratulations and expressing appreciation of his valuable services during the last 50 years. The gifts included a Sheraton cabinet and a Chipendale chair from the company, three pieces of antique silver from the staff of Henley's and its subsidiaries and a cigarette casket from the directors.

# Equipment and Appliances

## Potentiometric Recorders—A Vacuum-tight Bushing

OUR attention has been drawn by **George Kent, Ltd.**, to their Multelec pyrometers, to indicate, record, signal or control heat input, no fewer than 3 800 of



The Multelec potentiometric recorder

which were supplied by the firm for war plants. The range of the Mark II instruments now extends to cover single and multipoint recording, many types of automatic control, radiation, pyrometers and manually selective multipoint indicators. The principal features of these instruments include the potentiometric principle and null point method of measurement. When the correct temperature is recorded no current flows through the galvanometer, the potentiometer is balanced and there is no deflection. Hence accuracy is independent of changes in galvanometer characteristics. Other features are automatic cold junction temperature compensation; indifference to varying line resistances; frequent automatic current standardisation; applicability to "suppressed zero" ranges; high frequency measuring cycle; maximum visibility of scale and record, 10 in. of the chart record being exposed to view, and both scale and chart illuminated by concealed lighting. The whole mechanism is built on a hinged frame which swings free from the case, providing easy access to all parts. The adaptable instrument casing is made for wall mounting or for flush panel mounting and has a dust- and fume-proof door. The gearbox on the drive from the 1/50th H.P. motor (a.c. or d.c.) to the chart provides easy lever change to speeds of from 1 in. to 2 in. or 3 in. an hour. For the higher temperatures, such as in the heat treat-

ment of metals, it is necessary to use thermocouples. These are supplied in iron-constantan, chromel-alumel and platinum-platinum rhodium covering all ranges for continuous operation up to 1 400°C. For higher ranges standard radiation pyrometers are supplied. For low temperatures generally, such as in air conditioning or refrigeration, and for narrow temperature ranges up to a maximum of 500° C., a recorder having a Wheatstone bridge circuit and using resistance thermometers with platinum or nickel coils gives maximum sensitivity and consistency of reading.

The new 625 B1 bushing produced by **Ferranti, Ltd.**, has been designed primarily as a vacuum-tight seal, but it has numerous general applications. Being vacuum-tight the bushing will not "breathe" during temperature cycles, thereby preventing the admission of moisture during operation. This is a great advantage when the sealed component is an impregnated condenser or transformer, and it is imperative when intended for tropical use.

The bushing, as illustrated in Fig. 1; comprises: (a) A glass insulator; (b) A copper flange for soldering to the metal case of the component to be sealed; (c) A copper end-cap through which the lead-out is to be soldered, and which is supplied pierced (up to  $\frac{3}{8}$  in. dia. hole) to custo-

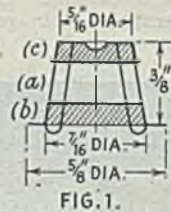


FIG. 1.

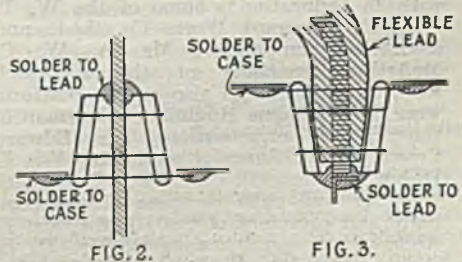


FIG. 2.

FIG. 3.

mers' requirements. The maximum working potential under normal conditions is 1 000 V r.m.s. a.c. or 1 000 V d.c. (This allows adequate safety margin.)

Two suggested methods of use are: (a) Extrusion method (Fig. 2) (the glass rim below the flange eliminates risk of the lead short-circuiting to case); and (b) intrusion

method (Fig. 3). This permits the bringing out of an insulated flexible lead in such a way that the sealed component can be handled with absolute safety from electric shocks and therefore requires no further protection.

A universal connection device with four basic plates designed to cover almost any requirement in the radio, telecommunication, or allied industries, is manufactured by **Labgear**, of Cambridge. These plates, named Lockstrips, are slotted so that each slot can be fitted into another slot, thus making complete compartments or assemblies. Strips may be staggered, allowing the overhanging position to come directly

over any fixed contact, such as a valve holder, thereby allowing direct wiring. It is claimed that Lockstrips require considerably less space than the standard plate type of resistor/condenser panel because the Lockstrip system is based on and designed for the smaller and more frequently used components and not on the largest component; the system enables a better electrical layout to be obtained by allowing all components to be kept close to the circuit stage with which they are associated; and gives almost complete protection for components as the barriers form a wall against damage. All Lockstrips are of tropical grade insulating material.

## The Henley Education Scheme

**T**HE large hall at the Woolwich Polytechnic was almost filled with apprentices and their parents or guardians on November 3, the occasion of the third con-



**Mr. E. G. Savage, Education Officer, L.C.C., at Henley students' conversazione**

versazione and prize-giving in connection with the education scheme of the W. T. Henley's Telegraph Works Co., Ltd., and associated companies. Mr. A. W. C. McArthur, manager of the Woolwich works, presided, and also on the platform were Sir Montague Hughman (chairman of the Henley organisation), Sir Edward Crowe, Sir M. Simpson and Mr. W. F. Bishop (directors), Dr. P. Dunsheath (director and chief engineer of the company and president of the I.E.E.), Mr. F. Anderson (general manager), Mr. E. B. Savage (Education Officer, L.C.C.), Mr. W. A. Gallon (borough electrical engineer, Woolwich), Mr. R. O. Wright (a former manager of Henley's Gravesend Works), and others.

Mr. McArthur having welcomed the guests and outlined the Henley education scheme for trade apprentices and student apprentices, Sir Montague Hughman pre-

sented the awards granted to 43 students in respect of examination successes under the education scheme, to ten employees with examination successes outside the scheme, and prizes to 26 students for craftsmanship, art, models and technical drawings. Their work formed part of an exhibition in the gymnasium, where demonstrations of scientific and technical apparatus were arranged by Mr. J. H. Savage (Woolwich works) and Mr. H. C. Hoban (research laboratories).

Sir Montague Hughman congratulated those who had won prizes, and wished those who had not better luck next time.

Mr. E. G. Savage, Education Officer to the L.C.C., speaking of the place such a scheme had in the general educational system, said it was within his own observation that schemes such as that Henley's were operating were perhaps more frequently to be found in the electrical industry than in any other.

A hearty vote of thanks was accorded Mr. Savage, on the motion of Mr. E. Judge (Gravesend works manager), and on behalf of the students John A. Rayson, the senior student, thanked the company for the educational facilities granted to them.

Dr. P. Dunsheath, as chairman of the Henley Education Committee, thanked the chairman of the governors and the governors of the Polytechnic for placing the hall, gymnasium and refectory at the disposal of the company, those who had arranged the conversazione, and all who had helped to make the education scheme, now in its fourth year, a success. He added that industry, in regard to education, must always have an eye on the youth who, in the future, would take a senior position; but it must also look after the average boy and give him a chance because he was going to carry the burden of the industry.

# Street Lighting

## Adequate Illumination a Major Safety Factor

SOME of the problems involved in the development of new and improved lighting were dealt with by Mr. E. C. Lennox in a paper on "Street Lighting" read before the I.E.E. Installations Section last night, November 8.

Street lighting, the author said, fulfilled public necessity in providing for the convenience and increasing the safety of all road users; in assisting police in their work of preventing crime; and in enhancing the attractiveness of shopping areas and giving emphasis to, and creating pride in, civic centres. Each of these functions called for serious thought to the design of appropriate installations, the most important function being the first of these. He firmly believed that adequate street-lighting facilities would be a major factor in minimising road accidents during the hours of darkness and that the cost of such lighting would be but a small premium to pay.

### Requirements of Street Lighting

The principal requirement of adequate street lighting was to provide means whereby the road user could see accurately and quickly any object in his line of vision. From the point of view of the road user, whether a pedestrian or a driver of a fast-moving vehicle, it was clear that he must see objects on the roadway against a background made up of the road surface and its environs, i.e., footpaths, fences, buildings, etc., lining the roadway. The street-lighting installation must create a contrast of brightness between the object and its background.

The complete lighting installation must, in effect, be such a build-up of the bright areas produced by the various lanterns that those areas merged and presented a complete pattern of background brightness to the observer. This required careful siting of each lighting unit so that the maximum value of background brightness would be observed by road users. In traffic-route lighting, the spacing of lamp standards, which should normally be an average of 150 ft. (180 ft. maximum in any span), might on bends be reduced to as low as 90 ft. with lanterns mounted 25 ft. high. The overhang of the lantern over the roadway must be considered in relation to the road width. The optimum effects which could be produced by lanterns appropriately designed could easily be lost by giving insufficient consideration to those details.

The benefit to be derived from the lighted background, posters, buildings, etc., as well as from footpaths and roadway, should be carefully studied. It was against these

backgrounds that objects were seen in silhouette.

A unidirectional distribution of light might be used on double carriage-ways or one-way roads where traffic proceeded in one direction only. The author believed that this system of lighting would be closely studied for use on dual carriage-ways.

### Code of Practice

The recommendations in the Final Report of the Ministry of Transport's Departmental Committee on Street Lighting set out the best code of practice for street lighting that had yet appeared. A new specification, which supplemented those specifications, was expected to be issued shortly.

The erection of lighting columns which in daylight offended the eye was not to be encouraged, and it was pleasing to record that the Royal Fine Arts Commission had already co-operated with manufacturers with a view to improving the standard of design. It was hoped that such co-operation would continue in the post-war period.

With the adoption of a B.S. specification, based on the M.O.T. Final Report, only two mounting heights need be generally considered: (a) 25 ft. for traffic routes, and (b) 15 ft. for non-traffic routes. But a number of types would still be required for trunk roadways and roads in industrial areas, where the utilitarian aspect was paramount, as well as for main civic centres, shopping areas and promenades, where consideration might be given to "amenities." Poles of good design were available in cast-iron (for Class B roads), steel tubing and concrete. The ultimate choice would always be a matter of taste, apart from the more important details of price, size, shape, etc. Concrete poles with a smooth, bright finish to save painting might well be a popular post-war product.

### Choice of Lanterns

The choice of lanterns would be determined by utilitarian and aesthetic considerations. The variety, both in size and shape, of light sources, some with horizontal and others with vertical elements, had resulted in a multiplicity of lantern designs which was bewildering to the uninitiated. The lantern should be mechanically robust, rigidly assembled and capable of easy and solid fixing to the bracket arm. Until just before the war fixing was mainly by means of a screwed nipple from the bracket arm to a terminal box at the top of the lantern. The more recent arrangement for side entry was much to be preferred, as it provided a more rigid fixing

and easy wiring. Exteriors should be as smooth as possible to reduce windage and facilitate cleaning. The lantern, generally, should be designed for ease of cleaning, both internally and externally. Prisms of exterior refractor bowls or plates should, wherever possible, face the interior. Where lanterns were totally enclosed they should be weatherproof, attention being paid to the junction of glassware with canopies, by firmly fixing a gasket which did not become loose or misplaced when the lantern was opened.

The more extensive use of light alloys might be expected, but the use of non-sympathetic metals in contact with each other should be avoided in order to prevent corrosion.

Metal-filament lamps would continue to play an important part in street lighting. They required no auxiliary apparatus such as chokes and condensers, as did the newer types of electric lamp. Colour output was more normal, and the small light source was easier to control and distribute than the average discharge lamp. Their efficiency was apparently limited to present figures, and this, in conjunction with their short normal life (average of 1 000 hours) showed the higher-wattage lamps to disadvantage in respect of annual running cost when compared with electric discharge lamps of similar lumen output.

The various forms of electric discharge lamps offered advantages over the metal-filament lamp in respect of efficiency and lamp life. From the economic angle those advantages were lessened by the higher cost of the lamp and the additional cost of auxiliary apparatus and its housing. But other points must also be considered by prospective users of these lamps for street lighting.

#### Electric Discharge Lamps

Where electric discharge lamps were to be used on Group A roads, it must be remembered that the spectrum of the light produced differed from the continuous spectrum of ordinary daylight. This could not in general be held to be a disadvantage in Group A lighting, where the chief consideration must always be road safety. A matter of great importance arose, however, in the lighting of such areas as civic centres and promenades, where a normal colour distribution might be considered desirable. Here either metal-filament lamps or some method of colour correction of mercury-vapour electric discharge lamps must be used, either by (a) including a metal-filament lamp in the lantern with the mercury-vapour lamp, which might prove somewhat expensive in maintenance; or (b) adopting some form of fluorescent mercury-vapour lamp. Sodium-vapour lamps should not be used in such cases.

The street-lighting picture as a whole must also be considered. Nothing was

worse than a patchwork of coloured lighting on small areas of roadway and street surfaces. The author registered a plea for much greater control in planning in order to avoid a colour-patchwork effect.

The introduction of the low-pressure mercury-vapour fluorescent tube had naturally raised the question of their use in street lighting in view of their greater efficiency as compared with metal-filament lamps, and the more normal colour output as against h.p.m.v. and sodium lamps. Welcome as those new lamps were for the illumination of interiors they could not, in the author's opinion, have any real place in street lighting because of the low wattage of the lamps manufactured—the largest lamp manufactured had an 80-watt rating, and at least four tubes per 150 ft. spacing would be required to give a light output equivalent to the 250 W h.p.m.v. lamp—and because of their dimensions, namely, 5 ft. long and  $1\frac{1}{2}$  in. diameter making a large, awkward, expensive and relatively inefficient housing necessary, which would introduce difficulties in fixing and maintenance.

#### Switching in the Future

The days of the hand switching of public lamps were surely past; its benefits, such as a daily patrol with its attendant quick and regular reporting of outages, were more than outweighed by automatic means of control and a system of regular patrol. The future might see new methods of centralised control—radio-controlled equipment might be evolved—and the engineer must give careful consideration to all the implications of the various methods in relation to both h.v. and l.v. networks, before embarking on a comprehensive scheme.

Constant research by lamp manufacturers would no doubt bring increased efficiencies and other improvements in the several types of electric lamps now available, raising still further the marked advantage they had over other forms of artificial illumination.

There could be no radical change in the mechanics of producing adequate street lighting—methods suggested as a result of experience, for example, the use of lamps suspended from balloons; reflection from clouds or balloons of the light projected by searchlights, or inseting a series of light sources in kerbs or fixing them at a relatively low level, could be, and had been, already dismissed as impracticable.

The increasing volume of road traffic would call for more and better lighting than in use before the war. The future should therefore bring to the electrical industry a vast volume of trade in street-lighting equipment. The many problems entailed in street lighting should therefore be carefully studied by all concerned, to ensure that the industry was able to meet the demand in all its aspects.

# Telephone Interference

## Overseas Visitors Take Part in I.E.E. Discussion

**T**HE paper on "Practical Aspects of Telephone Interference Arising from Power Systems," by Mr. P. B. Frost and Mr. E. F. H. Gould, of the Post Office Engineer-in-Chief's office, extracts from which were given in our last issue, was read and discussed at the meeting of the Institution of Electrical Engineers on November 1.

Before calling on the authors, the president, Dr. P. Dumsheath, welcomed a number of delegates who were in London attending meetings of the C.C.I.F. He said there were delegates from China, Denmark, France, Italy, Mexico, Mozambique, the Netherlands, Sweden and the U.S.A., together with representatives of the Allied Commission and of the secretariat of the C.C.I.F.

The paper summarised investigations on telephone interference carried out in this country between 1934 and 1944. A comparison of calculated and measured values of induced voltage at various sites showed, it was stated, that in most cases good agreement was possible with the available data on earth resistivity. Further work was required on the screening effect of various earthed conductors. The precautionary measures available for power and telephone systems to avoid damage to plant and injury to personnel from high induced voltages were discussed. Results of tests showed that noise interference was serious from faulty power lines, which were maintained in operation through the rise of arc-suppression coils. The propagation of harmonic currents on long power lines required further study. Attention was drawn to the possibility of interference from a power line supplying a large rectifier. Other sections of the paper were devoted to multiple earthing of high-voltage and low-voltage systems, apparatus developments and rise of earth potential.

**Mr. J. Hacking** (Central Electricity Board) said the number of serious happenings on telephone systems due to interference from power lines in this country was small. Subscribing to the plan for co-operation between those concerned with the telephones and those operating power systems, he expressed the view that there was no justification for giving prominence to the telephone side. The Post Office had been given very wide powers, but the views of the public supply authorities must not be disregarded. The problems must be considered jointly and a solution fair to both services in the most economical manner must be sought. For this reason he did not like the order in which the remedial measures were dealt with in the paper, and the inference that the whole

onus rested on those operating power systems. That was not an example of the co-operation which was necessary. Over-voltages could occur on telephone systems from lightning or from power systems, but the paper rather tended to minimise the danger from lightning on the ground that it was of short duration, but it was questionable whether it was of such short duration compared with interference from extra high voltage systems. Lightning strokes were not single strokes; there were recurrent strokes which made troubles due to lightning last as long as interference from power systems. Mention was made of difficulty in carrying out work on telephone lines due to risk of interference from power systems, but precautions were taken to safeguard men working on power lines and he found it difficult to accept the view that precautions could not be taken in the case of telephone linesmen. Gaseous discharge tubes had been used experimentally and they gave excellent results if well designed. He believed the Petersen coil would be used more in the future, although it had limitations in certain conditions.

**Dr. W. G. Radley** (Post Office) said the paper rather gave the impression that the authors felt many problems still remained unsolved and that a great deal of experimental work must be done before they could begin to calculate many interference effects with any confidence. On the other hand, he would like to sound a more optimistic note and point out that the basis for the theoretical calculation of inductive effects was firmly established by experiment some ten years ago. It was not so much the theory that was uncertain now as that in many cases the practical conditions were not accurately known. Therefore, the chief value of a series of measurements such as were given was in the building up of data from which one could deduce, what he might call for want of a better name, factors of experience. He would have liked more information with regard to the operation of the three-electrode gas-filled tubes, and he asked if the authors were entirely happy in the suggestion that a reasonable degree of accuracy was obtained from them, always assuming that the resistance of the earth connection was low.

**Dr. H. S. Osborne** (American Telephone and Telegraph Co. and vice-president of the American Institute of Electrical Engineers) spoke of the co-operation that existed in America on the question of interference or inductive co-ordination, as

it was called in the U.S.A. Although this had always been difficult and complicated in a technical way, the problem had become less troublesome during recent years. Owing to the co-operation that existed, the danger of restrictive legislation had been avoided. Those concerned had got together and pointed out that there were far more points on which they agreed than disagreed and, therefore, they should co-operate to solve the latter. As a result there had been great developments in telephony without trouble from power systems. A new problem had arisen during the last few years due to the wide expansion of the use of rectifiers for aluminium plants, chemical works, railways and so on, but certain steps had been taken to deal with that. The use of quick-acting circuit-breakers tended to obviate the danger to linesmen, and there had been developed in the United States a series of protective clothing and devices for placing on overhead wires where they were known to be dangerous. However, such devices were not practical for general use. Improvements had also been made in protective devices for telephone lines. In an endeavour to make both electricity supply and telephones available to all farmers in the United States, consideration was being given to the possibility of a joint use of the rural power lines to give also the telephone service. The rural power lines were of the order of 12 to 15 kV and a form of construction had been devised which it was believed gave protection to the telephone lines, and at the same time considerably reduced the cost of construction.

**Mr. H. W. Grimmlt** (Electricity Commission) remarked that supply engineers knew that the Post Office had been given too many powers, but the result had been a great influence on the design of power systems. He had often hoped that an erudite member would read a paper entitled "The Influence of the Postmaster-General on the Lay-out of Power Cables in the United Kingdom," and although it might be thought that many of the interference problems were really the responsibility of the Postmaster-General it must be admitted that, considering the matter broadly, the influence of the Postmaster-General had been to the benefit of the supply industry. The supply industry had a lot to thank the Post Office for, although there were a few differences of opinion on details. However, the outstanding feature in the paper was that very few accidents that had occurred and for that reason some of the conclusions in the paper seemed rather strong. For instance, the reference to Petersen coils might cause people not to instal them when, in fact, they were great trouble savers in operating

supply systems. Surely the value of Petersen coils must be dependent on the lay-out of the system in relation to the telephone circuit. With regard to induction on telephone lines, had the authors any case of accident to men jointing cables? Personally, he thought the risk was very remote. The authors had rather gone astray in saying there was prohibition of multiple earthing of low-voltage systems. There was no prohibition of multiple earthing of ordinary sub-stations.

**Dr. G. Swedenborg** (Swedish Posts and Telegraphs) said that many 220 kV power lines in Sweden ran in the north-to-south direction owing to the configuration of the country, and the same applied to many of the telecommunication lines, so that it was impossible to avoid parallelism between the two types of line. A calculation of induced voltage in the telephone lines from earth fault currents showed that acceptable values could only be obtained if the earth connection of the power lines consisted of suitable current limiting devices such as Petersen coils or resistors. The recent trend in Sweden, however, had been to adopt direct earthing of the neutral point rather than Petersen coils, in order to reduce insulation costs and to obtain certain advantages in the construction of the protector equipment. Referring to the different types of protective devices mentioned in the paper, he doubted whether it was possible to introduce three-electrode gas discharge tubes or earthing relays in telecommunication lines when these consisted of cables containing about 200 metallic circuits. The lay-out of special screening wires on either the power lines or the telecommunication cable would involve unreasonable cost, and the only remedy in such cases was to retain the Petersen coils to limit the earth fault current. The need for transmitting large blocks of power from the north to the south of Sweden had become so urgent in recent years that an experimental and theoretical investigation had been undertaken into the use of high voltage d.c., and a preliminary investigation had indicated that a 440 kV d.c. line would transmit about three times as much current as a 220 kV a.c. line of the type hitherto used in Sweden. An experimental line was to be brought into service next spring.

**Mr. J. S. Forrest** (Central Electricity Board) supported all that had been said as to the need for co-operation, and said that in difficult cases a test was usually required and facilities could only be obtained by full co-operation of the parties concerned. Further, a test was useful in convincing everybody that remedial measures were necessary. The interference which might be obtained from a.c. lines feeding large



mercury arc rectifiers was something which required watching in this country. Admittedly there had not been any serious trouble so far, but the wave form of some of our a.c. systems was considerably distorted by harmonic currents due to the rectifier, and he strongly urged that action should be taken before the trouble became really serious. Mention had been made of the large number of cases of interference due to earth return circuits. He believed that where this had happened the earth return circuits had not been of the best, and he hoped there would be no more trouble from that cause.

**Mr. S. B. Warder** (Southern Railway) gave details of further tests carried out by him on the Southern Railway in addition to those mentioned by the authors, which were carried out between Byfleet and Portsmouth. He indicated that slightly divergent results were obtained for the screening factor for the system as a whole as compared with the figures in the paper for the Byfleet-Portsmouth line, and said that the screening factor was also influenced by the climatic conditions according to whether winter or summer.

**Mr. D. P. Sayers** (Birmingham electricity department) said that from the practical point of view he was a little disappointed at the lack of detail in the paper. For instance, Table 1 indicated that from the practical point of view certain measurements corresponded to certain calculations, but it did not go any farther and finished up at a very interesting point. It would have been useful to know the subsequent operating experience. It would be interesting to know if the devices put in by the Post Office had functioned on any or many occasions and some assessment of the cost of the plant injury had they not been installed. He thought he was expressing the views of most power engineers when he said that whilst they fully appreciated their responsibility in this matter, they had a feeling that the restrictions on the earth fault current were based on rather abstruse mathematical calculations not entirely supported by concrete evidence. With regard to the statement that a number of incidents had been identified on telephone systems as due to power systems, surely the authors should have indicated the number and seriousness of these incidents. The Birmingham undertaking was one of the heaviest power cable and telephone cable areas, and he was, therefore, particularly interested in the effect of earth faults on underground cables. He asked if there were any cases on record of telephone linesmen and jointers being injured through faults attributable to power cable faults. Power supply people probably had as many jointers working on their cables as the tele-

phone people, but he could not recall any case in which a jointer had received a shock due to induced effects from a power cable.

**Mr. E. S. Ritter** expressed the view that there was much more interference due to faulty operation of power systems than to definite faults or transient faults in the power system, and asked how many power systems there were on which there could be faults which were never brought to light until some interference or other trouble was caused to some other user?

**M. G. Valensi** (Secrétaire Generale C.C.I.F.) said it was felt that now was an appropriate time to take steps to ensure the greatest possible co-operation between the power supply and telephone interests because of the great improvements that had taken place in recent years in both techniques, and also because there were so many common bonds between the two. Power engineers were also telecommunication engineers, having regard to the extent to which telephonic communication was used on the power systems, so that they had a great interest in preventing interference.

## Illumination Design

The E.L.M.A. Lighting Service Bureau will open the 41st Illumination Design Course at 2, Savoy Hill, London, W.C.2, on November 21, the programme being as set out below. We are informed by the Bureau, however, that accommodation is already booked and we give the programme as a matter of interest only and as indicative of the subjects to be covered in future courses.

Wednesday, November 21:—10.0 a.m.: Registration. 10.30 a.m.: Official opening by Mr. H. A. Lingard, Chairman of the E.L.M.A. Council. 10.45 a.m.: The New Outlook on Lighting, by Mr. W. J. Jones, covering the work of N.I.E.L.S. during the war and an analysis of the demand for better lighting. 2.0 p.m.: Lighting in War-Time, by Mr. E. B. Sawyer, describing how lighting aids production efficiency, and the lessons of A.R.P. lighting. 3.30 p.m.: Illumination Design for Interiors, by Mr. R. O. Ackerley.

Thursday, November 22:—9.30 a.m.: The Development of the Electric Lamp, by Mr. A. G. Penny. 10.30 a.m.: Modern Conception of Quality, by Dr. B. P. Dudding, describing the achievement and effect of quality control, with special reference to lamp manufacture. 11.30 a.m.: Fluorescent Lamps, by Mr. H. R. Ruff. 2.15 p.m.: Circuits and the Maintenance of Fluorescent Lamps, by Mr. J. N. Hull. 3.30 p.m.: Fluorescent Lamp Fittings and Methods of Installation, by Mr. C. R. Bicknell.

Friday, November 23:—9.30 a.m.: The Relation Between Light and Colour, by Mr. T. S. Jones. 10.30 a.m.: Post-War Lighting Possibilities, by Mr. E. B. Sawyer. 11.30 a.m.: Other Applications of Artificial Light, by Mr. A. Mansell. 2.30 p.m.: Applications of Fluorescent Lamps, by Mr. A. D. S. Atkinson. 3.50 p.m.: General Discussion.

# Engineers and Management

## First I.E.E. Informal Meeting of the Session

THE first I.E.E. informal meeting of the session was held on October 29, when the president, Dr. P. Dunsheath, opened a discussion on "Should Engineering Concerns be Managed by Engineers?"

He began by saying that if any reason were required for devoting time to the discussion of this subject it could be found in the present inefficiency of industrial management; indeed, it had been said that an important factor in industrial management in this country was the inborn resistance to capital expenditure and change in equipment, and a desire to secure profits by the suppression of competition. A recent publication entitled "Tools for the next Job" (published by the Tory Reform Committee) had shown the need for this country to take the question of international competition seriously; industrial efficiency as measured by physical output per head before the war was more than twice as great in the United States than it was in the United Kingdom, speaking in general terms, whilst in the case of motor-car and radio-set manufacture it was four times greater.

### Rule by Administration

The President referred to John Burnham's book, "The Management Revolution," which showed that, while capital had virtually lost its power, Socialism was not taking its place. What had sprung up as the most powerful of industrial controls was the rule by administration, both in business and in government. If this were so, then the engineer might have much to contribute.

He alleged that the weakest factor in British industry to-day was the administrative side, and he asked those present to consider whether the management of engineering firms as a whole attained anything like the efficiency that it attained by the scientific and technical sides. Warning to his subject, he said: "An indictment of management is to be found in the complete lack of that something which may be put down as loyalty to the firm and that spirit of enthusiasm which over-rides everyday difficulties. Whilst we had carried the fetish of scientific management with stop-watch and motion study a very long way, we had neglected human psychology, which was much more vital. There was strong evidence that the time had arrived for returning to the state of closer human contacts between manager and managed, which were such a feature of industry half a century ago."

The popular view that the sole object of management was to produce financial profit to the investor he regarded as an unsatisfactory conception. The real object should

be to run the concern so as to secure the greatest possible success in the furnishing of the service, whatever it might be, to the community. If correctly interpreted, profit for the organisation and service to the consumer became synonymous.

Control of industries by finance or the direction of production by finance was deplored and attention was called to the fact that whilst in the U.S.A., industry was often under the control of finance, men with the widest technical experience were employed, and as a result, industry in the U.S.A. achieved a very high standard of efficiency.

There were many engineers who, if they were put into a position of managerial responsibility would be a complete failure. Equally, the lack of practical outlook on the part of the scientist completely unfitted him for management. Commenting that an institute existed solely for the purpose of formulating the standards of knowledge, training, conduct or experience desirable in the practice of industrial administration, the warning was given that a dangerous assumption existed in certain circles that industrial administration was an activity that could be conducted *in vacuo* by an individual otherwise completely ignorant of the particular industry which he was to administer. The manager of an engineering concern must understand engineering principles in order to carry the high administrative responsibility with the maximum success. The main characteristics which made a successful manager were obviously a flair for leadership, a capacity for securing co-operative effort from a number of people working together, a sound judgment and a keen imagination.

### Need of Broader Engineering Courses

Twenty speakers took part in the discussion, the general trend of which was that an engineering training was a good background for a man who possessed managerial ambitions, although it was said that managers were born and not made. A plea was made for greater attention to management matters in engineering courses, and the qualifications for a manager were defined by a speaker as an engineering background, a commercial outlook and an administrative and organising ability.

In summing up the varied comments, the President remarked that it was clear that the whole question under review was linked up with education, and that much was to be expected of the enlightened view that was now being taken of the nation's responsibility in this regard.

# Industrial Information

**A New Depot.**—The Enfield Cable Works, Ltd., announce that they have recently opened a depot at 2, Rockstone Place, Southampton (Telephone: Southampton 2413/4), where most of their standard products are available.

**Price Advance.**—F. C. Blackwell and Co., Ltd., announce that increases in manufacturing costs compel them to increase their selling prices for all items as from November 1 to 60 per cent. of the net trade prices shown in the 1919 list and subsequent issues.

**Cheerful Rationing.**—To fill the needs of colder days the recipes on this month's card issued by the E.A.W. are for warming dishes and soups and hot sweets. They are tasty and nourishing and also help to conserve rationed food. There are also some useful home hints and handy measures.

**An Electronic Relay.**—Survic Controls, Ltd., have just issued a leaflet (Publication E.A.10(a)) describing their electronic relay, type E.A.2, which, it is claimed, needs only a few micro-watts to operate it, and will control a load of 2 kW at 200/250 V a.c. It can be adapted to operate with a photo-electric cell.

**Summation Metering.**—Ferranti, Ltd., have issued a new catalogue (List IS.6) giving details of their summation metering equipment, which has been designed specially to summate the loads of bulk supplies of electricity given over two or more feeders and to measure the maximum demand on the summated loads for tariff purposes.

**Fuel Efficiency News.**—The October issue of the leaflet published by the Ministry of Fuel and Power Fuel Efficiency Committee dealing with the training of stokers, the City and Guilds courses in boiler house practice, the Institute of Fuel examinations, and the winter's programme arranged by the Ministry in collaboration with the Ministry of Education and the technical colleges.

**Kent-Multelec Pyrometers.**—An admirably produced booklet has been issued by George Kent, Ltd., describing a range of temperature recorders and controllers based on the potentiometric principle, of extreme sensitivity and great relay power. The instruments and their varied applications are illustrated by a large number of photographic reproductions and drawings.

**Copper Development Association.**—The Copper Development Association, which during the war operated principally from a temporary office in Rugby, has now acquired premises at Kendals Hall, Radlett, Herts. All urgent communica-

tions and applications for the association's literature should be addressed to Radlett. The association will continue to maintain its registered address at Grand Buildings, Trafalgar Square, London, W.C.2.

**Certificates of Origin Order Revoked.**—The Board of Trade have revoked the Import (Certificates of Origin and Interest) Order (S.R. and O., 1939, No. 1505) and amending orders. Importers need no longer produce certificates of origin and interest in respect of goods imported from Liberia, Liechtenstein, Portugal, Spain, Sweden and Switzerland.

**Gauge and Tool Makers' Exhibition.**—Among the members of the Gauge and Tool Makers' Association who have taken space at the exhibition to be held by the association at the New Hall, Vincent Square, London, S.W.1, from January 7 to 18, are the Newall Engineering Co., Ltd., the Sigma Instrument Co., Ltd., Universal Tools, Ltd., Precision Tools (Leeds), Ltd., the Monarch Tool Co., Ltd., the Horstmann Gear Co., Ltd., the Coventry Gauge and Tool Co., Ltd., Precision Grinding, Ltd., Fox and Offord, Ltd., Reliance Precision Tools, Ltd., and the Midland Gauge and Tool Co., Ltd.

**Fair Trading Policy.**—The third edition of the "British Electrical Industry Fair Trading Policy for Home Trade" has just been published by the Electrical Fair Trading Council. It contains important amendments and additions to the previous two editions, which have resulted from experience gained since the original edition was published in 1936. The more important of these amendments set out extended definitions for the special large buyers and recognised users. Previous schedules have been revised, and two new schedules have been added. Any electrical firm can obtain a copy from the secretary, at Kern House, Kingsway, London, W.C.2.

**Release of Storage Premises.**—Return to industry of premises requisitioned during the war for storage purposes is to be accelerated. Up to September 30, 1945, about 138 million sq. ft. of industrial floor space was still held under requisition by Government departments; premises covering about 12 million sq. ft. were in process of being released. Provided that disposals depots, labour and transport are forthcoming, the aim of the Government is to ensure the release of the remaining factory accommodation by the end of 1946.

**Bell System Technical Journal.**—The April 1945 issue of the Bell System Technical Journal contains several informative articles on the usage of piezo-electric

crystals, particularly in oscillator circuits and the independent measurement of their performance indices. A further article discusses the protection of buried toll cable against strokes of lightning, a general method being to add a copper shield outside of, and insulated from, the normal lead sheath. References are further given to papers on ultra-short-wave transmission, vibration recording in aircraft, and the technique of making paper capacitors.

**Nife Batteries in Procession.**—We reproduce a photograph of a lorry exhibit which was entirely prepared by amateurs at the



Lorry exhibit of Nife Batteries, Ltd., prepared by amateurs at the company's works, and seen in Birmingham last Saturday

works of Nife Batteries Ltd., and entered in local hospital carnivals, the most recent being the Birmingham University Students' procession last Saturday. The exhibit was illuminated by Nife nickel cadmium alkaline accumulators and was without doubt the brightest spot in the torch light procession. Considerable interest was aroused by the miners' cap lamps and hand lamps and also by the exhibit, for the first time, of the smallest alkaline accumulator yet made. It measures 13 mm by 11.5 mm by 25 mm and has a capacity of  $\frac{1}{10}$  Ah. Thousands of these miniature cells were made at the company's works and assisted the war effort.

**War-time Production.**—Details have been given of the war-time activities of Pickering's, Ltd., electric lift makers, Stockton-on-Tees. In the year before the war the firm made 300 lifts of various types, but contracts for commercial firms were reduced when hostilities started. The firm's first war-time contracts were for the complete designing and manufacture of handling plant for heat treatment furnaces in a number of the largest aluminium factories in the country. Other types of handling plant and furnace charging machinery were for aircraft engines, airscrews, bombs, shells, armour plate and gun barrel forgings.

Over 100 food lifts were made for aerodromes, in addition to ammunition lifts for the Dover cross-Channel guns. The firm were also engaged in the making of trench mortars, Bailey bridges and pontoon bridge sections.

**Notes for Contractors.**—Discussions on a claim submitted by the E.T.U. for a review of the existing wages paid to electricians in all zones and of the existing wage structure of the industry took place at a meeting of the Standing Committee of the National Joint Industrial Council on October 23, and it was decided to grant an increase of 2d. an hour, to commence on the first pay day in December. The inclusive hourly rates will then be as follows: Grade "A," 2s. 7 $\frac{1}{2}$ d.; Mersey district, 2s. 5 $\frac{1}{2}$ d.; Grade "B," 2s. 4 $\frac{1}{2}$ d.; Grade "C," 2s. 3 $\frac{1}{2}$ d.

## Radio Measurements

AT a meeting of the Radio Section of the I.E.E. on Wednesday was read a paper entitled "Radio Measurements in the Decimetre and Centimetre Wavebands," prepared by Messrs. R. J. Clayton, J. E. Houldin, H. R. L. Lamont and W. E. Willshaw.

The paper deals with the technique of radio measurements evolved as a necessary aid to the development of decimetre- and centimetre-wave valves, circuits and equipment, and surveys some of the methods applicable in this field. It commences with a review of the circuit theory of coaxial and wave-guide transmission lines, followed by a short section on high-frequency oscillators.

Succeeding sections deal with the measurement of the fundamental quantities of frequency, power, impedance and voltage. Heterodyne methods of frequency measurement, and coaxial and resonant cavity wavemeters, are described. The design of bolometer and calorimeter circuits is discussed for powers between 1 microwatt and several hundred watts. Measurements of reflection co-efficient and  $Q$  values are included in a section on impedance.

The concluding sections deal with derived measurements: receiver sensitivity, aerials and field strength. A standard of receiver sensitivity is established, based on thermal noise voltage, and the design of suitable signal generators and sensitivity measuring equipment is discussed. A section on aerials comprises measurements of polar diagram, gain and impedance. Finally, equipment for the absolute measurement of field strength at centimetre wavelengths is outlined.

## News in Brief

**Wireless for Children.**—The Hull Children's Care Committee is to provide wireless sets at the children's homes at a cost of £112.

**Telephone Installation.**—The South Shields Finance Committee has approved the installation of a private telephone system at the Town Hall.

**Main Line Electrification.**—Work on the electrification of the Manchester-Sheffield line, suspended because of the war, will be restarted soon. When completed it will make this the first British main line to be entirely electric.

**Underground Power Stations.**—The Urmston Council is requesting the Stretford and District Electricity Board to build electricity sub-stations in the urban district underground so that gardens may be planted over the roofs.

**Restoring Cable and Wireless in the Far East.**—It is announced that four of the twelve Cable and Wireless Ltd. Far Eastern stations which were occupied by the Japanese have now been wholly or partially restored. The offices at Singapore, Hongkong and Penang are open to the public.

**Illumination Photomicrography.**—A meeting of the Association for Scientific Photography will be held at the Alliance Hall, Westminster, S.W.1, on November 29, at 6.30 p.m., when a paper by Mr. A. G. Sabin on "Illumination Photomicrography" will be read and discussed.

**1946 Components Exhibition.**—The Radio Component Manufacturers' Federation's exhibition of radio and communications components will be held at Grosvenor House, Park Lane, from February 19 to 22, 1946. The exhibition will not be open to the public and admission, as in previous years, will be by ticket only.

**U.S. Radio Relay System.**—A seven-years' plan to set up a super-high-frequency radio relay system between major cities in the U.S., which, it is claimed, will eventually eliminate much of the 2 300 000-mile telegraph wire network, is announced by the Western Union Telegraph Co. in New York. The new radio system uses towers 30 miles apart and provides a number of channels to handle telegraph traffic. Circuits for facsimile transmission of teletypewriter and telephone messages have also been provided.

## War-Time Activities Exhibition

**S**PEAKING on Wednesday at a preview of the War Activities Exhibition of the English Electric Co., Ltd., which is to be opened to the public on November 19, at their London showrooms, in Kingway, Sir George Nelson, chairman of the company, said there were no fields of war activity in which the company had not played its part. We had now to face the greater problem of the change-over from war to peace, and it called for as great an effort in quicker time, because our very existence and the filling of home needs, depended upon the volume of our export trade.

The exhibition shows, in miniature, by means of a series of illuminated panels, photographs and models, how the company's works at Stafford, Rugby, Bradford and Preston met the country's needs by turning out sixty million pounds worth of war materials and equipment. Among the products illustrated are equipment for ship propulsion and protective devices for the battle against the magnetic and acoustic mines; a 3-pole air-break circuit breaker of the type largely used in mine-sweeping craft; Halifax and Hampden bombers; No. 2Mk.1 predictor and the mechanism of a large searchlight; hydro-

electric units and large rectifier plants to feed new aluminium factories; four types of army tanks, including the later Comet, made by novel methods; Diesel-electric locomotives, and power stations mounted on railway trucks, turbo-alternators, transformers, motors and other equipment supplied to the U.S.S.R.; communications equipment; and the huge range of the company's peace-time engineering work, with examples of their products. There is also a glimpse of the company's approach to the future.

A miniature high-frequency heating equipment is installed, which can be operated by visitors, and also greatly enlarged micro-photographs of sections through welded structures.

An experimental plant for the laboratory preparation of synthetic resins is seen at work, and a large scale model of the high-voltage laboratory at Stafford forms the largest exhibit in the research section.

The windows, facing on to Kingway, show a detailed model of one of the four 30 000 kW turbo-alternators at Little Barford, some examples of the company's prototype "Ritem" domestic appliances, and a large diorama of the Galloway hydro-electric scheme.

# Plugs and Sockets

## E.C.A. Statement on Matter of Up-rating

IN support of the views already put forward against the proposed up-rating of the B.S. 546 standard 5A plug and socket, the Electrical Contractors' Association has issued a statement to the effect that many of the sockets installed in the early days did not comply sufficiently closely with the specification to permit of interchangeability between various makes, without becoming too hot. The matter was rectified, but, it is claimed, those installed before the adjustment was made are still in use and are unfit for up-rating. It is also pointed out that some sockets, too, are controlled by 5A switches, which should not be up-rated.

It is stated that the considerations involved in the matter of plugs and sockets are essentially of the type which contractors, supply authorities and Government departments can have full knowledge, and these are unanimously in favour of a new design with a fuse in the plug. The I.E.E. Wiring Rules Committee, it is said, has not been consulted in the matter, despite its intimate concern.

It is stated that the number of 3 kW portable appliances is believed not to exceed 7 per cent. and is diminishing as fixed fires come into more general use; with a wider provision of socket-outlets the per-

centage is likely to fall further.

Assuming that an 1 800 W, 230 V kettle (8A), a 1½-kW fire (6½A) and a 2-kW fire (9 A) can be suitably protected by a 13 A fuse, the size of flexible cord with which they should be wired has to be settled, for in the absence of up-rating the flexibles as well as the plug and socket, the appliances will have to be wired with larger and more expensive cord than they need. If the fuse were in the plug its rating could, it is argued, at least be related in reasonable degree to the rating of the cord and appliance. Again, while on a 230V circuit the up-rated design would perhaps be good enough to carry 13A, it is probable that with voltages of 220 or 200 or lower there may be overheating.

The association points out that new designs with fused plugs are already available and in use, and it is unreasonable to suppose that users will abandon them for a standard which, it is claimed, contravenes the wiring regulations.

It is, in conclusion, maintained that manufacturers will save nothing as regards cost of tools by up-rating, because the socket must be re-designed to contain the fuse and to accommodate larger circuit wire, while the plug must be re-designed to receive larger cords.

## Book Reviews

**"It Can Now be Revealed"**—More About British Railways in Peace and War. (London: British Railways' Press Office). Pp. 64. Illustrated. 1s. net.

Issued on behalf of the four main line railways this booklet is a sequel to "British Railways in Peace and War," which was published last year. Illustrated with photographs, it records how the railways carried workers and raw materials for the construction first of war factories and then of the equipment made in them; how the railways themselves designed, built, and repaired armaments that played their part in the Battle of Britain, North Africa, and the invasion of Europe; how they helped to prepare and supported the bomber offensive based on English aerodromes; and how railway staffs toiled and suffered under flying bombs.

The busiest four weeks in British railway history followed D-Day, with the operation in that month of 17 500 special trains for troops and stores, 113 trains exclusively carrying military mails and parcels, and ambulance trains that made 300

journeys. The purpose of the booklet is twofold. Besides giving a fuller conception than ever before of those efforts of the British Railways and London Transport that probably contributed most towards final victory, an endeavour has been made to explain, quite simply, some of the problems that now face the railways. These problems and the post-war plans of the railways to give the public the best possible transport services as soon as conditions permit are described in the final chapter, "The Way Ahead."

**Hints on Public Speaking.** By GLADYS BURLTON. (London: The Burlington Institute). Pp. 11. 3s. net.

This handy booklet is intended for the guidance and assistance of "teachers, preachers, politicians, business men and all who wish to inform, influence or entertain an audience." The essentials of success in public speaking, together with common errors that must be avoided are clearly set out in a convincing manner, and anyone with normal intelligence, who follows the advice given, should, with practice, become a good speaker.

# Electricity Supply

**Hospital Equipment.**—The Middlesex Health Committee is to purchase nine food trolleys for the Harefield Hospital at a cost of £1 026 and £180 for the installation of plug points and wiring.

**Barrow-in-Furness.**—The Electricity Committee is to provide supply to Merlewood Farm, Lindale, at a cost of £260; to High Newton at £1 020; and to Greengate estate at £580.

**Cardiff Model Kitchen.**—The model kitchen built by the Cardiff electricity department for installation



View of Cardiff model kitchen

at a Local Government exhibition held in the City Hall at the beginning of October, and which was attended by approximately 45 000 people, has now been erected in the electricity showrooms. A 4.4 cu. ft. refrigerator, a Moffat cooker, and the Charlesworth sink unit received great attention.

**Ashton-under Lyne.**—The Council has approved the expenditure of £2 200 on the electrification of the plant lighting and heating at the sewage works at Plantation Farm, Dukinfield.

**Blackpool.**—The Electricity Committee is to provide surge diverters at certain selected points at a cost of £457, and has obtained sanction to borrow £154 269 for two transmission lines from Peel to Bispham.

**Fulham (London).**—The Electricity Committee has reviewed the operation of the rental wiring hire charges and has come to the conclusion that these can now be reduced to 6d. per point per quarter for six months or more for quarterly meter consumers, and 7d. per point per quarter for less than six points

with a minimum charge for three points for quarterly meter consumers. It is also recommended that the charge per unit for slot meter consumers be reduced by ½d. per unit.

**Bolton.**—In the annual report of the Borough Electrical Engineer for the year ended March 31, 1945, the result of the year's working as compared with that of the previous year shows that the gross profit, after adjustments with the Central Electricity Board, was £80 325 (£108 793), leaving a balance, after deducting for income-tax, contributions to capital account, transfer to reserve fund and rate aid of £59 594 (£76 994). The balance carried forward was £205 899 (£185 168). Capital expenditure during the year amounted to £152 505.

**Birkenhead.**—At a meeting of the Electricity Committee Mr. Arnett of the Central Electricity Board, stated that the necessary instruction would shortly be issued for the extension of the station by a third set of 50 000 kW. The Committee authorised Messrs. C. Isler and Co., Ltd., to explore the possibility of boring for water. In connection with contracts for equipment, Mr. Arnett stated that the Central Electricity Board was definitely not in favour of open tenders in view of the present emergency, particularly affecting labour supply.

**Wick.**—Provost T. W. Anderson and members of the T.C. recently met representatives of the North of Scotland Hydro-Electric Board to discuss the future of electricity supply in Wick and district. Provost Sir Hugh Mackenzie, Inverness, and three other members of the Board staff expressed their desire to see the development of a comprehensive scheme for the distribution of electricity in the county of Caithness, in which Wick T.C. and Thurso and District Electricity Supply Co. are the authorised undertakers. Sir Hugh pointed out that any development in Caithness could not go on unless further economic schemes similar to those of Loch Sloy and Tummel-Garry were developed by the Board. There was an exchange of ideas on the benefit that would accrue if the Board were to acquire the electricity undertaking of the T.C.

**Rhyl.**—The Traders', Ratepayers', Hotel and Apartments', Master Bakers', and Grocers' Association have united in sending a protest to the Council demanding cheaper electricity charges, with special concessions for shops, hotels and boarding houses. In the protest they state that although Chester and Wrexham get their electricity from the same supply as Rhyl.

the charges in both these towns are lower than at Rhyl. The five organisations have requested the electrical engineer, Mr. C. Hall, to meet them and discuss the best methods of reducing charges.

**Fannich Hydro-electric Scheme.**—It is announced that all objections have been withdrawn to the North of Scotland Hydro-electric Board's constructional scheme No. 3, the £960 000 Fannich scheme, and the Secretary of State for

Scotland has therefore not found it necessary to hold an inquiry. The scheme covers part of project No. 71 of the Board's development scheme. With an estimated average annual output of 77 000 000 units, it proposes to utilise Loch Fannich in Ross-shire as a reservoir. A power station, with an installed capacity of about 24 000 kW at Crudie Bridge, in Strath Bran, will be fed by means of a tunnel and pipeline from Loch Fannich.

## Electricity on the Farm

Exhibition and Demonstrations at Lea Marston

**F**ARMING interests were represented at the recent root-lifting and farm machinery demonstrations held by the Warwickshire War Agricultural Executive Committee at Lea Marston, near Coleshill, which were attended by some 3 000 people.

To show new methods and remind the farming community of the increasing necessity for electricity on the farm, the Birmingham electric supply department co-operated by staging an exhibition covering rural needs. Advantage was taken of the fact that a grid line crosses the field, to locate the marquee adjacent to a pylon which then formed a symbolic background.

A propitious start was made when the first visitor to the marquee, Lord Aylesford, placed an order for a cooker, and showed keen interest in the agricultural and horticultural sections. The staff were kept busy all day demonstrating equipment and answering questions covering all aspects of home and farm electrification. Much of the apparatus on show was working, and the variety of questions asked showed the keen and practical interest which the rural dweller is taking in modern developments.

The centre of the tent was largely taken up by a 3 H.P. Essex mill which was shown as a complete unit grinding mixed cereals, the screens being changed from time to time to produce various grades of meal. One of the outstanding attractions, consisted of a 2½ cwt. two-way sack hoist, mounted on a tubular scaffolding tower outside the marquee showing the ease and speed with which a large consignment of sacked goods can be handled, the two-way action permitting almost continuous operation.

Among other exhibits were arc-welding in operation, water pumping, a compre-

hensive array of portable tools, a portable spraying equipment, sheep shearing



Part of the exhibit of the Birmingham electricity undertaking

machines, electric fences, an incubator, dairy equipment, etc.

In view of the many possible applications of electric lighting and heating, special display stands had been prepared to illustrate the many ways in which these services can be provided and the principles on which they operate. Wiring systems suitable for the farm were shown by means of four display boards, the switching in each case being arranged to show different methods of control.

In the domestic section a prominent place was given to the four E.D.A. model kitchens, which were supported by a representative selection of household appliances including cookers, a washing machine, water-boiler, wash-boiler, vacuum cleaner, medical lamp, lighting fittings, fires and irons.

The exhibits were supplemented by posters and photographs, and a limited number of booklets and pamphlets was available for distribution.



# Contracts Open

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

**Maltby U.D.C.**, November 10.—Supply of 30 panel electric fires in connection with the erection of houses on the Manor Park housing estate. Specification from Mr. H. Chadwick, Council Offices, Rotherham Road, Maltby, Yorks; deposit, £2 2s.

**Plymouth Electricity Department**, November 10.—Supply of (a) meters and (b) underground joint boxes. Specifications from the City Electrical Engineer, Armada Street, Plymouth.

**Blackpool Electricity Department**, November 12.—(1) Supply, laying, jointing and connecting of various types of 3-core and telephone cable; (2) supply and installation at one sub-station of an automatic fire extinguishing system; and (3) supply and delivery to site of two 10 000 kVA, 33 kV/6.6 kV automatic on-load ratio change transformers. Specification from the Borough Electrical Engineer, Shannon Street, Blackpool.

**Southwark Electricity Department**, November 14.—Supply and delivery over a period of 12 months ending December 31, 1946, of paper-insulated, lead-covered steel tape, armoured and unarmoured cables. Specification from the Borough Electrical Engineer, Penrose Street, Southwark, S.E.17.

**Woolwich Electricity Department**, November 14.—Supply of h.v. and l.v. cables required during year January 1, 1946, to December 31, 1946. Specification from the Town Clerk, Town Hall, Woolwich; deposit, £1 1s.

**Woolwich Electricity Department**, November 14.—Supply of electricity meters for the year ending December 31, 1946. Specification from the Town Clerk, Town Hall, Woolwich; deposit, £1 1s.

**Woolwich Electricity Department**, November 14.—Supply of transformers required during the year ending December 31, 1946. Specification from the Town Clerk, Town Hall, Woolwich; deposit, £1 1s.

**Bradford City Council**, November 23.—Supply, delivery and erection of one 30-ton electrically-operated overhead travelling crane. (Contract "C.37.") Specification from Mr. T. H. Carr, Electricity Department, 27, Bolton Road, Bradford.

**North-West Midlands J.E.A.**, November 26.—Supply of outdoor type static

transformers (No. A.278), electricity supply meters (No. A.279), spraying of cooling towers (No. A.281). Specifications from Mr. F. Favell, York Chambers, Kingsway, Stoke-on-Trent; deposit, £2.

**Manchester City Council**, November 26.—Supply, delivery and erection at Stuart Street generating station of six capstans and bollards (Spec. No. 840), and surge and make-up water cast-iron tanks, etc. (Spec. No. 841). Specifications from Mr. R. A. S. Thwaites, Electricity Department, Town Hall, Manchester; deposit, £1 1s.

**Kettering Electricity Department**, November 28.—Supply of e.h.t. and l.t., p.i. lead-covered armoured cables for the period of 15 months ending March 31, 1947. Specification from Mr. C. Burns, Rockingham Road, Kettering; deposit, £1 1s.

**Bedwelly U.D.C.**, December 1.—(1) Supplying and laying approximately 1 000 yards of 3 in. cast-iron main; (2) supplying and erecting 11 000 V switchgear, underground cables, and overhead lines. Particulars from the Electrical Engineer, Electricity Showrooms, High Street, Blackwood.

## Overseas

**State Electricity Commission of Queensland**, December 10.—Supply, delivery, erection, and setting to work of 7 500 kW and 750 kW steam turbo-alternators, accessories, and evaporating plant at Wide Bay Regional Electricity Board, Maryborough; Capricornia Regional Electricity Board, Rockhampton; and Townsville Regional Electricity Board. Tender forms from the Agent-General for Queensland, Queensland Government Offices, 409-410, Strand, London, W.C.2.

**Eire Electricity Supply Board**, January 28.—Supply, delivery and erection of the hydro-electric generating plant at Cathleen's Fall and Cliff stations on the River Erne. Particulars from the Chief Design Engineer, Electricity Supply Board, 26, Lower Fitzwilliam Street, Dublin, C.18, deposit, £5 5s.

**Belfast**.—The Chairman of the Belfast Electricity Committee, the Town Clerk, and the City Electrical Engineer have visited London in connection with the plant extension at the Harbour power station, estimated to cost about £1 079 000. This deputation is making representations to the Heavy Plant Committee of the Ministry Fuel and Power with the object of ascertaining how the manufacture of the plant can best be expedited.

# Business Shows the Way

## An Example of Modern Enterprise

At a moment when certain aspects of banking, the fuel industries and communications are being subjected to a process of nationalisation, and the President of the Board of Trade is busy appointing committees to govern various industries, the speech made by the Chairman of Lever Brothers and Unilever, Ltd., at their annual meeting last week was most timely, and though not electrical in origin, is nevertheless of considerable interest to the industry. No direct reference to politics was made by Mr. Geoffrey Heyworth, and the purely business character of the address thus gave added weight to his survey of modern enterprise at work.

### Government of Industry

Mr. Heyworth began by reminding shareholders that the main purpose of an annual meeting is to enable them to vote "for or against the continuation in office of the board of directors." In other words, the government of industry is already subject to the democratic principle, always provided (as in national affairs) that those entitled to vote exercise their responsibility. In order that shareholders may have the necessary information on which to base their views, the Unilever board will in future issue a review in advance of the annual meeting, in a form which may well become a model for British industry as a whole. The decision reveals a breadth of vision and a sense of values which are encouraging in these days, when so many aspects of private enterprise are subject to ill-informed criticism.

Referring first to trading operations, usually presented in terms of finance, Unilever consider that mere sales figures will not be appropriate. "We never think of our operations in that way ourselves; we think of tons of raw materials, cases or tons of soap, pounds or tons of margarine and so on." As for trading results, which are really historical records it is felt to be neither wise for the shareholder nor fair to the board to form a judgment wholly on these records. "Decisions are made on the basis of estimates, projections, surveys and guesses. The lapse of time between the decision and its fruition in the form of profit and loss varies from a term of years to hours, and during all this time the factors that determined the decisions are changing." It is useful to be reminded of the element of risk that enters into the operations even of the largest businesses, since all too many people now assume that trade is a more or less automatic process calling for the minimum of skill in its direction.

On the subject of the management of staff, Mr. Heyworth said that the board seeks to make every member of their organisation "feel a part and not an appendage of the whole," and aims at ensuring promotion on merit. This aspect of the companies' activities is facilitated by the international character of the business. A large number of their executives at home and overseas have worked in more than one country, providing "a most effective means of breaking down prejudices and begetting a willingness to adopt new approaches to old problems that is of great value." The fact that manufacture and research are carried on in many countries contributes to the progress of them all. Indeed, some of the methods improvised overseas were found to be applicable in this country and vice versa, "so much so that it is difficult to say how much of our experience is derived from home sources and how much from abroad." Business thus shows the way to achieve co-operation between peoples and countries in the service of a common purpose. Few firms have the direct overseas connections available to an international concern like Unilever, but there is a pressing need for its example to be followed if British industry is to resume the world-wide leadership which marked earlier eras of expansion. Not only will trade benefit, but effective foundations will be laid for a lasting peace.

### SURPLUS ELECTRICAL EQUIPMENT

In a bulletin to members, the Association of Electrical Machinery Traders state that advice has been received from the Director General of Machine Tools to the effect that the department has decided to set up an advisory panel to advise the department on matters of policy and procedure in the handling of disposals, in particular such matters as the rate of release, price and distribution policy, home and overseas markets, scrapping and re-conditioning. The panel will be appointed by the department, but it is desired that the trade members should be nominated as follows: Four manufacturers' representatives nominated by the B.E.A.M.A.; one independent manufacturer nominated by the department; four merchants' and dealers' representatives nominated by A.E.M.T.; one independent merchant or dealer nominated by the department; one representative nominated by the Electrical Contractors' Association; and one representative nominated by the Electrical Wholesalers' Federation.

# Empire Communications

## Cable and Wireless (Operating) Ltd. to be Publicly-Owned

**I**N the House of Commons on November 1, the Chancellor of the Exchequer, Mr. Hugh Dalton, made a statement regarding the Commonwealth telecommunication system to the effect that the Commonwealth Telecommunications Conference, held in London this summer, considered the future of overseas telecommunications service on the basis of a report prepared by Lord Reith after his mission to the Dominions and India earlier this year. The conference unanimously recommended, first, a fundamental change in the organisation of the service; second, the public-ownership of overseas telecommunications services of all the Commonwealth Governments; third, the replacement of the existing Commonwealth Communications Council by a new board with wider functions representing all the Governments of the Commonwealth; fourthly, financial contributions by members of the Commonwealth for the maintenance and use of the cable system. The Government of the United Kingdom had accepted these recommendations so far as they affected this country, subject to the agreement of Parliament. The overseas telecommunications services now operated by Cable and Wireless, Ltd., would therefore be transferred to public-ownership. Legislation to this end would be introduced in due course and arrangements and terms for the transfer were under discussion.

### Letter to Stockholders

The board of Cable and Wireless (Holding), Ltd., in a letter addressed to the stockholders relative to the proposals, point out that the directors have strongly opposed the plan for Government ownership, but in view of the Government's decision they are now entering into negotiations to see whether agreement can be reached on the price to be paid for the shares of the operating company.

In their letter, the directors state that the decision of the Government implies the acceptance of recommendations by the Commonwealth Telecommunications Conference which met in London in July, 1945. These recommendations envisaged the formation of public utility corporations in the United Kingdom and in the Dominions and India, and the establishment of an overriding authority which would, in effect, receive the net revenue of those corporations, from which it would deduct its own expenses and such expenses as were deemed to be common to the system as a whole, thereafter apportioning the balance among the various national bodies. The

central body would also be responsible for decisions on matters of policy.

### Not in Public Interest

The directors have felt bound to make the strongest representations both verbally and in writing, to the United Kingdom Government and to the Commonwealth Telecommunications Conference and other conferences which preceded it, to the effect that they consider the proposals to be inimical to the interests of the peoples of the Empire and to all classes of telecommunication users. They have also said that they consider the proposed scheme impracticable and unworkable. They consider it dangerous to the foreign concessions. In particular they entertain the gravest apprehensions regarding the setting up of the overriding authority, which would control the operations not only of the United Kingdom company but also of the corporations carrying on communications in the Dominions and in India. The directors have pointed out that in the discussions which have taken place with the United Kingdom Government and with the Governments of the Dominions and India, there has been no criticism regarding the manner in which the operating company and its associated companies overseas have discharged their task of providing cheap and speedy services for their clients. In fact, the general efficiency of the undertaking has attracted most favourable comment.

Nevertheless, the letter continues, the United Kingdom Government has accepted the recommendations involving a change to Government-ownership. In these circumstances, and bearing in mind the interests of the stockholders, the directors have no option but to explore informally the question whether it will be possible to reach agreement on the price to be paid for the shares of the operating company. They emphasise that the discussions will be without prejudice to the position of either side in the event of it not being possible to reach a settlement by agreement and that the proposals do not envisage a change to Government-ownership of Cable and Wireless (Holding) Ltd., or of any of the other companies in that group. No binding step will be taken by the directors without stockholders first being informed.

**Iron and Steel Institute.**—The autumn general meeting of the Institute will take place at 12, Great George Street, London, S.W.1, on November 22 and 23, at 10.30 a.m. and 2.30 p.m.

## In Parliament

The following are replies to recent questions in the House of Commons:—

**Hydro-electric Schemes.**—In a written answer to Major Ramsay, Mr. Buchanan stated that the estimated cost of mechanical and electrical work for the Tummel-Garry hydro-electric project was £1 172 000, and of the civil engineering works, including the power stations, £5 006 000. Replying to Sir B. Nevin-Spence, Mr. Buchanan said the following schemes had been prepared, or were in course of preparation by the North of Scotland Hydro-Electric Board; *Constructional Schemes*: Sloy, Morar and Lochalsh; Tummel-Garry and Gairloch; Fannich; Cowal; Shira; Skye; Findhorn-Duntelchaig; Affric; transmission from Shira and Sloy to Central Scotland; transmission from Tummel-Garry to Southern Perthshire; transmission from Fannich to Inverness, Keith and Aberdeen, and staff housing for Sloy. Surveys were now being made for schemes to supply Orkney, Shetland, Kintyre, Caithness, Ullapool and Lochinver. Where, as in the case of Orkney and Shetland, water-power resources were small, it was proposed to supply distribution schemes necessary from oil engines. *Distribution Schemes.*—Orkney, Shet-

land, Morar, Lochalsh, North Cowal, South Cowal, Eute, Great Cumbræ, Gairloch, Ullapool, Lochinver, Skye, Outer Hebrides, Islay, Mull, Luig and Seil, and Arran. If the Tummel-Garry scheme were abandoned, provision of electricity supplies to nearly one-third of these schemes would immediately be jeopardised and the supply to all of them would be seriously retarded.

**Electricity (North-Eastern Area).**—Mr. E. Shinwell, in a written answer to Mr. Grey, said arrangements were being made for the extension of the Dunstan power station of the North-Eastern Electric Supply Co. by the installation of two 50 000 kW turbo-alternators, with corresponding boilers and auxiliary plant. Arrangements were also under discussion for the extension of the North Tees power station of the same company by the installation of two 60 000 kW turbo-alternators with the corresponding boilers and auxiliary plant. When these arrangements have been completed, additional capacity for the generation of electricity will have been provided comparable with what would have been provided at the proposed Kepier station, and there should therefore be sufficient capacity to meet the needs of the north-eastern area for the next few years.

## Company News

BARTON AND SONS, LTD.—Intm. 3% on ord. (same).

QUEBEC POWER.—Qtrly. 25c. (same), payable Nov. 26.

T. BLACKBURN AND SONS, LTD.—Fst. and fin. on ord. 9%, less tax (8%).

PRESSED STEEL CO., LTD.—Intm. on ord. 10%, less tax (same), payable Nov. 16.

MARTIN BROS. (MACHINERY), LTD.—Net pft. for yr. ended June 30 £6 550 (£9 667).

GARRARD ENGINEERING AND MANUFACTURING CO. LTD.—Intm. div. 12½% (same).

WOMBWELL FOUNDRY AND ENGINEERING CO. LTD.—Fin. div. 10% (same), mkg. 16% (same).

KITCHEN AND WADE, LTD.—Fst. intm. for 1945-46, 12½% (same). Pft. to Mar. 31, £96 466 (£136 658).

PATERSON ENGINEERING CO., LTD.—Div. 10% (same) plus bonus 2½% (same). Pft. for yr. to Apr. 30 £38 534 (£39 114).

FREDERICK BRABY AND CO., LTD.—Fin. div. on ord. 7½%, mkg. 10% (same) for yr. to Sept. 30. Tradg. pft. £188 243 (£295 737).

SOLUS TEORANTA.—Pft. to June 30 £13 494 (£15 978). To tax £3 900 (£8 000),

deprecn. £6 160 (£6 339), fin. div. 2½% (5%), mkg. 7½% (10%), fwd. £2 231 (£2 357).

HOLOPHANE LTD.—Tradg. pft. to June 30 £17 749 (£23 526), plus int. and divs. £1 227 (£692), less dirs.' fees £900 (same), taxtn. £9 000 (£15 000). To amt. written off goodwill and patents £218 (£170), gen. res. nil (£5 000). No div. (same), fwd. £18 657 (£9 799).

THOMPSON BROS. (BLISTON) LTD.—Fin. div. on ord. 7½% (same), plus bonus 7½% (same), both less tax, mkg. 22½% (same) for yr. ended July 31, also div. and bonus on new ord. at same rate (nil). Includg. special item £2 212 on acct. of matured life policy, pft. blee. for yr. £24 191 (£21 132).

COCHRAN AND CO. (ANNAN).—Tradg. etc., pft. to June 30 £103 206 (£78 193). To maintenance £21 449 (£30 832), deprecn. £9 607 (£9 291), staff bonus £7 779 (£5 862), dirs.' fees £1 000 (£750), interest £1 878 (£1 995), leavg. pft. £61 493 (£29 337). Tax £52 081 (£18 882), war damage £299 (£846), new issue exes. £1 962 (nil). div. 4% £6 000 (same), fwd. £3 221 (£2 010).

### Company Meetings

**J. AND F. STONE LIGHTING AND RADIO, LTP.**—The annual meeting was held in London on Oct. 25, Mr. N. W. Wild, the chairman, presiding. In the statement issued with the accounts, the chairman reported further progress in the operating results, the trading profit being £113 802, against £79 951 in the previous year. It was gratifying to note that in the face of all their war-time handicaps the organisation was able to function efficiently and profitably. Apart from their activities as distributors of radio and domestic equipment, their manufacturing subsidiary company turned its plant over to war production; from this source alone the company's profits for the year had been increased by £30 000.

**RENOID AND COVENTRY CHAIN CO., LTD.**—The annual meeting was held at Manchester on Oct. 25. In the course of his address the chairman, Mr. Charles G. Renold, said the prospects before the company were undoubtedly good in the sense that their products were finding ever-extending applications. He mentioned the impetus which the use of precision chains had received from the experience of war-time developments. The world was now entering on a new phase of mechanisation as exemplified by the development of manufacturing industries in the dominions; the attention which was being focused on the development of backward countries, such as India and China; the drive to mechanise British agriculture and British coal-mining, and so on. This movement provided ever-widening openings for their products and these opportunities related both to the home and the export markets. There was thus no doubt that the basic condition for the company's future prosperity existed—namely, a great and expanding demand.

**MUREX, LTD.**—The annual meeting was held in London on October 29. In the statement of the chairman, Mr. George P. Joseph, he said there was a great war-time expansion in the welding industry. To mention some of the major applications—ship construction and repair work for the Royal and Merchant Navies, tanks and armoured cars, bombs and ammunition, aircraft engine mountings, petrol tanks, landing gear, etc., prefabricated sections for "Mulberry" Harbour and the welding of the "Pluto" pipeline; while in the field service repair gangs with portable units operating from fully-equipped bases had carried out emergency repairs. In all these activities Murex Welding Processes, Ltd., made a notable contribution despite difficulties, in common with other manufacturers, of obtaining adequate supplies of raw materials, labour scarcity, and the use

of substitute materials. The directors had under consideration plans for post-war expansion which when carried out would call for a substantial addition to the company's cash resources.

**PHILCO RADIO AND TELEVISION CORPN. OF GT. BRITAIN, LTD.**—The adjourned eighth annual meeting was held in London on November 5, and was followed by the ninth annual meeting. In the review covering the accounts for the two years ended March 31, 1945, Mr. L. D. Bennett, the chairman and managing director, states that throughout the war period, the company's activities provided a substantial contribution to the war effort, included amongst which were the following: Radar equipment for all types of aircraft and for land stations; midget radio receivers for Continental resistance movements; portable receivers for commandos; portable receivers and transmitters for field use; receivers and transmitters for the Fleet Air Arm. Major aircraft parts for several types of aircraft; components for Browning guns; cable for degaussing ships against magnetic mines; cable for warships, submarines, mines, searchlights, tanks and dockyard and airfield installations, and electric motors and generators for all Services. The directors felt that future prospects were good, bearing in mind the equipment, manufacturing resources and technique which the company and its subsidiaries now possess.

## Metal Prices

	Monday, Price.	Nov. 5, Inc. Dec.
<b>Copper—</b>		
Best Selected (nom.) per ton	£80 10 0	— —
Electro Wirebars ... "	£62 0 0	— —
H.O. Wires, basis ... per lb.	9 <sup>th</sup> rd.	— —
Sheet ... "	11 <sup>th</sup> rd.	— —
<b>Phosphor Bronze—</b>		
Wire(Telephone)basis ..	1s. 0 <sup>th</sup> rd.	— —
<b>Brass (60/40)—</b>		
Rod, basis ... "	— —	— —
Sheet " ... "	— —	— —
Wire " ... "	11d.	— —
<b>Iron and Steel—</b>		
Pig Iron (E. Coast Hematite No. 1)... per ton	£7 13 6	— —
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ... "	£28 5 0	— —
Mild Steel Tape (Cable Armouring) basis 0.04 in. ... "	£20 0 0	— —
Galvanised Steel Wire No. 8 S.W.G. ... "	£26 0 0	— —
<b>Lead Pig—</b>		
English ... "	£31 10 0	— —
Foreign or Colonial ... "	£30 0 0	— —
<b>Tin—</b>		
Ingot (minimum of 99.9% purity) ...	£303 10 0	— —
Wire, basis... .. per lb.	3s. 10d.	— —
Aluminium Ingots ... per ton	£85 0 0	— —
Spelter... .. "	£31 5 0	— —
Mercury (spot) Ware- house ... .. per bott.	£31 5 0	— —

Prices of galvanised steel wire and steel tape supplied by the C.M.A. Other metal prices by B.L. Callender's Cables Ltd

# Commercial Information

## Mortgages and Charges

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

**KELLER ELECTRICAL INDUSTRIES, LTD.,** Holmer Green.—Oct. 3, £1 000 debs.; general charge, £1 800. Sept. 29, 1945.

**NEW PROCESS WELDERS, LTD.,** Southall.—Oct. 12, £2 000, further charge (supplemental to mort. dated Feb. 21, 1944), to Credit for Industry, Ltd.; charged on part of North Weylands Farm, Molesey Rd., Walton-on-Thames. \*£3 650. Oct. 14, 1944.

## Satisfactions

**DOWSING CO. (ELECTRICAL MANUFACTURERS), LTD.,** London, S.E.—Sat'n. Oct. 6, of debs. reg., July 19, 1937, to the extent of £500.

**PRESSED STEEL CO., LTD.,** Cowley.—

Sat'n. Oct. 9, of debs. reg. Mar. 29, 1927, and Aug. 26, 1930, to the extent of £10 000.

**T. C. ENSTONE AND CO. (SUCCESSORS), LTD.,** B'ham., engrs.—Sat'n. Oct. 10, £2 600, reg. June 19, 1941.

## Companies Winding-up

**LEOMINSTER ELECTRIC SUPPLY CO. LTD.**—At a meeting of the company at 24-30, Gillingham Street, London, S.W.1, on October 23, a resolution was passed that the company be wound up voluntarily, and that Mr. Arthur M. Scott be appointed liquidator.

**AMESBURY ELECTRIC LIGHT AND GENERAL SUPPLY CO. LTD.**—A meeting of the members of the above company will be held at 24-30, Gillingham Street, Westminster, S.W.1, on November 29, 1945, at 10.30 a.m., to receive the account of the liquidators.

**DOWNTON ELECTRIC LIGHT CO. LTD.**—A meeting of members of the above company will be held at 24-30, Gillingham Street, Westminster, S.W.1, on November 29, 1945, at 10.45 a.m., to receive the account of the liquidator.

# Coming Events

## Friday, November 9 (To-day).

**INSTITUTE OF WELDING**—Birmingham. "Review of the Application and Development of Oxygen Cutting," R. Dore. 6.30 p.m.

## Saturday, November 10.

**I.E.E., N. MID. STUDENTS' SECTION.**—Visit to works of Brook Motors, Ltd., Huddersfield. Meet at main entrance to Empress Works. 2.30 p.m.

## Monday, November 12.

**I.E.E., N.E. CENTRE.**—Newcastle-on-Tyne. "Practical Aspects of Telephone Interference," P. B. Frost and E. F. M. Gould. 6.15 p.m.

## Tuesday, November 13.

**I.E.E., E. MIDLAND SUB-CENTRE.**—Nottingham Gas Department. "The Operation, Maintenance and Testing of Overhead Lines and Associated Outdoor Equipment on A.C. Systems," R. C. Hatton and Dr. J. McCombe. 6.30 p.m.

**ILLUMINATING ENGINEERING SOCIETY**—E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2. "The New Version of the I.E.S. Code," introduced by H. C. Weston. 6 p.m.

**ROYAL INSTITUTION OF GREAT BRITAIN.**—London, W.1. Lecture II (Course of 4 lectures), "After the Discovery of X-rays," Dr. A. Muller. 5.15 p.m.

## Wednesday, November 14.

**I.E.E., TRANSMISSION SECTION.**—London, W.C.2. "Recent Progress in the Design of the High-Voltage Overhead Lines of the British Grid System," W. J. Nicholls. 5.30 p.m.

**SCOTTISH SECTION.**—Edinburgh. "Operational Control of Electricity Supply Systems," W. Kidd and E. M. S. McWhirter. 6 p.m.

**S. MID. STUDENTS' SECTION.**—Birmingham. "Mica and Micanite," W. B. Robertshaw.

**BRITISH INSTITUTION OF RADIO ENGINEERS.**—11, Upper Belgrave Street, London, S.W.1. Discussion on Radio Industry Council Report on "Post-war European Broadcasting," R. G. Clark. 6.15 p.m.

**INSTITUTE OF WELDING, W. SCOTLAND BRANCH.**—39, Flimbank Crescent, Glasgow. "The Use of Welding and Rivetting in Shipbuilding," G. Roberts and J. F. Morton. 6.30 p.m.

**I.E.E., SHEFFIELD SUB-CENTRE.**—Royal Victoria Hotel. Discussion evening. "The Choice of Control Gear for Works Low Tension A.C. Distribution Systems," opened by R. S. Bennett, L. H. Crowther, W. France and J. R. Phillips. 6.15 p.m.

**I.E.E., N.W. CENTRE.**—Manchester. "Planning the Future Electricity Meter," G. E. Moore. 6 p.m.

## Thursday, November 15.

**I.E.E.—London, W.C.2.** Parsons Memorial Lecture. "High-Voltage Research at the National Physical Laboratory," R. Davis. 5.30 p.m.

**N.W. STUDENTS' SECTION.**—Manchester. "Introduction to Fundamentals of Transmission Lines," Capt. D. K. C. Macdonald. 6.30 p.m.

**Friday, November 16.** **INCORPORATED RADIO SOCIETY OF GREAT BRITAIN.**—I.E.E., London, W.C.2. "Aerial Systems for the Radio Amateur," F. Charman. 6.30 p.m.

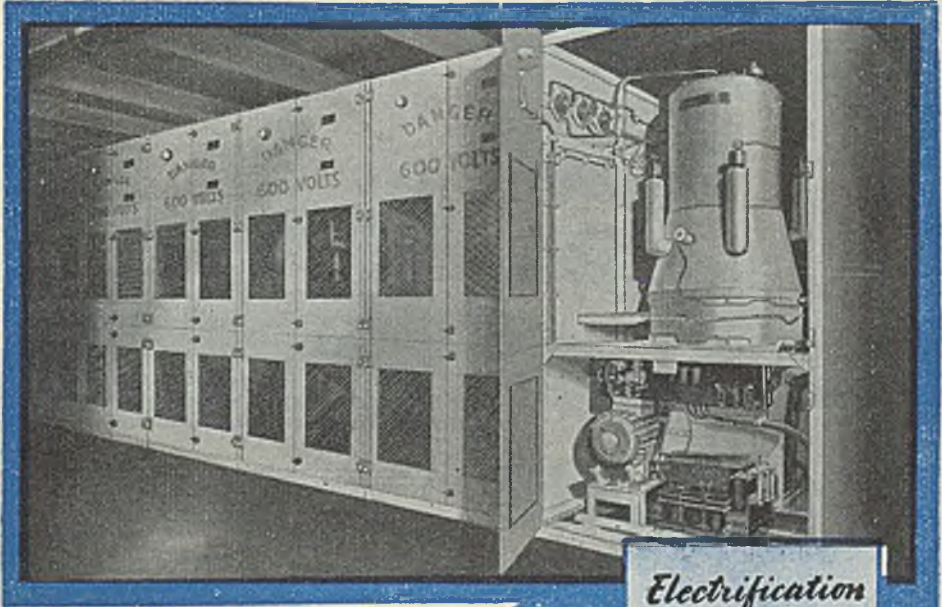
**BRITISH INSTITUTION OF RADIO ENGINEERS.**—University College, Southampton. "Engineering Methods in the Design of the Cathode Ray Tube," Dr. H. Moss. 6.15 p.m.

## Saturday, November 17.

**I.E.E., N. MID. STUDENTS' SECTION.**—Leeds. "Electrical Machinery for Ship Propulsion," W. J. Belsey. 2.30 p.m.

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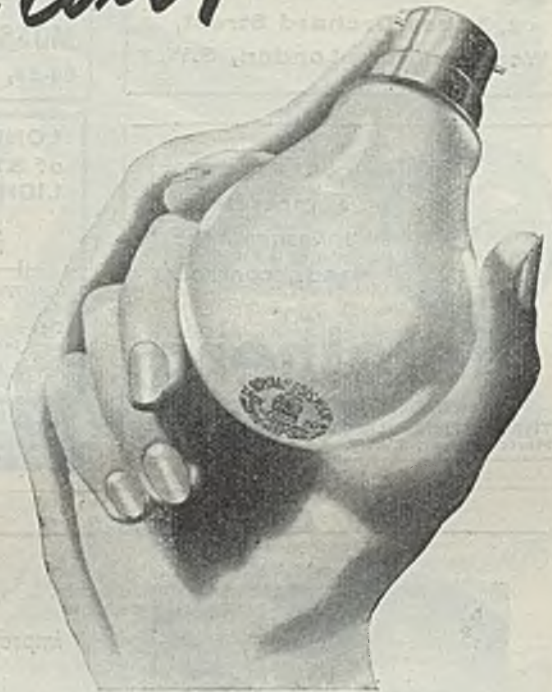
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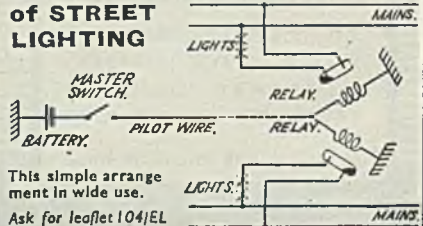


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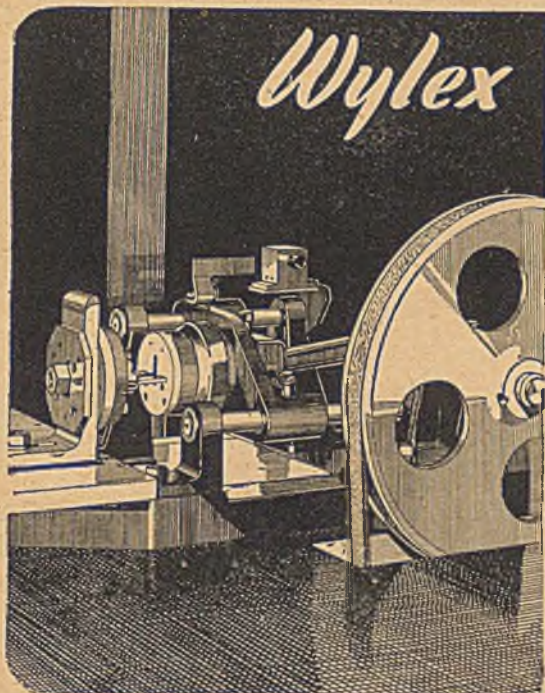
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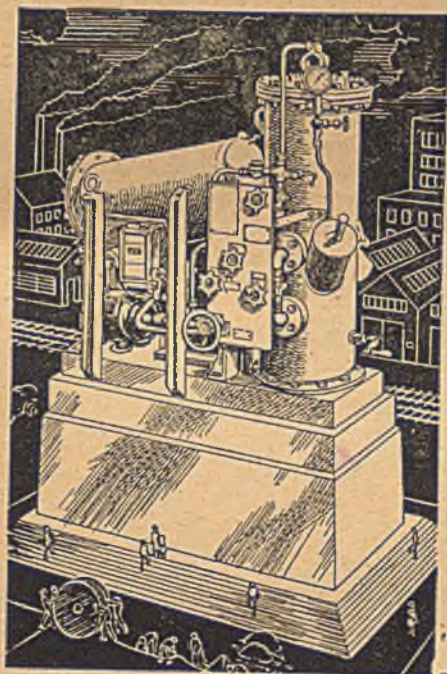
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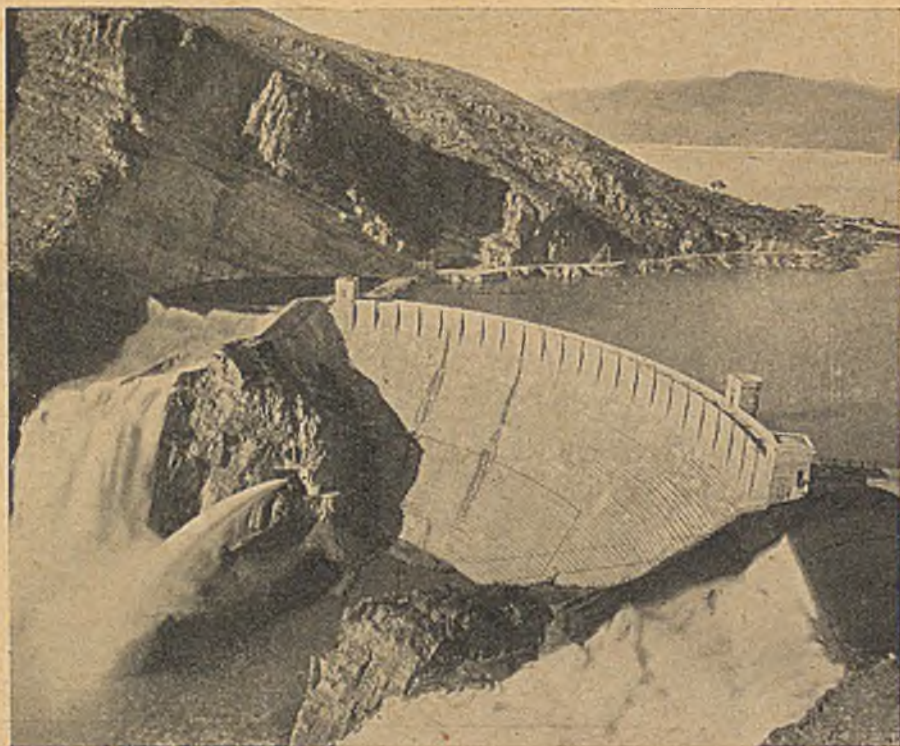
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