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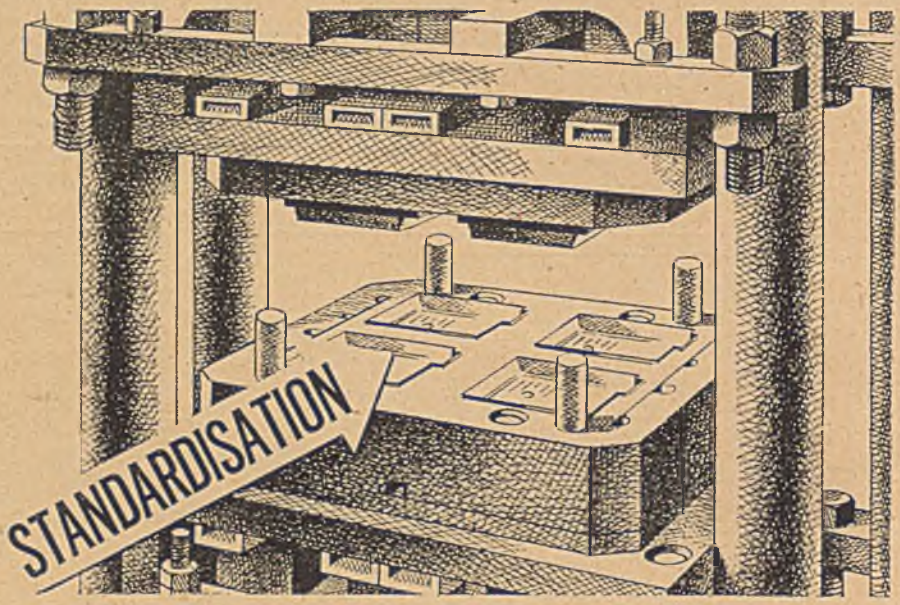

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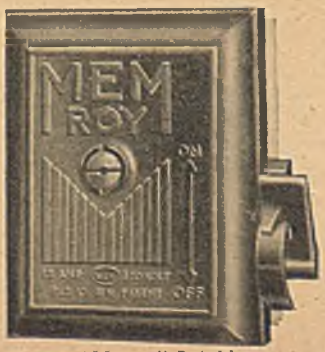

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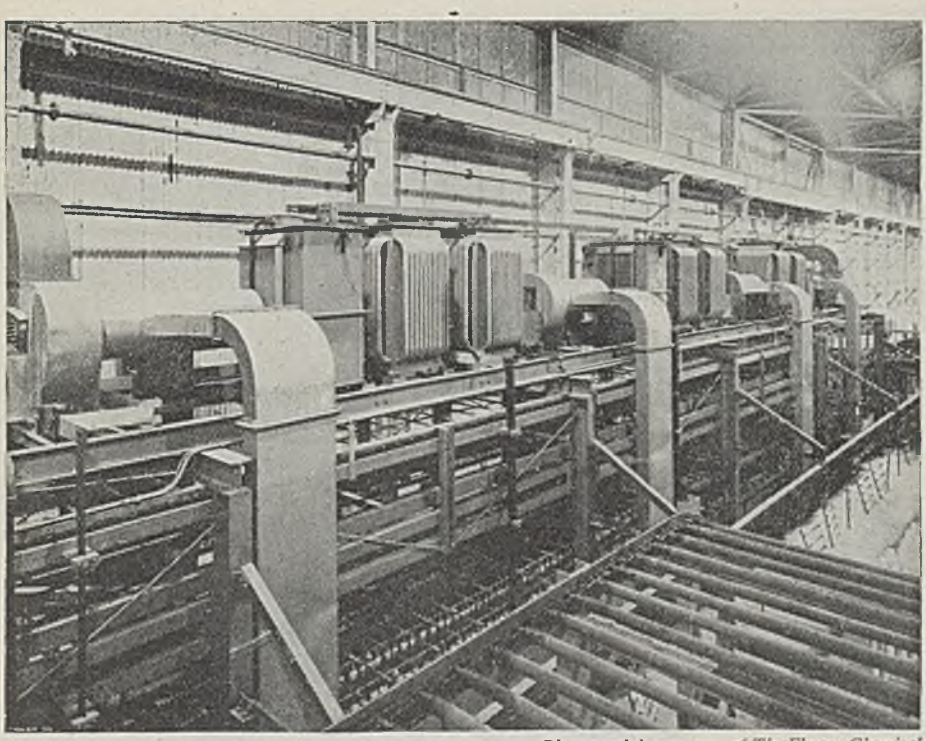

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CHIEF CONTENTS OF THIS ISSUE

Exhibitions

THE touring exhibition of electrical appliances which was opened at Manchester last week, the recent exhibition at Tynemouth, the exhibition sponsored by the Aluminium Development Association, which is to be seen in London this month, and the official discussions with respect to the staging of a British Industries Fair in 1947, all indicate that the ground is being prepared for a trade offensive.

Confining ourselves to electrical interests, it will be appreciated that the electrical industry has for some time been ready with its plan of attack, but due to the restrictions imposed by the various Government departments involved, little can be done at present save to tantalise the public by showing them what they cannot have. The exhibition of all-electric kitchens, combined service units and prototype appliances is good and useful propaganda which will bring reward, and should be continued with all the enthusiasm of which the industry is capable—but the direction of the sales drive behind the displays should at this time be aimed, not so much at the general public as at those official bodies and ministries which are delaying production by withholding skilled labour and materials.

It is realised that the war against Japan has prior claim upon the resources of the country, but even those persons with the most elementary knowledge of military affairs will appreciate that by the defeat of Germany, the necessity for maintaining our high output of war munitions is reduced in volume. That being so, the electrical industry is entitled to at least some of the labour and materials which are no longer required for war purposes.

Rightly or wrongly, the impression gained from official circles is that the electrical industry is not yet ready to enter upon peace-time production, and the necessity for a quicker release of labour and materials does not therefore arise. The fact is—and we have endeavoured at every opportunity to force it home—that the industry is not only capable of allocating a portion of its manufacturing capacity to peace-time needs while still maintaining its war production, but it sees in the present position possible harm being done to the good name of electricity by the inability to offer little more than lip service to the public. We have our exhibitions, our prototype appliances, our kitchen designs—but nowhere can be seen a kettle, a hair dryer, a vacuum cleaner or an electric cooker for sale.

Though we have been told that our generating capacity is being added to only very slowly and that the next two winters may still produce peaks requiring the shedding of load, we suggest that it would be unreasonable to make use of this possibility in support of denying the manufacturers of electrical domestic

appliances the opportunity of stocking up in readiness for the demand which the public will soon expect to be satisfied. There is much to be done before the public are likely to see the results of peace-time production, even if labour and materials were now available, and so that the industry may be ready to meet what is expected of it, both with respect to output and absorption of labour released from the Armed Forces when it comes along—it is time that a more substantial percentage of our manufacturing capacity was switched to meeting peace-time needs. In the circumstances, the message which our exhibitions should convey, must be in the first instance directed to those Government departments whose mental outlook is still influenced by the conditions of 1941 and before, and in the second to the public in the hope that their opinions may be brought to bear upon those officials who have it in their power to free the industry from at least some of the red tape in which it is now enmeshed.

Another British Achievement

WITH the Government release last week of the story of "Fido"—the system developed by British science for the dispersal of fog over R.A.F. airfields—was made known yet another achievement with which the electrical industry is associated. Many times in this war British ingenuity and British resourcefulness have found solutions to problems that began by being insoluble, and compared with the contributions made by the other Allied Nations, it is a record of which we may well be proud. The self-buoyant cable for defeating the magnetic mine, radio-location, the Pluto cable, the Mulberry harbour are but a few of the expressions of the ingenuity of our engineers—and, it is pleasing to note, electrical engineering and electrical manufacturers played a very appreciable part in their success. The direct result of these developments was to hasten the conclusion of the war in Europe with the complete and unconditional surrender of the enemy, and we are entitled to do a little boasting of the support which British enterprise has contributed towards that achievement.

"Operation Fido"

ALTHOUGH "Operation Fido," is not an electrical product the electrical industry played a worthy part in the early investigations and experiments that led to its development. In the first instance, Mr. GEOFFREY LLOYD, the Minister in Charge of Petroleum Warfare, called in among others, Sir HARRY RAILING, and with those of other industrial concerns, the technical resources and research establishment of the G.E.C. were applied to the solution of the problem of fog dispersal. Babcock and Wilcox, Ltd., Geo. Kent, Ltd., and Sulzer Bros (London) Ltd., also undertook valuable experimental work. Among possible fog clearance methods considered were the use of super-sonic waves, electrical discharges, drying by refrigeration and outdoor air-conditioning apparatus, but from the outset the use of heat promised the best chance of success.

National Grid Control in Lift Shaft

THOUGH perhaps not so spectacular as those war-time operations which have been given names, the engineering achievement of the Central Electricity Board in transferring their control system in 1940/41 from Bankside to accommodation provided by a disused Underground lift shaft, is as noteworthy as any. Already familiar with the arrangements at Bankside, the enemy soon made it clear from his aerial attacks that he hoped to render the grid control inoperative; had he been successful, the achievements of Pluto, Fido, Mulberry, and D-Day might have been different, with the coming of VE-Day delayed. As we now know, however, the Central Board engineers anticipated the danger and though the City of London rocked above, the national control of power to the war production plants, hospitals and the like, stood up to all the forces of destruction that the enemy was able to bring to bear. We are this week by courtesy of the Board, able to give a brief description of the arrangements made, and though space prohibits a more complete explanation of the details, sufficient is given to make it clear that the work involved called for engineering skill of the highest degree. That it was done without interruption during the time that London was suffering its worst aerial attacks, speaks volumes.

District Heating

WITHIN the last year or two the development of district heating has been advocated in different parts of the country, and the reasoned lunch-hour discourse on the subject by Prof.

REGINALD O. KAPP at University College, London, last week, was particularly opportune, in that he pointed out the limitations as well as the advantages of this form of heating. Of the latter, convenience of heat on tap, smoke abatement and preservation of coal are considerable, but the cost of installation in existing towns and cities, where the houses are not fitted with hot water radiators, would outweigh any saving. The expense, which Prof. KAPP estimated at £12 per head of the population, would, he suggested, be justified only in areas where houses would be built to take advantage of such a service. It was suggested that we ought to go ahead with district heating wherever circumstances are favourable, and wherever possible, to attempt the combined generation of electricity and heat in the form of water or steam. Any such schemes, however, should be regarded only as experimental so that by the experience gained in operating them we may have at some future date the best instead of the "just good enough," born of going ahead to quickly.

Growth of Supply Industry

IN spite of war-time restrictions and enemy action, the electricity supply industry continued to expand steadily during the years between 1938 to the end of 1944. This is shown by the figures given in a statistical digest for 1944 issued by the Ministry of Fuel and Power. The number of units generated by authorised undertakings and railway and transport authorities increased by 13 901 millions, in the six years from 1938, to 39 649 million units in 1944, representing an advance of over two million units a year. The greatest increase in the sale of units was to power consumers, the figures being 10 841 millions in 1938-39 and 20 951 millions in 1943-44. The sales for lighting, heating and cooking rose from 8 340 million units in 1938-39 to 9 721 millions in 1943-44. It is obvious that expansion in this field was restricted by the need for fuel economy and the almost complete stoppage of the sale of domestic appliances. The black-out reduced the consumption of electricity for street lighting from 376 million units in 1938-39 to 16 million units in 1940-41. In 1944 the units sold for this service numbered 20 millions. The revenue from the sale of electricity rose from £90 132 000 in 1938-39 to £134 405 000 in 1943-44. It is of interest to note that the total number of gas consumers in 1938 was 11 215 000, and in 1943 11 199 000. The figure for 1944 is not yet available. Sales amounted to 1 530 million therms in 1938 and 1 690 millions in 1943. The provisional figure for 1944 is 1 767 million therms.

Electrical Equipment in Mines

ALTHOUGH the number of coal mines in which electrical equipment had been installed was reduced from 1 412 in 1938 to 1 394 in 1944, the number of electric motors in operation above and below ground increased from 55 555, representing 2 229 335 H.P., in 1938, to 65 326 of 2 485 101 H.P. at June 30, 1944. These figures are exclusive of mines under the Coal Mines Act in Cleveland, Lincolnshire and Northants. The electric motive power used below and above ground was almost equal, the figures for 1944 being 1 333 937 H.P. below ground, and 1 151 164 H.P. above ground.

Two Interesting Appointments

TWO interesting personal notes recorded in this issue are the appointment of Sir GEORGE BAILEY to the office of managing director of Associated Electrical Industries Ltd., and Mr. H. WARREN to a like position with the British Thomson-Houston Co., Ltd. Readers will join with us in extending very best wishes. Sir GEORGE is already well-known by virtue of the many presidential and other offices he has held in addition to the chair of the Metropolitan-Vickers Electrical Co., Ltd., while Mr. H. WARREN is generally associated with the institution of the B.T-H. research laboratory at Rugby.

The Aluminium House

THE prototype aluminium house which was opened to public view in London on Wednesday, contains little of outstanding electrical interest, in that with the exception of light and power, an immersion heater, electric cooker, washer and refrigerator, electricity appears to play only a minor part. This is disappointing for with such a new idea as aluminium for building, it seems reasonable that the essential services of such a dwelling should be equally up-to-date.

Now It Can Be Told—III

London Underground War-time Control Centre of the C.E.B.

WHEREAS until the autumn of 1938, the grid was operated in sections covering the nine separate scheme areas, with control rooms at Glasgow, Newcastle, Manchester, Leeds, Birmingham, London

Exterior view of the national and area control centre during construction

and Bristol, it has since 1941 been operated as a single unit, with the sections retaining regional control over the operation of the stations and the system in their areas under the overriding directions of a national control organisation, so that transfers of energy between one area and another are effected with due regard to economic generation and the electricity needs of the country as a whole.

When fully inter-connected operation of the grid began, the duties of national control were carried out at the control centre for the S.E. England and E. England

Temporary control for S.E.E. and E.E. areas during construction

areas, which together form one operational district. The S.E.E. control room was in Park Street, Southwark, nearly opposite the Bankside power station, and some time before the war, steps were taken to protect the staff and equipment from the effects of enemy action. In addition, an emergency control room was provided on the northern side of the river, while a second emergency control was established at the Board's Islington grid sub-station where standby telephone facilities were available over C.E.B. multi-cores to most of the generating and sub-stations.

The first emergency control was rendered uninhabitable in one of the earliest raids

The apparatus gallery

on London and thereafter regular use was made of the control room at Islington, the practice being to split the control staff between there and Bankside during heavy raids.

It had early become clear, however, that safer accommodation would have to be found, and inquiries for an alternative site resulted in the discovery of two disused lift shafts at a London Underground station, and with the co-operation of the L.P.T.B. arrangements were made for taking over these shafts, together with certain ground floor and basement accommodation, with access from the emergency staircase. In equipping the new premises the opportunity was taken to establish a separate national control room.

The arrangement is of special interest

in that it shows the adaptability of our civil and electrical engineers. The actual location is withheld from publication for security reasons, but it may be said that the two shafts have been joined together at various levels, and floored so as to form a number of rooms. The two main shafts were 23 ft. dia. and about 120 ft. deep, and were built up of cast-iron segments in the usual manner. To provide adequate strength for resisting side blast from deep-penetration bombs, and at the same time to support the various floors, each main shaft was lined with 18 in. of reinforced concrete. The floors were also of the same thickness. Bomb stoppers were built into the upper portions of the main shafts and these consisted of 12 ft. of reinforced concrete in three slabs separated by a 9 ft. air space and a 14 ft. blast-absorbing layer of ballast. Thus, the base of each bomb stopper, which is the ceiling of the first inhabited room, is approximately 35 ft. below ground level.

Area loading control room

In order to protect the main shafts against side blast it was also necessary to construct a specially designed bomb stopper in the nearby access stairway and this was arranged so that there was a minimum thickness of 9 ft. of reinforced concrete.

A fourth shaft carrying ventilating air to the Underground was also protected by a bomb stopper, designed to pass 60 000 cu. ft of air per min.

In all, thirteen rooms were provided, six in one main shaft and seven in the other. In addition, the original exit passage from the lifts to the station platforms was converted for use as an apparatus gallery housing the power and communications equipment.

Three watertight doors were fitted; one in the stairway bomb stopper, to protect against flooding from surface water; and two in the lower portions of the main shafts to protect against flooding from the Underground. A ventilation system supplies the whole of the building below the bomb stoppers with temperature and humidity-controlled air, while in addition to the normal cotton - wool dust filters, special poison gas filters can be put into circuit by remote control from the apparatus gallery. The ventilation plant is at the base of one of the main shafts.

National control has no concern with the operation of individual generating stations; its function is the general co-ordination of interconnected operation through the Board's regional control centres. Within the limits of security and tie-line capacity, inter-area operation is, as previously mentioned, on an economic basis and one of the main functions of national control is to maintain transfers between areas on a pre-arranged programme. This programme is revised each week in the light of the latest information on plant availability and relative generating costs in each of the areas. One of the responsibilities of national control is the co-ordination of main transmission line and

Area switching room

generating plant maintenance programmes; another is that of frequency and time control.

The equipment in the national control room consists of a line diagram showing the main grid circuits; frequency and time error indicators and recorders; and indicating and recording meters for most of the main inter-area tie-lines in the country.

The national control room

Associated with the room is a teleprinter room containing instruments connected with the area control rooms. Practically all communications with the areas, including operating instructions and routine meter readings, are carried out over teleprinter channels. Until the end of raids by piloted aircraft, there was also a teleprinter connected with Fighter Command H.Q., over which air-raid warning messages were transmitted. These messages came in sufficiently far in advance of the sounding of the public sirens to give time for anticipating rapid fluctuations in load, and also to enable certain precautionary steps to be taken where appropriate.

The national control system is associated with the S.E. England and E. England control to the extent that the continuous load indications for the feeders connecting the S.E. and E. England district to the associated Mid-East, Central England and S.W. England districts are repeated on indicating instruments and recorders in the national control room. The national control engineer also employs the S.E. England manual telephone exchange for communication with the engineers controlling the S.E. England and E. England districts and for communication over the P.O. public telephone system. Separate telegraph circuits are, however, used between national control and the six control rooms for all areas other than S.E. England and E. England. In addition to the communication facilities provided by the teleprinters, continuous load indicators for inter-area feeders are transmitted to national control over separate private-rented telegraph circuits.

Taking as an example the indications for the inter-area feeders connecting Scotland to N.E. England and N.W. England, readings initiated at the inter-area substation at Galashiels for the connection between Scotland and N.E. England are transmitted 60 miles over a private line to the Glasgow control room. At this point they are amalgamated with similar readings for the interchange on the two connections between Scotland and N.W. England, originated 90 miles away at Carlisle. After display in the Glasgow control room the amalgamated signals are transmitted over a relay distributor 400 miles to national control where they are received on a decoding distributor and displayed on the individual indicators and recorders for the three primary 132 kV lines concerned. Similar indications originating in a like manner are transmitted from the Central England control room in Birmingham. Of the 15 inter-area feeders on the whole grid system, 12 are at present indicated in national control, and equipment in manufacture for installation at Leeds will enable the indications to be obtained for the remaining three-132 kV primary inter-connectors to complete the picture.

S.E. England Control

Owing to the fact that each room is only 20 ft. dia. it was necessary to divide the S.E. England control into two. It was also convenient to do so, because the functions of an area control can be divided broadly into switching of grid circuits and loading of generating stations. Two rooms, one in each shaft and connected by a passage about 8 ft. long, have accordingly been selected for the purpose.

The main switching control diagram, which was transferred from Bankside, occupies almost the whole of the available wall space. It consists of over 41 000 one-inch squares of plastic material mounted on vertical steel strips 6 in. wide. With a choice of different symbols engraved on the squares the diagram has been built up to show the arrangement of all circuits and associated switchgear within the area. Red alarm lamps are fitted into the diagram for indicating switch operations at each sub-station. Provision is also made for fixing suitable labels to indicate presence of earths on apparatus under maintenance; labels are also used to show apparatus covered by permit-to-work cards and to signify special requirements. No direct switching is carried out by the Board's

control engineers, however, telephoned instructions being used exclusively.

The loading control room contains a diagram of the S.E.E. system showing only that amount of detail required for loading purposes. For simplicity in operation, instruments showing feeder loadings have been incorporated in the diagram. Additional instruments giving generator loads, frequency and time error are incorporated in panels at the side of the diagram.

In the centre of a two-position loading desk is a routine instructor by means of which instructions can be sent to the more important stations. These instructions cover the picking up or dropping off of varying amounts of generation or the shedding of load in emergency.

One of the disadvantages of a control room so far below ground is that it is difficult to keep a constant watch on weather conditions. To overcome the problem as far as possible, light intensity indicating and recording instruments are provided on the loading desk. These are actuated by two light cells; one on the roof of the building above the control room and one at a London grid sub-station.

A War-time Necessity

The control room is the centre of 1 450 miles of private lines rented from the P.O. radiating to 57 major sub-stations and power stations. The lines terminate on telephone type apparatus. In the Bankside control room this telephone type apparatus was associated with control equipment which displayed the high voltage switch positions, gave indications of the loads through the main transformers connecting the undertakings' systems with the primary grid, and showed the tapping positions of the on-load tap-change gear on these transformers. The equipment, which was ranged round the perimeter of the main control room, occupied so much space that it was impossible to transfer it to the underground control room and the individual switch position indications, "on demand" transformer load readings and tap-change indications had to be abandoned as a war-time measure and the essential features of the transmission of routine load instructions to major power stations were telescoped into racks of telephone type equipment, specially designed and built to contain the essential circuits for these functions.

The S.E. England control room therefore now includes telephone type equipment for establishing communication from the control centre over the private lines to 27 automatic exchanges installed in the outlying sub-stations, together with 28 cordless telephone switchboards and individual extension telephones at the remaining power stations and sub-stations. Other uses are for transmitting routine loading instruction signals to 25 major power stations, and receiving remote indications of the frequency on the east and west sections of the London area primary grid system, and on the northern and southern sections of the outlying 132 kV grid system.

Multi-Core Cable System

The private rented lines are supplemented by a separate communication system over spare circuits in multi-core cables provided inside the London area originally for protective gear purposes.

Signalling on the Post Office private lines is by means of polarised d.c. where the circuits are suitable for end to end d.c. working, but in 17 instances it is necessary to employ voice frequency signalling due to the circuit characteristics.

The signalling apparatus used for setting up telephone calls is also employed for transmission of the routine instructions for generation from the loading control desk to the associated power stations and for the receipt of acknowledgment that the signals have been received. For 17 of the 25 stations the routine instruction originators were removed from the original control equipment, mounted on a new telephone type rack and driven from the loading desk by telephone type rotary line switches under the remote control of keys on the desk. In the remaining eight instances, a more recent design of transmitter was employed utilising telephone relays and components throughout.

The continuous feeder load indications and indications of generated load utilise the same lines as those employed for signalling and communication purposes, the modulated signals for the load indications being separated by means of filters to enable speech and load signalling to proceed simultaneously. In the majority of instances a band from 1 900 cycles upwards is employed for load indications, but in some instances the load indicating signals encroach on the speech band where interruption of the load indications during telephone conversations can be tolerated. The two systems in use employ either voice frequency signals generated by a photo-electric transmitter associated with a watt-meter transmitter, these signals being amplified and de-modulated after receipt at the control room, or the counting of pulses initiated by watt-hour transmitters over a given time period measured by the control room master clock, the integrated reading over the time period being shown on the associated indicators.

In what has been referred to as the apparatus gallery, the equipment is arranged so that all power units are on one side wall, whilst the communications

equipment racks are arranged in a line along the other. Front and back access is provided, so facilitating maintenance work. In the event of interruption to the services of the building due to a mains failure, all vital load is switched automatically by a contactor to a standby supply: should this supply also be dead, a limited supply can be obtained by manual switching from the Underground 33⅓ cycle system. All vital communications equipment is run from floating batteries, which are duplicated. Sufficient capacity is available to run the control centre and provide lighting on an emergency basis for at least a day.

Incorporated in one of the main bomb-stoppers is a circular room housing a series of calculating boards used for network calculation. These comprise a short-circuit calculator and a load-flow calculator, both being d.c. operated, and consisting of networks of resistances representing circuit reactances, loads, etc. The short-circuit calculator is in two portions; one covering the London area and the other the remainder of the S.E.E. system. The load-flow calculator is a single unit covering the whole of the S.E.E. system. Each of these three units consists of a black Sindanyo panel mounted on a steel framework enclosed with sheet steel ends and back to form cubicles. The resistances are mounted on the back of the panel and interconnection of the resistances is effected by means of jacks, plugs and cords from the front of the panel. The system diagram is shown on the front of the panel. All measurements on the short-circuit calculator are made on a central instrument desk, the instruments being connected into the network by means of plugs and cords mounted on a shelf running below the calculating board and permanently wired back to the desk.

In addition to the calculators already mentioned there is a universal calculating board, consisting of 66 variable resistances with arrangements for interconnecting them by links and cords. This can be used by itself or in conjunction with one of the other calculators. Interconnection of the different calculators is effected by a number of bus-wires running round the room, with outlets adjacent to each calculation board. Power for all the calculating boards is obtained via a metal rectifier unit, from the 230 V a.c. mains.

The short-circuit calculators are used to check the duty imposed on the Board's switchgear with various switching arrangements and to estimate the duty that will be imposed on new switchgear in connection with extensions to the system. They are also used for special investigations, mainly in connection with protective gear settings. Provision is made for investigating both three-phase faults and single earth faults on the system.

The load-flow calculator is used for forecasting the distribution of load on the various parts of the system with different switching and generating arrangements and also in connection with extensions to the system.

All the equipment, with the exception of the universal calculator, was designed by the Board's staff.

Sir George Bailey

As briefly announced in our last issue, Sir George Edwin Bailey, C.B.E., M. Sc., M. I. E. E., M.Mech.E., M.I.P.E., who was made chairman of the Metropolitan-Vickers Electrical Co., Ltd., in March, 1944, has now been appointed managing director of Associated Electrical Industries, Ltd.

Sir George Bailey

Among the many public offices held by Sir George, was that of president of the Engineering and Allied Employers' National Federation, from 1940 to 1943. He became trustee to the federation in 1943. He was also president of the Institution of Production Engineers from 1939 to 1942, president of the Manchester District Engineering Employers' Association in 1926 and 1927, and a member of the Beveridge Committee on Skilled Men in the Services in 1941.

He is president of the Manchester Engineering Council, hon. treasurer of the Manchester District Engineering Employers' Association, and a member of the North Western Regional Board (Ministry of Production).

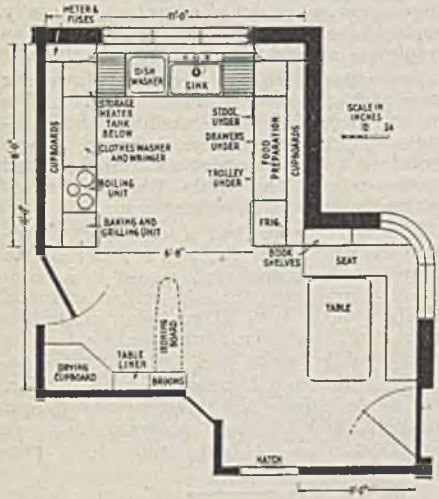
During the period of the war in Europe Sir George Bailey was chairman of the Local Reconstruction Panel (Manchester Area) Emergency Services Organisation, and a member of the industrial panels of the Ministry of Labour and Ministry of Production. The degree of M.Sc. (Honoris Causa) was conferred upon him by the Manchester University in July, 1942.

The honour of C.B.E. was conferred on Sir George Bailey in 1941, and in 1944 his services to the country were further recognised by his being created a knight bachelor.

Aluminium and Electrical Appliances

Exhibition of All-Electric Kitchen and Fittings

THERE is being shown at Selfridges, London, until June 30, a display sponsored by the Aluminium Development Association, intended to show something of the scope of the metal, and this includes representative examples of lighting fittings,



Plan of the aluminium kitchen arrangements

domestic appliances and portable tools, in the construction of which aluminium has been used. These examples, which are in themselves of standard design, are finished in some cases in Alumilite of most attractive colours and are well worth the attention of the industry.

From an electrical point of view, the show-piece may be said to be an all-electric kitchen, designed by Mr. Ernest R. Gilbert, intended to demonstrate how aluminium alloys can be used in connection with future housing problems. It is emphasised at the exhibition that the kitchen is an " ideal " in that neither size nor price have been permitted to restrict its design or lay-out.

The arrangement of the equipment will be appreciated from the plan reproduced above, and between the ceiling and the upper section of the storage cupboards is a conducting system through which foul air is withdrawn by an extractor fan mounted on the outside wall. One end of this ducting system extends into the top of the drying cupboard to remove the hot moist air and facilitate the drying of the clothes. Also within this ducting runs the wiring system which provides additional lighting points above the sink, the cooker and the food preparation bench; in this way, evenly-distributed illumination is, it is claimed, provided with the elimination of all dark corners.

A comprehensive system of wall-cupboards (fitted with sliding doors)—the top tier for reserve stores and the lower for non-perishable package foodstuffs, china, glass-ware, etc.—ensures that everything can be stored out of sight, yet ready for instant use when required. All cupboards are of aluminium, all shelves are quickly adjustable for height, and removable for easy cleaning.

Power points are located, one at the back of the food preparation bench and the other close to the boiler unit, and the portable appliances include a toaster, mincing machine, mixer and kettle. When not in use, these are stored in the cupboard below the boiler unit.

Within the cavity at the left of the window are mounted the fuse boards and main switches for the lighting and power circuits, together with the electricity meters. The meters themselves are mounted on a small hinged door which can be opened from the outside of the house by the supply authority's reader for the purpose of checking current consumption.

A constant supply of hot water for the kitchen is obtained from an electrically-heated and thermostatically controlled

General view of the aluminium kitchen

storage tank incorporated between the sink unit and the clothes washing machine.

The cooker design is such that the baking and boiling sections form two independent units at a convenient height above floor level. The oven, with its door hinged below instead of at the side, to provide a working surface for basting and turning, is fitted with interchangeable radiant elements mounted in a frame which can be inserted into two positions. When plugged into the upper socket (about two-thirds down the oven) baking or roasting is carried out in

The electric cooker oven and automatic time control

the upper portion, whilst below the heating elements there is ample room for grilling. The oven is thermostatically controlled, with a travelling pointer to show working temperature, and it is also time-controlled by means of an electric clock mounted above it. A feature of the oven is that the heating elements, side members and racks can be removed in a few seconds for the interior to be wiped over with a rag after use. The boiler unit is noticeable for its large working surface. Behind its three-heat element is room for saucepans and cooking utensils, also plates, to be kept warm during the preparation of the meal. Its 3-position switches are fitted with automatic signal lights to show when each is switched on; beneath is a drip tray, instantly removable for cleaning.

With respect to the clothes washer, it is Mr. Gilbert's view that hitherto, owing to the smallness of the average kitchen, most washing machines have suffered from the serious defect that they have not been permanently plumbed into the domestic water and drainage systems. As a result, time and energy must be expended by the user in preparing the machine for service. In the kitchen exhibited, this preliminary work has been obviated and the machine is always ready for use. One unusual feature is that the machine is fitted with a separate rinsing tank. The wringer, operated by its own independent motor, swings out of use when not required, while the washer, when out of operation, is totally enclosed, and its upper portion can be employed as additional working surface.

Associated with the electric dish-washer is a garbage disposal unit. This consists of a motor-operated shredder which reduces potato parings, small bones, scraps from the plates—in fact all forms of food waste—into a thin pulp which is automatically flushed down the drain.

The refrigerator has a capacity of approximately 4½ cu. ft., and its mechanism is mounted at the rear where it is adequately ventilated through grilles arranged at the sides. It is fitted below with two deep ventilated aluminium drawers for the storage of potatoes and green vegetables.

The Aluminium Development Association has as its objects the development of new markets, and to guide potential users in the type of alloy best suited to a particular need.

Aluminium House

THE first temporary aluminium house to be on exhibition is being shown at Somerset Street, London, W, by arrangement with Selfridges Ltd., and the Light Alloy Exhibition Committee of the Aluminium Development Association, and was officially opened on Tuesday by the Rt. Hon. Duncan Sandys, M.P. The house is shown as part of the exhibition, "Aluminium—from War to Peace," referred to above. It is made and delivered to site in four sections and that exhibited was assembled in eight hours complete to the last detail. Of the electrical equipment there are the normal lighting and power points. Hot water for the house is supplied by means of a tank at the back of the fire in the living room, with an immersion heater in the storage tank. An electric cooker and refrigerator are installed in the kitchen.

BOOK RECEIVED

"Electro-plating: A Survey of Modern Practice." By S. Field and A. Dudley Weill. 5th Ed. (London: Pitman). Pp. viii + 483. 15s. net.

District Heating

Prof. Kapp on Its Advantages and Limitations

IN the course of a lecture entitled "The Future of Domestic Heating," delivered at University College, London, on May 29, Prof. Reginald O. Kapp dealt with the subject of district heating.

The first district heating scheme he knew of, he said, was installed in Manchester early in the century, and though the idea was not pursued it was developed abroad and made substantial progress. The reason why we had not gone further with the idea was not that we would not have been better off with district heating, nor that we were less enterprising, but engineering and economic factors made it unattractive at the time.

The advantages accruing from district heating were convenience of heat on tap, smoke abatement and coal preservation.

Boiler Efficiencies

To make district heating effective, the necessary boilers would have to be comparable in size to those used in our latest power stations. Such boilers had an efficiency of about 80 per cent., but since their use would involve the transmission of hot water or steam over long distances, heat losses in the pipes would lower the overall efficiency to about 70 per cent.; still well above the 55 per cent. for individual central heating boilers, however. It was possible, to attain even higher efficiency figures if the generation of heat and electricity was combined in the same station; paradoxical though it might sound, however, this was only possible if the efficiency of electricity generation was reduced.

The amount of heat given up to the cooling water in a modern generating station was now about the minimum, as might be calculated from the second law of thermo-dynamics. No one had a use for vast quantities of luke-warm water, so the heat discarded from a generating station in the cooling water must be counted a loss.

If, however, less steam was used and it was allowed to leave the station at a higher temperature, it could serve for district heating. In doing so, less heat in the steam would be converted into electrical energy, and to some extent one would be robbing Peter to pay Paul. Nevertheless, there would be a substantial net gain, in that it could be shown that the reduction in output of electrical energy per lb. of coal would be only about one-tenth or one-ninth of the energy gain available for district heating. There was, in consequence, a saving in coal of roughly one-third, if heat and electricity were produced from a combined station.

In 1937, according to Sir Alfred Egerton, domestic heating accounted for 37 million tons of coal, and electricity supply for 15 million. Domestic heating had at that time an efficiency of about 25 per cent., but had this been entirely by central heating fed from a boiler in each house, instead of almost entirely by open fires, the efficiency would have been about 55 per cent. and about 20 million tons of coal would have been saved in that year. Had the whole of the domestic heating load been taken by large central boilers feeding district heating networks, the efficiency would have been about 70 per cent. and a further four million tons of coal would have been saved. Had electricity stations taken over the supply of district heat to their full capacity, one-third of their 15 million tons coal consumption, would have been saved and, instead of requiring a total of 52 million tons for domestic heating and electricity supply we would have required only 23 million tons.

Another advantage of combined, as opposed to separate generation, was a saving in cost of installed plant. If a generating station was designed to provide heat as well as electricity, the boiler plant would cost a little more, and the condensing plant a little less; the cost of the turbines would be much the same and that of the generators exactly the same. The net result might, or might not be a more expensive station, but against any extra cost was the saving of an independent boiler installation for supplying heat from a separate heat station.

A Building Question

Dealing with the limitations of district heating, Prof. Kapp said the chief difficulty was that almost all houses in this country had been built with open grates and were not fitted with hot-water radiators. The cost of making the necessary change would outweigh any saving, and district heating could thus only be seriously considered for new houses; but even these offered few attractive prospects. To provide district heating, pipes would have to be laid in the streets from the central boiler installation to the consumers, and where distances were not great this might cost, say, £12 per head of the population. Such expense clearly was not justified for a supply to a few isolated new houses in a district; but it might be if all the houses were new and could be built to take advantage of the offered service.

Another difficulty was to know what to design for. There would have to be installed in each house a so-called heat exchanger in which the heat in the water distributed from the central boiler house was transferred to the householder's hot water system. Again, people would be less careful of heat when it was on tap than when they had to produce it themselves, and this difficulty was increased by the problem of metering.

Further, the ratio of heat to electricity demand was unknown and fluctuating, and it would be greater in the winter than the summer. Supposing, for instance, that a combined station was designed for a given ratio and at any time the actual ratio was less, if the station generated all its electrical requirements it would be generating too much heat. The most obvious remedy would be for combined stations to run at all times as much plant as might be needed for the heat load and to import from the grid any electricity needed in excess of that generated. Though the most economical from the point of view of national expenditure, this solution did not, however, lead to the lowest cost of electricity only, for it demanded that the requirements for district heat should determine where electricity should be generated, whereas at present the Central Board's programme was governed by the relative thermal efficiency of the stations. A last objection to combined generation was that it would greatly complicate the accountancy of the supply industry.

In conclusion, Prof. Kapp said that the difficulties and limitations called for caution, but not for inactivity. Wherever possible we ought to attempt combined generation and to regard any such scheme as experimental. The advantages of combined generation outweighed the disadvantages, but it should be noted that the advantages were all national and the disadvantages all fell on the supply industry. To be fair, therefore, the relative costs of heat and electricity ought to be so adjusted that some reduction in the cost of electricity compensated the industry for its sacrifices in the national interest.

News in Brief

Street Lighting Scheme.—It is proposed to spend an extra £5 080 at Burnley on restoring full street lighting from September 1.

Hospital Lighting.—The Hastings Health Committee is to renew the electric lighting installation at the municipal hospital at an estimated cost of £1 300.

Sanatorium X-ray Equipment.—The Birmingham Health Committee is to provide X-ray facilities at West Heath sanatorium at a cost of £2 491; at Romsley Hill sanatorium at £4 644 and at Salterley Grange sanatorium at £1 296.

Kitchen Planning Exhibitions.—At a meeting of the Ilford Housing Committee the question of a kitchen planning exhibition was considered and the Borough Engineer suggested the arrangement of an exhibition of two kitchens, one to be equipped by the Gas Light and Coke Co. and the other by the electricity department, the work of organising and of building the actual kitchens to be undertaken by the Borough Engineer's department. The Committee agreed.

Leeds Telephone Exchange.—A new automatic telephone exchange has been officially opened by the Lord Mayor of Leeds, Ald. C. V. Walker.

School Installations.—The Northumberland Education Committee is to provide additional electrical services at North Seaton School at a cost of £150. Middlesex Education Committee is to provide electrical and mechanical engineering equipment at Enfield Technical College at a cost of £1 360.

Eire Electrification Contract.—It is announced that the contract for a £70 000 electrification scheme has been given to the Stal Turbine Works, Sweden. This is the first contract in a £30 000 000 electrification scheme which the Eire Government proposes to carry out during the next few years.

Housing and Town Planning.—The Yorktown (Camberley) Gas and Electricity Co. and the Wessex Electricity Co. co-operated in a housing and town planning exhibition organised by men of the R.E.M.E. School at Arborfield, Berks.

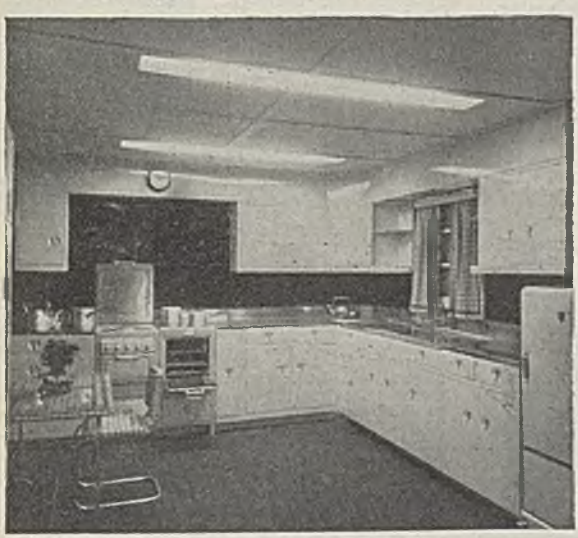
TWENTY-FIVE YEARS AGO

FROM THE ELECTRICIAN *of June 4, 1920: The Home Office has sanctioned the use of small electric locomotives in coal mines. These locomotives, which have hitherto been employed in iron mines as feeders from the faces to the main roads, are designed to haul a load of 10 to 15 tons on the level, or about 3 tons up a gradient of 1 in 30. Each carries a battery of 24 cells of the iron-clad Exide type, with a capacity of 193 Ah. These are charged from a station in the mine, the current being derived through a converter.*

Electricity Looks Forward

Exhibition to Tour N.W. Area—Electric Kitchen Display

TWENTY-TWO electricity supply authorities in the North Western region of the British Electrical Development Association have co-operated in staging an exhibition, "Electricity Looks Forward,"



Kitchen designed by Manchester Housing Department

now being held in the Kendal Milne store, Manchester. This exhibition will tour the north-west and at each centre it will be open for two or three weeks, providing ample opportunity for inspection by building authorities throughout Lancashire, Cheshire and North Wales. Provision has been made to expand the industrial portion of the exhibition and limit the agricultural, or *vice versa*, according to the character of the town where it is staged. Next on the list is Chester where it will be seen from July 12.

About 60 manufacturers of various classes of goods have provided exhibits and assisted in various ways. Photographs, maps and diagrams also provide a colourful background to the attractive range of display pieces.

The chief feature of the exhibition is the range of four full-scale electric kitchens. Two were constructed by the St. Helens Electricity Department; an all-steel kitchen produced by Moffats Ltd., in conjunction with the Blackburn Electricity Department; and the fourth, designated the North-West Kitchen, based on the preferences expressed by the 4 000 housewives who answered a questionnaire on post-war kitchen needs. Designed in collaboration with the Manchester housing department, it represents a kitchen, which the Corporation consider capable of realisation in post-war housing policy. In the kitchen there is a 4 cu. ft. refrigerator, a vertical type cooker (with oven thermostat), electric kettle, over-sink water heater, hot-water supply from a back-boiler behind the open fire in the living room, circulator type immersion heater in a hot water cylinder. In the utility room a power washing machine and electrically heated clothes drying cabinet have been

All-steel kitchen designed and constructed by Moffats Ltd.

installed. Both kitchen and utility room have an adequate number of power sockets and there is ample and correctly placed electric lighting.

The all-steel kitchen by Moffats Ltd., is built up on the unit principle and can be adapted to any shape or size of room. In addition to the usual main electric appliances, there is provided an electric clock and on either side of the cooker, an enclosed tray-rack and a withdrawable towel-drying rack fitted with a small electric heater.

One section of the exhibition is devoted to electric baking and canteen equipment, including a 4 ft. × 4ft. oven, a cake mixer, pie-press with electrically-heated platen and a 20 gal. water heater. For canteens there is a range of appliances rated from 3.5 kW to 18 kW. Farming exhibits are a group on their own. They comprise electrode boilers, sterilising chests, bottle-washing plant, milk coolers, etc.

Samuel Gratrix Ltd., show a kitchen-bathroom unit, providing on the kitchen side an electric cooker, wash-boiler sink, cupboard and refrigerator and on the bathroom side a lavatory basin, water heater, bath, etc. The E.L.M.A. provide a comprehensive exhibit illustrating the principles of good lighting; the C.E.B. display models of transmission towers and samples of overhead line conductors, etc.

High frequency heating is illustrated by a 7½ kW 10-15 mc/s heating unit with hand-operated moulding press. These are only a few of the more outstanding exhibits.

Ald. Sir William Walker, who presided at the opening ceremony, said that the developments in domestic electrical equipment had not been stopped by the war.

Lord Brabazon, who performed the opening ceremony, said that during the war many women for the first time in their lives acquired a knowledge of workshop planning, organisation and practice and had been struck by the fact that homes, looked upon as workshops of comfort, were out of date and badly organised.

Mr. R. A. S. Thwaites, chief electrical engineer and manager, Manchester, said electricity which had been a luxury for a few had become the necessity for the many. Brief speeches were also made by Mr. C. D. Taite and Mr. W. H. Metcalfe (chairman, North West E.D.A.).

Contributors to the success of the exhibition included: Aidas Electric Ltd.; Artic Fuse and Electrical Mfg. Co., Ltd.; Bastian and Allen Ltd.; Baxendale and Co., Ltd.; Belling and Co., Ltd.; J. Beresford and Sons Ltd.; Berry's Electric Ltd.; Best Products Ltd.; Geo. Bray and Co., Ltd.; B.E.A.M.A.; British National Electrics Ltd.; British Thomson-Houston Co., Ltd.; British Vacuum Cleaner and Engineering Co., Ltd.; Bulpitt and Sons; Burco Ltd.; Christy and Norris Ltd.; Consolidated Pneumatic Tool Co., Ltd.; Cooper-Stewart Engineering Co., Ltd.; Dorman and Smith Ltd.; E.A.W.; Electrolux Ltd.; English Electric Co., Ltd.; Ferranti Ltd.; Gardiner and Gulland Ltd.; Gascoigne (Reading) Ltd.; General Electric Co., Ltd.; Gratrix, Samuel, Ltd.; Hague and McKenzie Ltd.; Harwell, T.M.C. (Sales), Ltd.; Heatrae Ltd.; Hobart Manufacturing Co., Ltd.; Hoover Ltd.; Hotpoint Electric Appliance Co., Ltd.; Jackson Electric Stove Co., Ltd.; Archibald Low Electrics Ltd.; Metropolitan-Vickers Electrical Co., Ltd.; Moffatts Ltd.; Morphy-Richards Ltd.; M.K. Electric Ltd.; Premier Electric Heaters Ltd.; Pressed Steel Co., Ltd.; Pyrotenax Ltd.; Revo Electric Co., Ltd.; A. Reyrolle and Co., Ltd.; Santon Ltd.; Simplex Electric Co., Ltd.; Siroma Engineering Co., Ltd.; Vent-Axia Ltd.

Tynemouth Exhibition

SPECIAL interest was displayed by visitors to the Industrial and Electrical Exhibition at North Shields, in the Tynemouth electricity department's exhibit comprising an all-electric kitchen planned by Moffats, Ltd., in steel, with a utility room attached, and a stand showing electric cookers and other apparatus.

Notwithstanding the fact that the department was not in a position to sell, many enquiries were received for cookers, wash-boilers, refrigerators, kettles and various other appliances, which will engage attention as soon as goods are available and on sale free from restrictions. Enquiries were also made for complete kitchen units as shown in the exhibition.

A further attraction was the Housing and Town Planning section. Models of industrial and residential developments at West Chirton were shown as well as perspective views of post-war permanent and temporary housing, and plans and perspective drawings of the central development of North Shields.

The industrial exhibits included local engineering products, scale models showing the application of metal cladding for buildings, and plastics.

Tynemouth electricity department's stand

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 nearly 40 years' service with the General Electric Co., Ltd., and nine years as manager in London of the G.E.C. switchgear and instrument department, **Mr. A. E. Jepson** retired on May 31. He joined the G.E.C. in 1900 as tester of electrical heating apparatus at Peel Works, Salford. Shortly afterwards he became assistant demonstrator in the electrical department at the Manchester School of Technology, and, having obtained further experience with the Manchester Corporation electricity department as chief assistant in the testing department, he returned to the G.E.C. in Manchester in 1910 to develop meter sales. In 1919 Mr. Jepson was appointed manager of the G.E.C. Sheffield branch, a position he held until 1929, when he was made assistant district manager of Lancashire and Yorkshire. This post he held until December, 1936, when he took up his appointment at the G.E.C. head office.

Mr. A. E. Jepson

Recently, Mr. Jepson was entertained by his colleagues at a dinner at Birmingham, where the chairman, Dr. C. C. Garrard, a director of the G.E.C., presented him with a bookplate and a number of books on behalf of those present.

Colonel J. C. Chaytor has been appointed a director of the North Somerset Electric Supply Co., Ltd.

Following the resignation of Mr. R. H. Kent from the Council, the Hammersmith Electricity Committee have appointed **Councillor G. Mason** chairman, and **Councillor N. Bartlett** vice-chairman.

Mr. R. H. Stein has relinquished his position with Braithwaite and Co. (Engineers), Ltd., and given up all his other business interests to take charge at the Ministry of Works of the production of prefabricated permanent houses.

Mr. H. Warren, who, recently, was appointed director of research and engineering of the British Thomson-Houston Co., Ltd., now becomes managing director on the retirement of Mr. H. N. Sporborg. Mr. Warren is 53 years of age, and went from Bristol University to the testing department of the B.T-H. Co. in 1911. He was appointed to the engineering staff in 1913, in 1921 he became engineer of installations, and in 1923 he collaborated with the late Mr. R. C. Clinker in instituting the B.T-H. research laboratory. In 1929 Mr. Warren became chief of the research laboratory, and in 1938 he was elected to the board of the company as director of research.

In presenting certificates and awards gained by students, apprentices and trainees under the Philips' industrial training scheme at their Mitcham works, recently, Mr. Chuter Ede, Parliamentary Secretary to the Ministry of Education, praised the scheme and said that the Ministry of Education were watching the experiment with very great interest. He noticed that some had taken their degree while still working in the factory. Mr. Ede was introduced by Mr. S. S. Eriks, managing director of the Philips group of companies, who was supported by Mr. T. E. Goldup, director, and Mr. F. A. Kloppert, works director, of the Mullard Radio Valve Co.; Mr. van der Zee, works manager, Mr. G. A. Taylor, training supervisor, Mitcham works; and Mr. H. A. Warren, principal of Croydon Polytechnic.

Mr. Chuter Ede presenting awards at Philips' Mitcham works. Mr. S. S. Eriks, managing director of the Philips group of companies, is seated on his left

Obituary

Mr. Arthur H. Pott, consulting engineer, on June 2, aged 80 years.

Mr. W. A. Pearman, general manager and secretary of London Power Co., Ltd., on May 30, aged 72 years. He served the electricity supply industry in London for 54 years, having joined the Westminster Electric Supply Corporation in April, 1891. On the formation of the London Power Co., Ltd., in 1927, he was appointed general manager and secretary.

Progress of Electricity Supply

Comparative Statistical Tables for War Years

THE second statistical digest issued by the Ministry of Fuel and Power contains tables relating to electricity supply during the war years to the end of 1944. These show that the total number of units generated in 1944 was 39 649 000 000, compared with 25 708 000 000 in 1938. The total generating plant capacity installed by authorised undertakings at the end of the year 1943-44 was 11 974 000 kW, and the aggregate value of the individual maximum loads on generating stations during 1944 was 10 435 000. The number of persons employed by authorised undertakings at January 1, 1944, was 89 944 (75 762 males and 14 182 females), compared with 120 731 (113 620 males and 7 111 females) on March 31, 1939. Below are given the principal tables with comparative figures:—

CONSUMERS, SALES, REVENUE.

	1938–39	1939–40	1940–41	1941–42	1942–43	1943–44
Number of consumers (thousand)—						
Public Authorities	6 768	7 017	6 923	6 962	7 012	7 077
Companies	3 333	3 547	3 595	3 672	3 669	3 703
Total	10 101	10 564	10 518	10 634	10 681	10 780
Electricity sold to consumers (million units)—						
Lighting, heating and cooking	8 340	8 690	8 810	9 875	9 353	9 721
Power	10 841	12 476	14 342	16 754	19 517	20 951
Public Lighting	376	142	16	20	21	20
Traction	1 236	1 230	1 139	1 166	1 170	1 140
Total	20 793	22 538	24 307	27 815	30 061	31 832
Revenue from sale of electricity to consumers (£ thousand)—						
Public Authorities (including Central Board for traction purposes only)	55 664	58 056	63 490	72 059	73 764	78 402
Companies	34 468	36 677	41 097	47 931	52 751	56 003
Total	90 132	94 733	104 587	119 990	126 515	134 405

NOTE.—Consumption by domestic consumers is estimated to have been 5 360 million units in 1938. The corresponding provisional figure for 1944 is 7 000 million units. The companies' year ended December 31 and the public authorities' year the following March 31 or May 15.

CLASSIFICATION OF GENERATING STATIONS ACCORDING TO UNITS GENERATED, YEAR 1944.

Group.	Number of stations.	each group (thousand units).
Up to 50 000 units	38	630
50 001 to 100 000 „	16	1 061
100 001 „ 250 000 „	27	4 741
250 001 „ 500 000 „	17	6 185
500 001 „ 1 000 000 „	16	12 077
1 000 001 „ 2 500 000 „	35	56 865
2 500 001 „ 5 000 000 „	21	79 514
5 000 001 „ 10 000 000 „	20	138 626
10 000 001 „ 25 000 000 „	30	495 601
25 000 001 „ 50 000 000 „	22	692 396
50 000 001 „ 100 000 000 „	23	1 690 964
100 000 001 „ 200 000 000 „	24	3 654 151
200 000 001 „ 500 000 000 „	33	10 480 608
500 000 001 „ 1 000 000 000 „	16	11 042 359
Over 1 000 000 000 „	7	10 007 368
Total	345	38 363 146

	1938.	1939.	1940.	1941.	1942.	1943.	1944.
Number of Public Authorities	378	373	373	374	374	374	375
Companies	213	208	205	202	201	200	198
Total	591	581	578	576	575	574	573
ELECTRICITY GENERATED (million units).							
By steam plant—							
Public Authorities	13 093	14 289	15 921	17 935	19 569	20 191	21 442
Companies	10 118	10 966	11 880	13 465	14 882	15 344	15 651
Railway and Transport	1 335	1 323	1 202	1 216	1 248	1 265	1 285
Total	24 546	26 578	29 003	32 616	35 699	36 800	38 378
By oil engines—							
Public Authorities	27	25	26	25	23	21	25
Companies	30	26	31	32	23	17	20
Total	57	51	57	57	46	38	45

ELECTRICITY GENERATED (*continued*)	1938.	1939.	1940.	1941.	1942.	1943.	1944.
By gas engines—							
Public Authorities	3	3	3	3	2	2	3
Companies	—	—	—	—	—	—	—
Total	3	3	3	3	2	2	3
By water power—							
Public Authorities	7	7	6	6	7	6	6
Companies	981	975	794	825	1 090	1 323	1 170
Total	988	982	800	831	1 097	1 329	1 176
By destructor plant, waste heat, etc.—							
Public Authorities	13	16	15	8	6	5	4
Companies	100	102	97	61	52	42	42
Railway and Transport	1	1	1	1	1	1	1
Total	114	119	113	70	59	48	47
OVERALL TOTAL—							
Public Authorities	13 143	14 340	15 971	17 977	19 607	20 225	21 480
Companies	11 229	12 069	12 802	14 383	16 047	16 726	16 883
Railway and Transport	1 336	1 324	1 203	1 217	1 249	1 266	1 286
Total	25 708	27 733	29 976	33 577	36 903	38 217	39 649
MATERIALS USED FOR GENERATING ELECTRICITY (thous. tons)—							
Coal	14 927	15 925	18 112	20 435	22 283	22 599	24 074
Coke and Coke Breeze	183	235	258	275	320	318	337
Oil	20	19	26	20	18	14	18

Number of stations (owned by authorised undertakers) generating electricity during 1944 was 345. In addition there were 14 generating stations belonging to and operated by railway and transport authorities.

Localisation of Faults

I.E.E. Discussion on Some New Tests for Low Voltage Cables

A PAPER on "Localisation of Faults in Low-Voltage Cables," by Mr. J. H. Savage, was read at the meeting of the I.E.E. Transmission Section on May 30.

Practical limitations of well-known fault-locating tests were considered, and some new tests capable of high accuracy were described. They included a d.c. valve-voltmeter circuit for core-to-sheath insulation faults, audio-frequency search methods for open-circuits, and radio-frequency tests for conductor defects. Mention was also made of fault localisation based on wave-reflection effects. The paper dealt mainly with factory technique for rubber- and plastic-insulated cables, but some of the methods could be applied to other types and to field work.

Dr. P. Dunsheath (W. T. Henley's Telegraph Works Co., Ltd.) remarked that the methods described in the paper displayed a considerable amount of ingenuity and novelty. At one time cable fault testing had to be carried out from the end of the cable, and the loop test was the one which the text books recommended. The remarkable thing was that by adopting more obvious methods, as the author had so ingeniously done, he had increased the order of accuracy out of all recognition. At one time, with the loop test, we were satisfied with an accuracy of hundreds of yards on long lengths of cable, but the author got within an inch. This was a great advantage in cable manufacturing works because it economised in technical personnel and reduced the amount of scrap cable. Another point of fundamental importance was the manner in which the author had used the inversion of the Wheatstone bridge—he had turned it inside out—to meet his requirements. There might possibly be other applications of that, apart from cable testing. The author had also used audio-frequency and radio-frequency and had shown the great advantage, even to cable makers, of knowing something about radio work.

Major L. G. Dumford (Ministry of Supply) said that whilst the spark test was becoming very much more popular in cable factories, it was only an empirical test. All the details were arbitrary. B.S.7 only catered for certain types of rubber-insulated cables, but there was a strong tendency to extend the spark test to other sizes. His own view was that there should be a comprehensive investigation into spark testing before it was extended to other sizes and types of cable, especially with regard to spark testing time, voltage, etc. As to the electrodes used in spark testing, it had always seem to him that the German idea of using ball bearings was likely to be more satisfactory than the device common in this country. Another point in connection with the spark test was ionisation, and rubber cables did not like ozone. Finally,

there had been a great extension recently —and more was looked to in the future—of the use of synthetic rubber and alternatives to rubber, but the spark test was devised for rubber cables, and he did not think it would be correct to adapt the test, as it had been used for rubber cables, and apply it, without any modification to these new types of cable. Therefore, again some investigation was necessary before applying the spark test to synthetic rubber cables.

Mr. J. G. Park (Northmet Power Co.) said that although the paper dealt with fault localisation from the manufacturing point of view, the methods described had possibilities when applied to power mains. He had in mind the type of fault—which fortunately was rare—where there was no external evidence. He had had cases in which he would have been much more comfortable if he had had apparatus of the type described in the paper, especially the valve voltmeter arrangement. He asked the author for an explanation of what was meant by " very exact localisation," mentioned in the introduction to the paper. Rapid localisation must be accompanied by maximum accuracy; it was a combination of both factors which provided early restoration of the service. In his own case, as the result of 72 fault locations on 11 kV and 33 kV cables, the degree of accuracy of localisation was .12 per cent. of the fault position, expressed as a percentage of the length. In connection with fault locating by wave reflection, the author had touched on some interesting possibilities and further details of the application of this method to transmission lines would be of very great interest.

Mr. A. J. Good (Johnson and Phillips, Ltd.) showed some slides relating to twin cables, and said that the balanced capacity method was only suitable for such cables.

Mr. D. P. Sayers (Birmingham electricity supply department) said that he was very glad the author referred to a strong sense of smell because he had, on occasions, found that a good nose was very much better than any other method of locating faults. The main point, however, was the prospect which the paper opened up of the application of electronics to the practical location of faults on cables in situ; that was the principal value of the paper from the supply engineer's point of view. His experience of search coil methods had never been very satisfactory on a city distribution system owing to the number of pipes, etc., in the neighbourhood. The fall of potential method was fairly well known to mains engineers mainly for the location of faults on low tension cables which might be particularly difficult to detect owing to the service cables which were connected at intervals. In Birmingham that method had been employed, but using rectifiers instead of batteries, with more satisfactory results. A troublesome type of fault was the high resistance fault on 33 kV cables, and he asked if the author had used the Goodings flashmeter test, with which he had had good results on several occasions.

Mr. F. S. Smith (Callender's Cable and Construction Co.) emphasised the need for standardising the names of the various fault localising methods. There had been little co-ordination in this respect in the past, and similar methods had been independently developed and given different names. The author did not make a proper distinction between " fall of potential " tests and " drop in sheath " tests. The former term should be restricted to those tests where voltage drops along the conductor of a cable were measured or compared, whilst " drop in sheath " tests should cover all tests depending upon drops along the lead sheath or armour. The author might have made reference to the inverted form of Murray-loop test as this was suited to factory work and the same type of valve voltmeter as that described in the paper could be used as a detector. A fairly accurate location could be obtained on a high resistance fault, thus limiting the length of cable which had to be explored by probing the sheath.

Mr. T. R. Scott (Standard Telephones and Cables, Ltd.) said that wave reflection methods were proving extremely interesting for investigating faults of the dead short or high resistance types, and it was possible that these methods with skilled operators and skilled interpretation would save a great deal of inconvenience and trouble. The same comment applied to the plastic type cables, and perhaps the time was coming when the so-called electronic methods could be applied to give a sort of view of the future of the cable for X-number of years ahead. But we were a long way from that yet.

Dr. A. Rosen (Siemens Bros. and Co., Ltd.) said it would be very nice to be able to supplement the more usual methods adopted on low tension cables by some method which was independent of the measurement of length, because at present, when one gave instructions for the cable to be sawn through, there were always doubts as to whether the right place had been located. With regard to spark testing methods, the author said that when a fault was located the usual method was to stop the winding gear and indicate the fault, but there were occasions when this could not be done and some automatic method of indicating the fault had to be resorted to. He had carried out experiments upon indicating the fault by spraying paint on to the conductor and other experiments were in hand.

Industrial Information

Change of Name.—The Enfield Cable Works, Ltd., Brimsdown, Middlesex, inform us that, for simplicity's sake, the company's name has been changed and that it will be known henceforward as Enfield Cables Limited.

Energy Regulator.—A technical publication—R. 12(a)—dealing with the Sunvic energy regulator, has been issued by Sunvic Controls, Ltd. It gives details of circuits for a wide range of applications, and prices.

B.T-H. Activities.—In the current issue of this magazine, Mr. A. A. Pollock describes a new method of cooling large commutators by air circulation, there is an article on dynamometers by Mr. G. F. Lowe, and further details are given of B.T-H. progress in 1944.

High Speed Steel.—Instructions for the hardening and tempering of high speed steel are given on a card issued by the Controller of Jigs, Tools and Gauges, Machine Tool Control, 35, Old Queen Street, London, S.W.1. It is available for all operators concerned with the heat treatment of high speed steel.

Birmingham Training Scheme.—A brochure has been issued by the City of Birmingham electricity supply department describing the engineering training scheme adopted by the department with the object of providing for selected young men the means and opportunity to obtain organised training in all branches of electricity supply work.

Mass Radiography.—An admirably produced brochure, profusely illustrated, has been published by Watson and Sons (Electro-Medical), Ltd. It describes in detail the Watson apparatus for mass miniature radiography, the method of operation, and its varied applications. Except for the American X-ray tube, the apparatus is British made.

Repair of Trailing Cables.—To those new to repair work, and others desiring a handy and comprehensive reference manual, the handbook M. 117—"How to Repair Type "A" Individually Screened Trailing Cables," published by British Insulated Cables, Ltd., will be of considerable service. The various repairs described are illustrated by photographs.

Swedish Recipes.—Recipes sent by Madame Silverjelm, of the Swedish Housewives' Association, Stockholm, are included on this month's "Cheerful Rationing" card published by the E.A.W. There are two meat dishes and two sweets which should give interesting variety to the early summer menu. The English recipes also contain some new ideas for salads.

Import of Machinery and Plant.—The Board of Trade are now prepared to consider applications to import machinery and plant needed for the production of civilian type goods for the export trade, or required for important home consumption, where such machinery and plant cannot be obtained from home sources. Application should be made to the Import Licensing Department, 1-6, Tavistock Square, London, W.C.1.

New Domestic Appliances Factory.—The Board of Trade has allocated one of the standard national factories at Broxburn, near Edinburgh, to Hotric, Ltd., a subsidiary of H. Webb and Co. (Engineers), Ltd. This factory is being equipped for the manufacture of electric water heaters and other domestic appliances for housing schemes throughout the country, and also for export. The head office and sales department of Hotric, Ltd., is remaining at 198, Fore Street, Edmonton, N.18, and, in addition to the new factory in Scotland, the existing factories at Tottenham and Bishop's Stortford are being retained.

An Anglo-Indian Agreement.—An agreement has been completed between Kirloskar Brothers and the Brush Electrical Engineering Co., Ltd., for the manufacture in India of electrical products consisting of rotating electrical machines, transformers, switchgear, etc. Provision has been made for the exchange of technical information between the parties and for the training of Indian personnel at Loughborough. Kirloskar Brothers have also entered into a similar agreement with British Oil Engines (Export) Ltd., representing Mirrlees, Bickerton and Day, Ltd., Petters, Ltd., J. and H. McLaren, Ltd., Oil Engines (Coventry) Ltd., and the engines manufactured by Fielding and Platt, Ltd., and sold under the name of Petter-Fielding.

Institute of Physics.—The report of the Institute of Physics for 1944 shows that its membership increased by some 15 per cent.—a new record. A new venture was the publication of a series of lectures given before the Industrial Radiology Group as a handbook of industrial radiology. The Report on the Teaching of Mathematics to Physicists, prepared jointly with the Mathematical Association, was published during the year. Arrangements with the Ministry of Education for the establishment of national certificates in applied physics were completed by the setting up of a joint committee to administer the scheme. Other matters which the board of the institute considered included patent law reform, higher technical education, the

limitation of radio interference and professional matters. Fifteen candidates were examined for the Institute's Laboratory Arts Certificate.

"Operation Pluto."—The Telegraph Construction and Maintenance Co., Ltd., contributed 54 miles of 2 in. Hais cable, involving 68 drums, each having a gross weight of 14½ tons, and followed this with 95 miles of 3 in. cable pipe-line, requiring 238 drums. The company also produced a special type of buoy to prevent damage during landing operations. This was used with great success, and the company received a letter of congratulation from the Admiralty. W. T. Glover and Co., Ltd., have supplied 20 miles of 3 in. Hais cable over a period of five months. The alloy pipe was extruded in 700/800 yd. lengths on Glover's special type of vertical lead press. The armouring of the pipe was carried out on cable armouring machines with certain modifications.

A number of multi-stage, high-pressure centrifugal pumps used for pumping the oil through the pipe-line were designed and manufactured by Mather and Platt, Ltd. They are capable of delivering 1 000 tons per day and are designed to work to a pressure of 1 500 lb. per sq. in. Each pump is driven by a Mather and Platt 550 H.P. motor.

The County of London Electric Supply Co., Ltd., and the Folkestone Electricity Supply Co., Ltd., designed the complicated l.t. networks at the coastal pumping stations and designed and installed the h.t. work. In addition, the electrical installation at the special factory established in connection with the scheme was done by the companies. They and their staffs have been thanked by Major-General Sir Donald Banks, Director-General of the Petroleum Warfare Department.

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.

Dunbar, B.C., June 9.—Supply, delivery and installation of street lighting equipment, including poles, lanterns, wiring, and control gear. Specifications and forms of tender from the Burgh Surveyor, Town House, Dunbar.

Leeds Waterworks Department, June 11.—Supply of two electrically-driven centrifugal pumps, 700 g.p.m., with motors and float-operated switchgear. Particulars from the Manager and Engineer, Waterworks Department, Civic Hall, Leeds, 1.

Amble U.D.C., June 14.—Supply, laying and jointing of l.t. mains and distributors, supply, erecting and connecting of feeder pillars and laying, jointing and connecting of services. Specification from Mr. W. C. Roy, Electricity Department, Dilston Terrace, Amble, Northumberland.

Torquay Electricity Department, June 18.—Supply of 11 kV indoor switchgear. Particulars from the Engineer and Manager, Electric House, Union Street, Torquay.

Littleborough U.D.C., June 19.—Supply and delivery of e.h.t. feeder cables (11 000 V). Specifications from the Electrical Engineer and Manager, Council Offices, Littleborough.

Gellygaer U.D.C., June 30.—Supply and delivery of house service units for one meter per consumer. Specifications from the Electrical Engineer and Manager, Electricity Offices, Hanbury Road, Bargoed, Glam.

I.E.E. Radio Section

THE I.E.E. Radio Section held an informal luncheon in London, on Tuesday when the chairman, Mr. H. L. Kirke, presided, supported by Sir Edward Appleton, F.R.S., Mr. P. Good, deputising for the president, Sir Harry Railing, and the chairmen of the other three sections—Mr. G. O. Watson (Installations), Dr. W. G. Radley (Measurements) and Mr. H. W. Grimmitt (Transmission).

Mr. P. Good, in submitting the toast of the section, mentioned his early experiments with a dot-dash transmitter as a schoolboy in the last century and said he envied members their adventurous experience. They had done marvellous work during the war, and he was sure the Section would continue to be a medium for the general exchange of knowledge on the subject.

The Chairman, in reply, said that although they in the Radio Section were a specialised branch of the industry, it was important to remember that radio could not go ahead without power, and the day was rapidly approaching when the power engineer could not get on without the radio engineer.

Mr. G. O. Watson, replying for the guests, said that although modern electrical engineering necessitated that there should be specialists, over specialisation was to be avoided.

Sir Edward Appleton also replied, and said he could claim to have guided their Chairman's early steps in radio. By adopting specialised sections in their institution many difficulties had been overcome. He was personally opposed to separate organisations for all physical and engineering subjects and regarded radio as both physics and engineering.

Company News

PLESSEY CO., LTD.—Fst. intm. 10% on ord.

R. A. LISTER LTD.—Intm. on ord. 5% (same).

A. C. WICKMAN, LTD.—No div. on ord. cap. (8%).

NATIONAL ELECTRIC CONSTRUCTION.—Fst. and fin. 10%.

ALBION DROP FORGINGS CO., LTD.—Intm. on ord. 5% (same).

R. HOOD HAGGIE AND SON, LTD.—Intm. div. 5% (same).

WAILES DOVE BITUMASTIC CO., LTD.—Intm. div. 5% (same), payable June 14.

CROMPTON PARKINSON, LTD.—Intm. div. on ord. and "A" ord. 7½% less tax (same).

WALSALL CONDUITS LTD.—Fin. div. on ord. 35% (same), mkg. 55%, less tax (same).

ALLEY AND MACLELLAN, LTD.—Fin. div. 7½%, mkg. 15% (same). Fwd. £8 488 (£6 191).

B. E. T. ELECTRICITY SUPPLY, LTD.—Fst and fin. 5% (same). Net pft. to Mar. 31, £32 415 (£31 379).

ALBION MOTORS LTD.—Div. for 1944, 12½%, less tax (same). Net pft. announced as £121 654 (£126 899).

WHESSOE FOUNDRY AND ENGINEERING CO., LTD.—Fin. div. for yr. ended Mar. 31, 30%, mkg. 40% (same).

SCOTTISH STAMPING AND ENGINEERING CO., LTD.—Fst. and fin. on ord. 10% (same). Net pft. 1944 £17 101.

N. GREENING AND SONS, LTD.—Fin. 5% (same) and bonus 2½% (nil), mkg. 10% (7½%). Net pft. to Apr. 30, £22 663 (£22 418).

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.—Fin. div. on ord., 10%, and cash bonus 5%, mkg. 20%, less tax, for yr. (all same). Net pfts. for 1944, £347 852 (£354 566). To war conting. £75 000 (£50 000). Carry-fwd. £399 326 (£398 974).

CONTROL OF NEW CAPITAL.—A new policy for the control of capital issue has been announced by the Chancellor in the House of Commons. The policy is described in detail in a new memorandum of guidance from the Treasury to the Capital Issues Committee, which is published as a White Paper (Cmd. 6645). This lays down various industries for which new issues of capital will usually be allowed. These include export trades, industries in development areas, public utilities, agriculture, housing associations, home-produced raw materials, and transport; they also include, subject to Treasury decision from time to time, domestic equipment and production machinery.

CABLE MERGER.—Full details of the British Insulated and Callender's Cable merger, referred to in "THE ELECTRICIAN" of Apr. 27, are now available. Circulars have bn. sent out to the shareholders of both cos. showg. the full details of the proposals, and givg. the necessary notices of the extraord. gen. mtgs. and class mtgs. required and of the resolutions to be submitted thereat. The mtgs. for both cos. are called for June 29. Sir Alexander Roger will be chairman of the new co. and Mr. T. H. Martin-Harvey and Mr. Charles Pipkin deputy-chairmen. The other dirs. are Mr. D. W. Aldridge, Mr. W. G. Hendrey, Mr. P. V. Hunter, Mr. W. H. McFadzean, Sir Eugene Ramsden and Mr. F. Waine.

Company Meetings

SOUTHERN AREAS ELECTRIC CORPORATION, LTD.—In the course of his address at the annual meeting held in London on May 16, the Rt. Hon. Viscount Elibank, the chairman, said that development of the Electricity Supply Undertakings was indicated by comparison. In 1939 units bought were 10 089 222 and in 1944 18 613 765, omitting figures for the Brentwood undertaking sold during 1944. Units sold had increased from 8 764 824 to 16 884 717.

(Continued on page 522)

Metal Prices

		Monday, June 4. Price.	Inc.	Dec.
Copper—				
Best Selected (nom.)	per ton	£60 10 0	—	—
Electro Wirebars ...	„	£62 0 0	—	—
H.C. Wires, basis ...	per lb.	9 7/16d.	—	—
Sheet	„	11 7/16d.	—	—
Phosphor Bronze—				
Wire(Telephone)basis	„	1s. 0 7/16d.		—
Brass (60/40)—				
Rod, basis	„	—	—	—
Sheet „	„	—	—	—
Wire „	„	11d.	—	—
Iron and Steel—				
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	—	—
Lead Pig—				
English	„	£26 10 0	—	—
Foreign or Colonial	„	£25 0 0	—	—
Tin—				
Ingot (minimum of 99.9% purity) ...	„	£303 10 0	—	—
Wire, basis...	per lb.	3s. 10d.	—	—
Aluminium Ingots ...	per ton	£85 0 0	—	—
Spelter...	„	£25 15 0	—	—
Mercury (spot) Warehouse ...	per bott.	£69 15 0	—	—

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

Average cost per unit bought had increased during this period from .652d. per unit to .836d. per unit. On the other hand, average selling prices showed reduction per unit from 1.946d. in 1939 to 1.91d. in 1944. An improvement in the average annual consumption per consumer from 1 011 units in 1939 to 1 614 units in 1944 was largely due to supplies for war production purposes.

JOHN THOMPSON ENGINEERING CO., LTD.—The annual meeting was held at Ettingshall, Wolverhampton, on May 18. Maj. (Hon. Col.) St. John Thompson, the chairman, presided. In the statement circulated with the report and accounts, the chairman said the marked financial stability of the group at December 31, 1943, had during the year again been very substantially strengthened, and the directors felt justified in recommending a similar dividend and bonus to that of the previous year on the ordinary shares.

MARCONI INTERNATIONAL MARINE COMMUNICATION CO. LTD.—The annual meeting was held in London on May 28. Admiral H. W. Grant, chairman and managing director, presided, and in the course of his statement said the accounts showed that the profit for the year, after making provision for taxation and contingencies, amounted to £90 138 and was slightly less than the previous year. The amount available for distribution to the shareholders remained approximately the same by reason of the incidence of taxation, particularly excess profits tax. The board had decided, therefore, to recommend a final dividend of 5%, thus making a total distribution of 7½% for the year. The company's financial position had been maintained throughout the year, and their contribution to the war effort had not lessened.

Commercial Information

Mortgages and Charges

NOTE.—*The Companies Act of* 1908 *provides tha every Mortgage or Charge shall be registered within* 21 *days after its creation, and tha 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.*

AIR CONDITIONING AND ENGINEERING LTD., Bredbury.—April 30, deb., to Trade Distributors Ltd. securing all moneys now or at any time owing by the co. and/or the Cheviot Trust Ltd. to the holders; general charge (subject, etc.). *Nil. Dec. 29, 1942.

C. A. BESLEY, BAILEY AND CO. LTD. Cardiff, electrical engineers.—May 11, £150 mort., to H. J. Hancock, Cardiff; charged on four stables, carpenter's shop, etc., at rear of 248 to 251, Bute Street, Cardiff. *£140. Feb. 5, 1944.

NORTH BRITISH ALUMINIUM CO. LTD. London, E.C.—May 16, disposition by Mrs. C. N. Fry or Steedman, with consent granted in implement of a Trust Deed dated Sept. 12, 1934; charged on land with Hazelcroft and other buildings thereon at Achintore, Fort William. *—Mar. 28, 1944.

YORK SHIPLEY LTD. London, N.W., engineers.—May 22, assignment, securing to Barclays Bank Ltd. all moneys due or to become due to the Bank; charged on contract moneys. *£9 856. Mar. 7, 1945.

Satisfaction

LONDON AUTO-ELECTRIC LTD. London, E.C., electrical equipment dealers.—Sat'n May 12, of deb. reg. Dec. 9, 1933, to the extent of £250.

County Court Judgments

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

GARLAND, A. J. (male), Bloomfield House, Otley, electrical engineer. £12 11s. April 13.

FRY, Andrew, 9, Stuart Road, Liverpool, 4, electrician. £21 16s. 4d. Feb. 15.

ROSS, Chas., 14, Sandon Street, Liverpool, electrician. £17 7s. 4d. April 9.

GOLDENBERG, J. (male), 23a, Adamson Road, N.W.3, electrical engineer. £32 9s. 3d. Mar. 22.

Notice of Dividend

MOZER, HYMAN, and MOZER, Sam, trading in partnership and described in the Receiving Order as H. and S. Mozer (a firm), of and carrying on business at 111, High Street, Stoke Newington, London, N.16, radio dealers. First and final dividend of 1s. 2⅜d. per £ payable June 12, 1945, Bankruptcy Buildings, Carey Street, London, W.C.2.

COMING EVENTS

Saturday, June 9.

INSTITUTE OF ECONOMIC ENGINEERING.—Waldorf Hotel, London, W.C.2. Discussion, "Co-ordination in Factory Administration," opened by P. M. Garnier. *2.30 p.m.*

Thursday, June 14.

INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION.—Kingsway Hall, London, W.C.2. Annual meeting. *10 a.m.*

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