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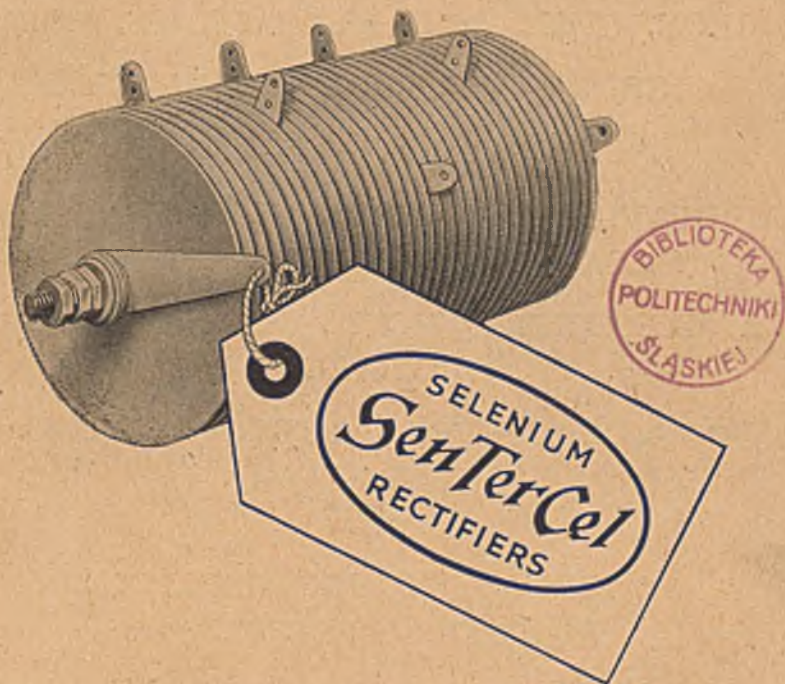
Vol. CXXXIV. No. 3494.

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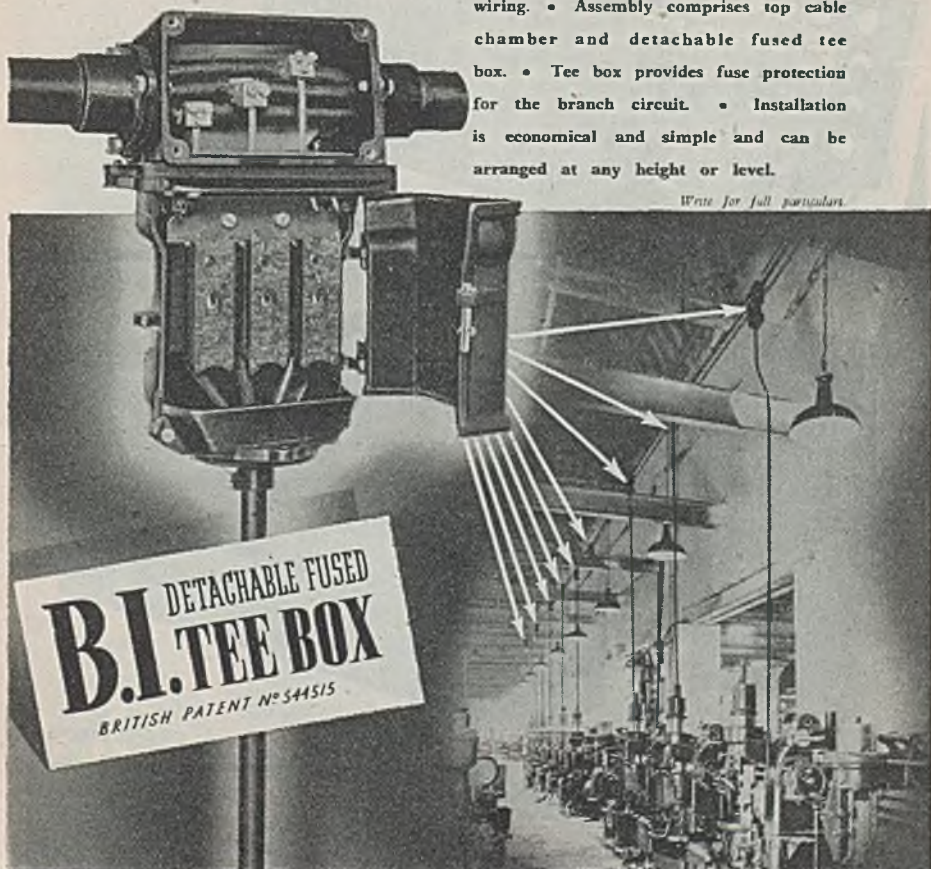


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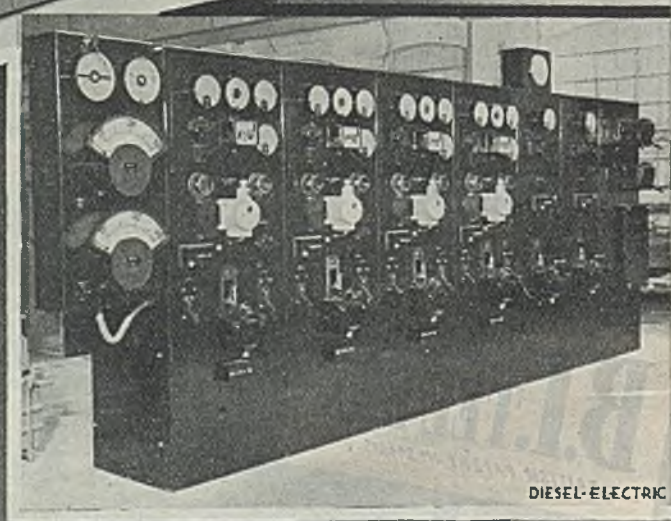
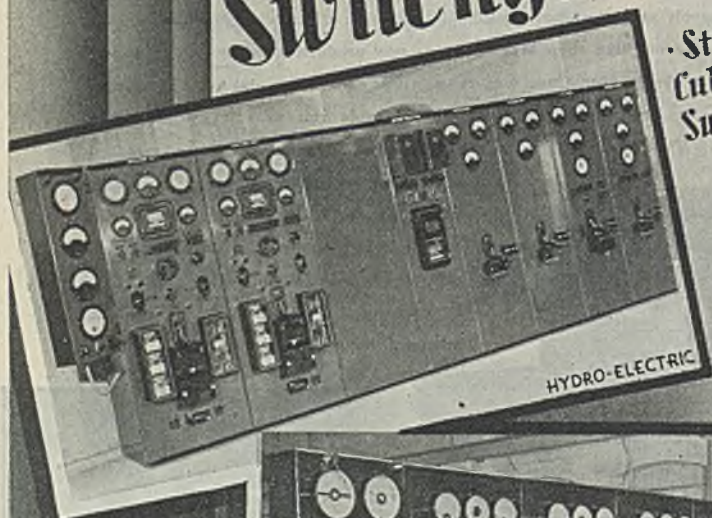
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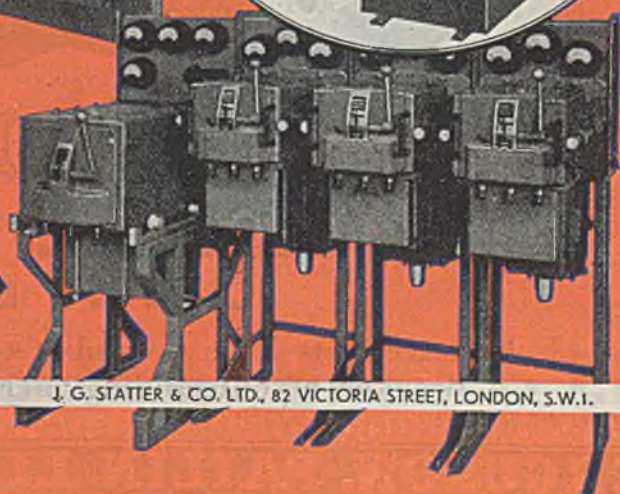
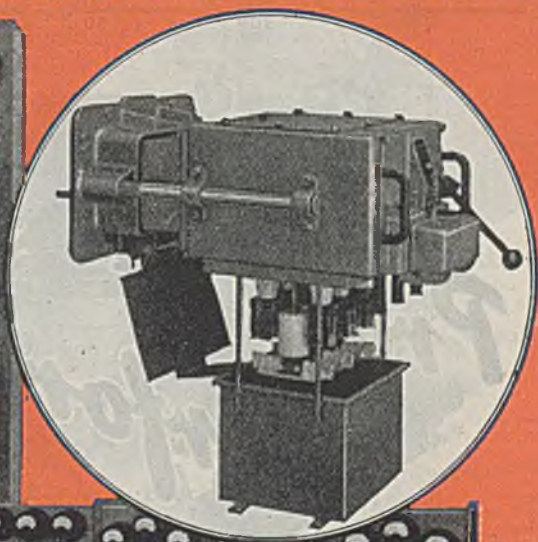
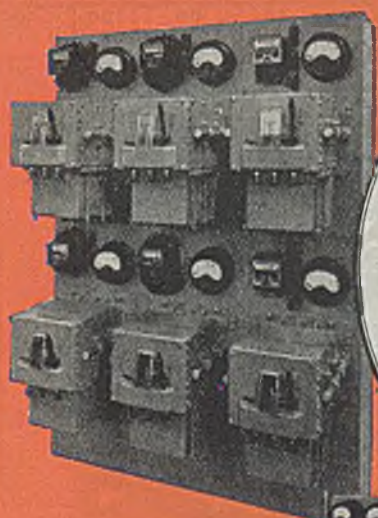
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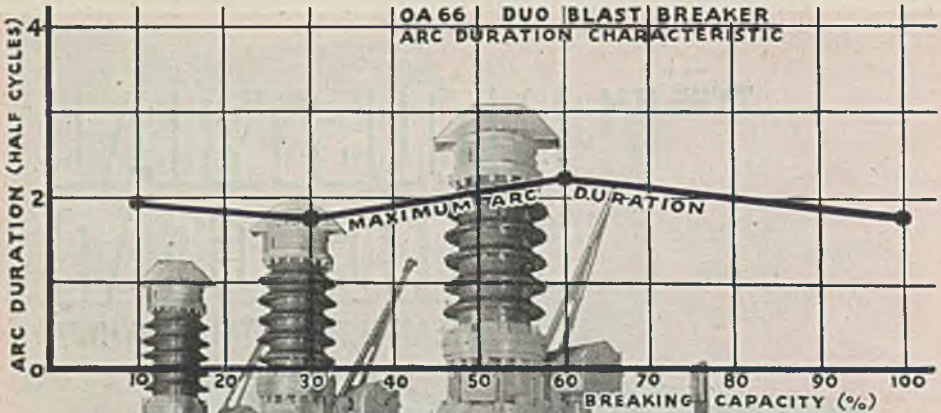
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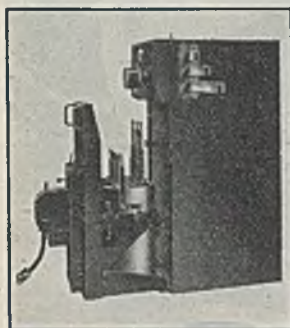
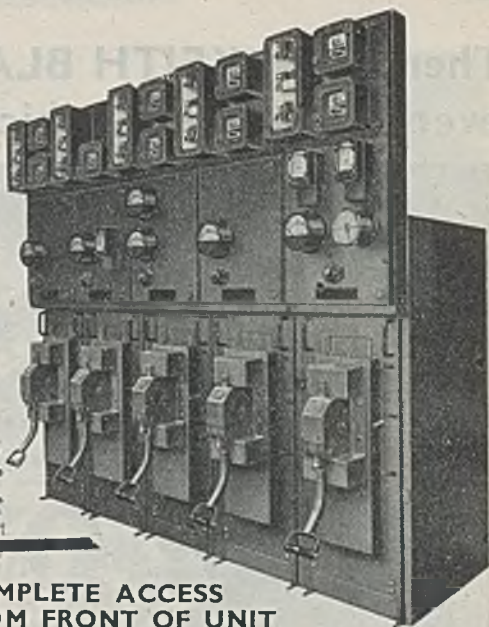


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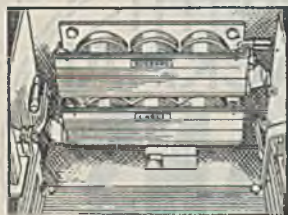
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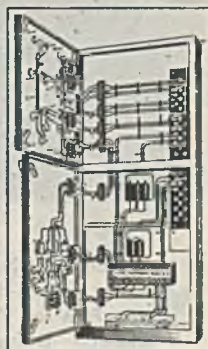
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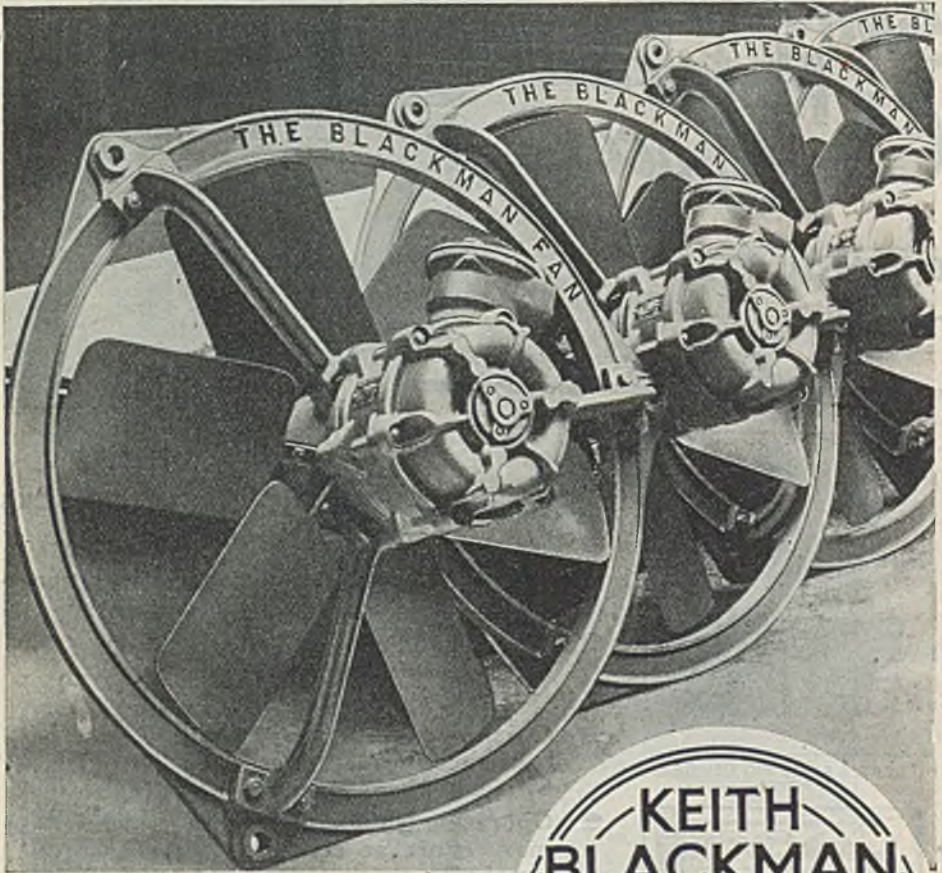
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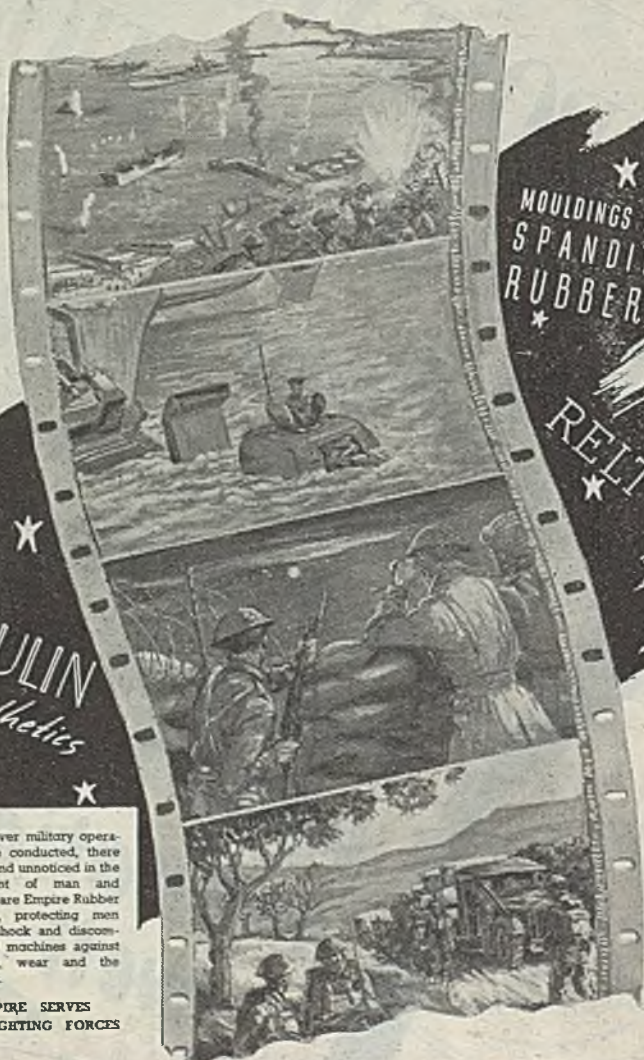
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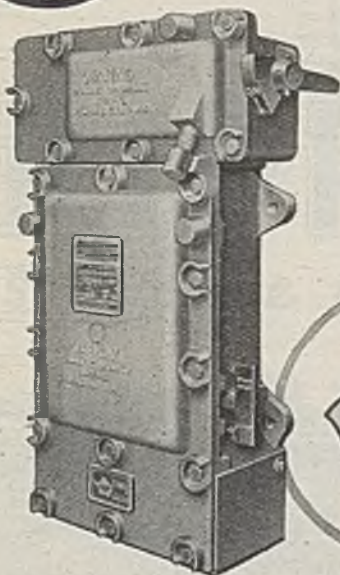
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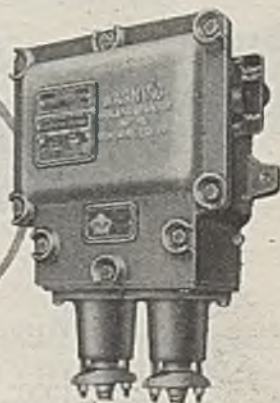


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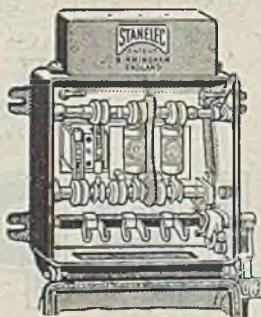
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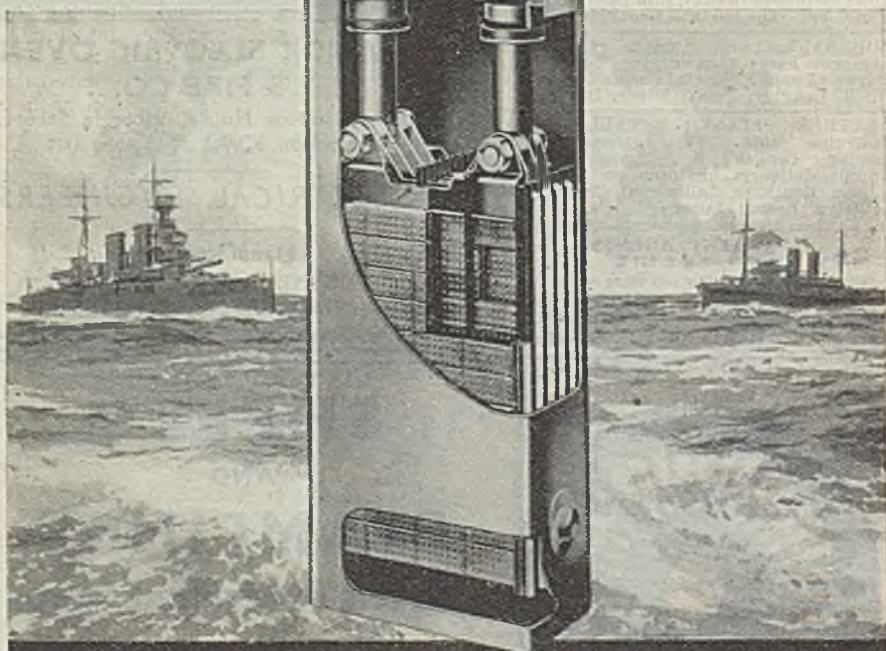
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No. 3494. [Vol. ^{No. 20} CXXXIV]

May 18, 1945

Annual Subscription 25.
Overseas 30s.

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certain, but while it is still true that war needs must come first, it is equally clear that every effort should be made to secure that both raw materials and trained operatives be made available as early as possible so that works' plant may be modernised, new processes installed, and those trades which in normal times make substantial contributions to British export trade may be provided with the necessary electrical and other gear to enable their manufacturing capacity to be at least as efficient and economic as that of their overseas competitors.

The relaxations which have already been made, such as the extension of the list of countries to which goods may be shipped, the curtailment of the formalities attendant upon the purchase of machine tools, and the provisions in the Supplies and Services (Transitional Powers) Bill, are satisfactory only up to a point, in that while in theory they assist production, in actual fact they do little more than make more prominent the need for a quicker release of skilled labour.

The present trend of things in the United States makes the position in this country even more urgent, if we are to make any effective counter to American competition in the export field, for while the United States is already devoting some of her production capacity to peace-time needs, British industry has first to replace much of its worn-out or obsolete plant, and then to find the man-power to operate the machines. It must not be overlooked that in addition to superiority in man-power to work it, the United States production machine has too, the advantage of not having been damaged in any way by enemy action, neither has it been required to work at so high a productive rate on war munitions as

Man-Power Needs

INDICATIONS that the authorities in the United States have been quick to take advantage of the changed conditions in Europe to start again the process of industrial conversion, entitle the British manufacturer to view with concern the little that is being done in this country to facilitate either home or export trade. Since it was made known that the authorities were ready to permit experimental and development work with a view to promoting overseas trade, some 1 200 applications for materials have been approved, but no relief has been allowed with respect to labour. Existing staffs are mainly engaged in war production, and are likely to remain so until the Pacific war is brought to a successful conclusion; not so much because the potential war output is as great as was needed two or three years ago, but because the staffs have been so depleted by military and technical necessity that industry has now little man-power to spare for the production of peace-time goods. How far the European situation will make additional man-power available to industry is un-

has its counterpart in this country. That being so, it is time that those charged with the responsibility of exercising controls over British industry and labour realised that unless they are more co-operative the problem of re-establishing our manufacturing capacity, will become more difficult of solution with each passing month.

Re-Mobilisation

THE efficiency with which industry will be able to absorb the labour released to it, depends upon the way demobilisation is carried out, and some explanation of its implications was given by Sir ERNEST BENN, in last week's issue of "Truth." In September, 1939, all those in industry, who, because of their age or from the nature of their positions and experience carried the least responsibility, were called to the colours, while applications for deferment were approved in the case of those whose work was of importance. By degrees the call-up reached the higher grades until only key-men were left. The national need, being still unsatisfied, the key-men, last of all, were themselves combed out and industrial man-power was reduced to a shadow of its former self. Now the need is to get some thousands of men and women back to work, but, as Sir ERNEST points out, if under the "first in, first out" arrangements industry is to be presented with the less responsible part of its personnel demanding re-employment, a difficult situation may arise. It is ordinarily impossible to employ a labourer without his craftsman and the same thing applies to engineering. If the "first in, first out" principle is applied too rigidly, therefore, the State will bear the responsibility of supporting "the first"-until "the last" resume their civil life.

VE-Day Floodlighting

THE examples of floodlighting which were seen on Tuesday and Wednesday of last week were happy reminders of the days when floodlighting of our national and other buildings was part of our public lighting arrangements, and suggested the thought that more widespread use might be made of this form of illumination when full days of peace return. The floodlighting of buildings in former years has largely been concerned with Government offices, churches and historic monuments, but with so much to

be rebuilt in our cities, we suggest that when the exteriors of our new buildings are considered, some thought should, too, be given to what effect floodlighting might have upon them. The illuminated exteriors of those existing buildings which warrant floodlighting, present a beauty all their own for floodlighting, unlike natural lighting, more generally illuminates from below. The result is that the architects' conception of light and shade is, in the case of old buildings, reversed when lighting is applied from the ground.

A Building Suggestion

THE effects which can be produced by floodlighting are without question beautiful, whether the building be old or new; the effects which have been seen so far, however, are the result of the lighting engineers' skill rather than the outcome of co-operation with the architect; and it occurs to us that when new public buildings are built to take the place of those damaged by the Germans, some thought should be given to the shape and depth of such things as sills so that if floodlighting is applied, the light and shade effects, though altered in character, may still be preserved. The floodlighting of such buildings as Westminster Abbey, the Houses of Parliament, Middlesex Guildhall, Big Ben and so on, produces a picture far more pleasing than does the floodlighting of many of our modern concrete buildings, for in the latter case the absence of light and shade gives the buildings a flatness they do not possess in natural lighting, and is unjust to the work of both architect and engineer.

Aluminium Houses

THE likelihood that aluminium will be used for building purposes was mentioned by Sir STAFFORD CRIPPS, Minister of Aircraft Production, last week, when he announced that the Minister of Works had placed an order for 50 000 temporary aluminium houses. From humble beginnings, the light alloy industry has already extended its operations to the aircraft, engineering and electrical fields, and though, no doubt, its entry into the domain of the builder will be strongly contested, the outcome will be watched with considerable interest. The large-scale consumption of aluminium which acceptance of the idea would entail might have a material effect

upon the electrical industry, both with respect to the metal itself and the consumption of current used in its production, shaping and finishing. The electrical industry is at the moment suffering from a severe shortage of aluminium for the making of domestic appliances, and any large-scale use of the metal in the production of houses might prolong that shortage. On the other hand any attempt to increase the production of aluminium in this country might offer opportunities for additional load in the years to come, when it is hoped the present shortage of generating capacity will have been made good.

Circuit Protection

IN this week's issue is discussed some of the problems involved in circuit protection, and criticism is made of the I.E.E. Regulations insofar as they cover the subject. The author of these remarks has been intentionally controversial for it is felt that the time has now arrived for a wide-spread ventilation of opinion on earth-leakage and similar devices, so that theory may be tempered with experience. The various schools of thought on the subject of circuit protection have, over the course of many years, shown little inclination to reach agreement, but it may be that under the stress of war when technical reserve was required to break down under sheer necessity, there may have grown a better understanding of the limitations governing every point of view. During the war years, there must have been built up a wealth of experience upon which to draw for future guidance, and the suggestion that the whole problem should receive further consideration, may not, after all, be an over statement.

High-frequency Heating

THERE was discussed recently at a meeting organised by Birlec, Ltd., a number of interesting details on the subject of high-frequency heating. The meeting, at which the bulk of the audience comprised electrical and metal industry technicians, was held in Glasgow, and among the speakers was Mr. T. G. TANNER, who referred to a machine which is being increasingly used in the metal industry for heating bars and billets; particularly in the black bolt industry. Questions raised after the address, concentrated on the economic aspect of this

form of heating, when it was generally agreed that it was essentially a mass production tool, in view of the heavy costs involved in capital expenditure. Detailed information on the question of cost of high-frequency heating is still difficult to obtain, although there must be by now some reasonable understanding of the position. As a war-time measure this form of heating has played a most valuable part in assisting our war-production, and though economy may not have been practised to an extent comparable with peace-time standards, sufficient knowledge must have been gained of the costs involved to indicate whether or not high-frequency heating will play an even bigger part in assisting the needs of peace-time production. Not so far, however, has anyone committed himself.

Installation Problems

MANY of the arguments associated with electrical installation technique are as far from settlement as they have ever been, and any form of compromise appears to be unattainable. This every one admits to be unfortunate but none is prepared to give ground. Now that the war in Europe is at an end, the installation trade will, sooner or later, transfer at least some of its attention from war-time wiring to peace-time housing, and though it had been hoped that the trade would by that time have settled its technical differences, the industry is still faced with such a variability of opinion that settlement is only a remote possibility. This is, in many ways, a great pity, for instead of the industry being able to give to the public something which can be put forward as accepted practice, the public is confused by diversity of opinion and disinclined to make decisions until the industry itself has reached some agreement. The Housing Committee of the L.C.C. is reported to have already recommended that a start be made on at least two of the London development schemes, and the time cannot, therefore, be far distant before those responsible for the electrical installation work will be looking for some guidance from the industry with respect to such problems as ring or room mains, fused plugs or sockets, and so on. The decision at all times rests with the local authorities it is true, but even so they appear to be hoping for some lead.

132 kV Compression Cable

Installation at Osbaldwick Now on Load

IN THE ELECTRICIAN of October 20, 1944, was described in detail, the arrangements made by the Enfield Cable Works, Ltd., in co-operation with the Central Electricity

switches; all the l.t. cables for auxiliary circuits are underground.

The sealing bells and rotating post isolators are, it will be seen from Fig. 2, erected on reinforced concrete supports, in the manner described in our issue of October 20 last, while below each sealing bell is the compensator housing a flexible bellows under gas pressure, for automatically maintaining a constant oil-pressure in the bell under all conditions of load and ambient temperature.

It will be remembered that in the cable used for this installation, the dielectric is subjected to a constant mechanical pressure exerted by nitrogen gas contained between the cable lead sheath, encompassing the impregnated paper insulation, and a further lead sheath or alternatively a seamless steel pipe.

The gas is, therefore, not in actual contact with the dielectric; it is not circulating but is in a purely static condition and no voids or low-pressure spaces can, it is claimed, exist in the dielectric, resulting in the ab-

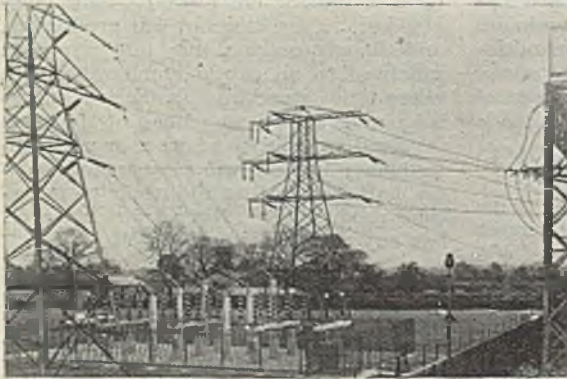


Fig. 1.—General view of the Osbaldwick installation

Board, for a long time test of their 0.4 sq. in. single core 132 kV compression cable in a situation where it will carry a rapidly fluctuating load, and where it will be subjected to such lightning and switch surges as would be experienced by a commercial line.

It may now be stated that the installation, which was planned for experience, is at Osbaldwick, near York, and was put on load last month.

At the invitation of the Enfield Cable Works Ltd., we visited the site last week and saw in completed form the earlier work examined last October. The installation is the same in all details as previously described, and its further interest therefore is found in the manner in which the work is completed. This for obvious reasons, lends itself better to pictorial rather than word description and the illustrations reproduced give a good indication of how the installation has changed in appearance since our visit in October last.

The picture Fig. 1, showing the general view of the site was taken on March 23, when the pressure test was made. In it may be seen the incoming 132 kV lines, and the compression cable terminations and

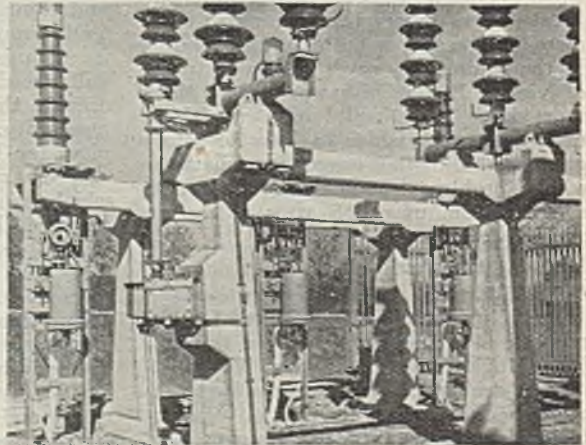


Fig. 2.—Sealing bells and rotating post isolators. The compensators for maintaining the oil pressure may also be seen

sence of ionisation under all conditions of load.

The Enfield Cable Works Ltd., have already established a reputation for their work with this type of cable and the in-

stallation at Osbaldwick will be watched with interest by a wide circle of engineers concerned with power transmission problems. Many have already seen the instal-

lation, and all have so far been impressed by the opportunities which the development of the cable presents in the future scheme of things.

Earth Leakage Protection

By "SUPERVISOR"

CONTINUING an examination of pre-war problems requiring attention for the now post-war era, it will be remembered that the date of publication of the 11th Edition of the I.E.E. Regulations for the Electrical Equipment of Buildings—June, 1939, with amendment February, 1940—was such that little attention, if any, could be devoted to it from the critical aspect, and one or two outstanding matters have gone by default up to the present time. Now that the whole question of regulations is likely to go into the melting pot, with at least some revision of the 11th Edition, one of these matters might receive attention here, with a view to consideration later.

Leaving aside the wider question as to whether the whole of Section 10 requires redrafting, Regulation 1006 certainly does. It will be remembered that this latter purports to regulate the use of voltage-operated earth leakage circuit breakers, called in the regulation "earth leakage protection." In addition, some references to current-operated circuit breakers are made in this regulation, with the result that the compilers appear to have become thoroughly confused between the two differing sets of conditions, and the proper way to apply protection by their means. The result is a regulation that should never have been included in any set of rules, as it is misleading, uninformed, and in places inaccurate.

An Educational Shortcoming

The theory and practice of circuit protection is apparently not taught to any extent at our technical universities and colleges. Thus a good many engineers, although thoroughly conversant with the intricacies of Ohm's Law seem quite unable to apply it to circuit protection. Let us examine the requirements of this regulation, bearing in mind that we are dealing with a voltage-operated device, responsive, according to B.S.S. 842, to a voltage of 24 V against an electrode resistance of 200 ohms, and not more than 40 V against an electrode resistance of 500 ohms. Curiously enough, Reg. 1006 does not mention this B.S.S.; it appears only in Section 13, a mere mention with no amplification, but it might be stated here that against negligible earth electrode resistance the device will operate on 10-12 V.

The note to Reg. 1006 lays down the fol-

lowing; "Attention is drawn to the possibility of the tripping solenoid being short-circuited owing to contact (either intentional or fortuitous) of metalwork of the electrical equipment with extraneous metal (e.g., steel structures, gas pipes or water pipes). For compliance with Reg. 1006, any kind of short-circuiting of the tripping solenoid to such an extent as would render it inoperative must be avoided"—and goes on to say that where this fortuitous contact is feared connection should be made to a separate earth electrode remote from any others.

Multiple Contacts with Earth

Now surely the normal condition in any installation employing metal conduits or lead-sheathed cables, plus metal-clad equipment is that many fortuitous, and intentional, contacts with other earth connected metal exist, and must exist. The mere compliance with Reg. 1002, special precautions in rooms containing fixed baths, ensures that contact is intentionally made with water pipes and other metal, and even with gas pipes if a gas geyser is installed. In any steel structure contact between conduits and steel must be numerous, but the point at issue is—does this constitute a short-circuiting of the tripping solenoid, or will it render the circuit breaker inoperative? The answer must be that if a voltmeter is rendered inoperative by means of a resistance connected across its terminals, instead of recording the voltage drop across this resistance—yes. We know, however, that provided it is of suitable range, the voltmeter will not be rendered inoperative.

In any case, the remedy suggested in the note, a separate earth electrode, is so important that it should be made the subject of a special regulation. It has always been known by those who have studied the voltage-operated device that a separate earth electrode is imperative, under all conditions of installation, for its proper operation, but the regulations apparently visualise its connection to the generally-recognised good electrode, the water pipe or the cable sheath. Granted, the fact that there must always be contacts between electrical metal and non-electrical conducting media, then a separate electrode for the voltage-operated device is essential, and should be given proper weight in the regulation. Earth leakage circuit breakers

should never be connected to conventional electrodes, but provided with a small driven electrode of their own.

This is not to say that a voltage-operated device connected to a water pipe will not function, even with fortuitous earth contacts on the conduit, but the amount of current which will have to flow over the fortuitous contact in order to produce the requisite operating voltage between the conduit and the water pipe may prove excessive, and the fuse blow before the voltage operated device functions. It is certain that a voltmeter, connected in place of the voltage-operated device, will record some potential difference, but after all, the conduit is already in contact with the water pipe; as a modern Euclid might say, things which are electrically connected to the same thing are connected to one another. Even so, it will be ensured that the circuit will be isolated without rise of voltage on the conduits, as if the operation of the fuse under excess current be delayed, then the requisite potential for the operation of the trip will appear.

A Debatable Point

In view of the foregoing, a prior sentence in the note is rather incomprehensible. This says: "The solenoid of the circuit breaker may be connected in series with the earth continuity conductor, and, as an alternative method, direct earthing may, if desired, be provided in addition." Surely, this is short-circuiting the tripping solenoid with a vengeance, and if the compilers of the regulation visualise the operation of the trip under these conditions, why fear that it may be stultified with fortuitous contacts between the conduits and other earthed metal?

It is clear that there is some idea in the compilers' minds that the device is going to operate with a rise in voltage, but they cannot entirely divest themselves of conditions associated with current-operated trips, which might be affected by leakage currents being shunted all over the place through fortuitous contacts, and the result is confusion. This view is borne out by the fact that the original 10th Edition, and its later amendments, continually referred to the voltage-operated device as a circuit breaker "operating with a current not exceeding 30 milliamperes," whereas, of course, it did not matter one iota if the tripping solenoid required 30mA or 300 mA, provided the voltage was controlled.

Further confusion of thought between current and voltage-operated leakage devices is apparent in the Report by the Committee on Multiple Earthing of the Neutral Conductor, presented to the Council of the I.E.E., and published in the Journal for July, 1942. This speaks of "protective devices responsive to very small leakage

currents" and proceeds to argue the matter from the current operation angle. One quotation will suffice: "Fault conditions giving rise to a voltage above earth (on the framework of apparatus) of less than 40 volts might result in a leakage current from the apparatus to earth through a fortuitous contact (i.e., in parallel with the circuit through the relay coil) of considerably greater magnitude than the current in the relay circuit, and sufficient to produce danger from fire"

It is difficult to imagine a fortuitous contact producing a fire without considerable voltage rise on the connected equipment, and it is pointed out that the voltage of 40 is only necessary against an electrode resistance of 500 ohms; with any lower electrode resistance the voltage is correspondingly reduced, and it is reasonable to assume that if the electrode resistance is 500 ohms then any fortuitous contact in the same area will be of very much greater resistance to earth. As pointed out above, however, it is necessary to get away from all ideas associated with current flow in connection with the voltage-operated device, and to consider that it is affected by voltage rise alone.

The whole matter requires careful consideration, however, with the production of regulations based upon experience, divested of some of the delightful theories advanced in committee. This point will be further dealt with in my notes next month.

In Parliament

The following is a reply to a recent question in the House of Commons.

Electricity Supplies (Norfolk).—Mr. De Chair asked the Minister of Fuel and Power whether he was aware that 46 villages in the South-West Norfolk Parliamentary Division were without an electricity supply at present and that only 37 of these were provided for in the post-war development schemes of the East Anglian Electric Supply Co.; and would he institute an immediate inquiry into the position of electricity supplies in this area with a view to supplying these villages with electricity in the shortest possible time. In reply, Major Lloyd George said it had been necessary during the war to restrict electricity development because of the shortages of manpower and material. Such restrictions could not yet be relaxed. The post-war development schemes of the East Anglian Electric Supply Co. would result in supplies being available in 85 of 94 villages and hamlets in the area referred to. Limited supplies were already being given in most of the remaining nine places. In view of these facts he did not consider it necessary to institute any inquiry.

Export Market Opportunities

Further Review of S. American and European Conditions

THE Department of Overseas Trade has published further reports in the series of reviews of commercial conditions in 26 countries. They deal with Argentina, Portugal, Sweden and Uruguay.

The spirit of political and economic nationalism has been growing in Argentina. In the economic field, states the report, this is evidenced by the desire to attain a far greater degree of self-sufficiency than has existed in the past.

The trade returns for the five years immediately preceding the outbreak of war indicate that Argentine importers looked upon the U.K. as a primary source of supply and that in many lines of business the U.K. exporter was still well able to meet foreign competition.

Local Production Capacity

In 1937 and 1938 the value of electrical goods and apparatus imported by Argentina from the U.K. was £545 000 each year. During the war the scarcity of fuel has led to the extended use of electricity for heat and power and a considerably increased demand for electrical equipment; this has resulted in a noteworthy expansion of local productive capacity. With the exception of some apparatus and materials of special use and fine manufacture, almost everything in current use is being manufactured in the country in appreciable quantities. A limiting factor which has affected the production notably of motors, transformers, alternators and switchgear has been the difficulty of obtaining electric steel sheets.

Motors of about 200-250 H.P. and up to 1 000 V are manufactured. These are a.c. three-phase motors, of the asynchronous type, with short-circuited rotor, for sizes up to 10 H.P., and with starting resistances in the larger sizes. These motors are of the open or enclosed types. D.c. machines of limited sizes for motor-generator equipments and for battery chargers are also being built, though not on a large scale. The production of auxiliary equipment such as starters, including automatic resistances and controllers, has commenced. Transformers up to 500 kVA for voltages up to 15 kV are also being built, and it is reported that transformers up to 1 500 kVA could be built in certain factories. Representative of types of machines that cannot yet be produced are alternators, converters and mercury vapour rectifiers.

Among articles in the category of switch-board accessories which are now made locally are certain types of l.t. knife switches, automatic switches, steel switchboards for l.t. oil immersed current and potential transformers for voltages up to 10 kV, small condensers, a.c. motors (from semi-manufactured parts), relays and switchboard accessories. Voltmeters and ampère meters are made on a small scale. Watt-meters, frequency indicators and d.c. meters are not yet produced in the country.

Before 1939 the only types of insulated cable made in Argentina were flexible cord and insulated cable up to 5 m.m. in section. Since then the production of a number of new lines has begun, e.g., lead covered wires for surface installations indoors are now made in appreciable quantities. Qualities of armoured underground cables for pressure up to 16 kV are now made and it is expected that this limit will shortly be raised to 30 kV. Certain highly specialised products, however, cannot yet be produced locally, notably copper wire of very narrow diameter (under 18 m.m.).

Among other local products for industrial, commercial or domestic use are electric furnaces of the resistance type, arc and spot welding machines, cookers up to 400 kW, other domestic heating appliances, refrigerators, electric fans, irons and radiators, and incandescent and fluorescent lamps.

Electrical Imports

The local radio industry devotes itself almost entirely to the work of assembly, most radio components being imported. Such industry may be expected to expand rapidly after the war.

Electric automatic signalling equipment is not made locally and it is improbable that it will be in the near future. Electric generating sets are being made locally; it is not likely, however, that the manufacture locally of large sets, whether Diesel-driven or turbine-driven, would be an economic proposition for some time to come. Telegraphic instruments must still be imported, but telephone receivers and many of the parts for automatic switchboards are already being manufactured in Argentina and plant is being erected which will shortly produce all kinds of telephone equipment including complete automatic switchboards.

In Portugal, owing to reasonable geographical proximity and to close com-

mercial ties, the United Kingdom starts with definite advantages provided she can offer merchandise on reasonably good delivery terms and at competitive prices. Among the main shortages in consumer goods are insulated wires and cables.

Portugal's potential supply of hydro-electric power is considerable. A few years before the war a Government commission was appointed to study the possibilities of developing it. At the end of 1942, there were 657 power stations in operation with a total capacity of 282 574 kW; 109 of those stations with a capacity of 86 249 kW were hydro-electric. The total output in the year was 465 230 706 kWh. Schemes for further development are under consideration.

U.K. Supplies to Portugal

The value of electrical machinery and apparatus imported into Portugal was £520 000 in 1939, £402 000 in 1940, £570 000 in 1941 and £596 000 in 1942, of which the United Kingdom supplied goods to the value of £61 000 in 1939, £116 000 in 1940, £145 000 in 1941, and £117 000 in 1942. In the same four years the U.S.A. supplied electrical machinery and apparatus to the value of £59 000, £94 000, £213 000 and £48 000, while the imports from Germany were £131 000, £32 000, £101 000 and £224 000.

It is the policy of the Government of Sweden, says the report on that country, to press forward with the development of hydro-electric power in order to reduce Sweden's dependence upon imported fuel. Sweden to-day is the third largest consumer, per head, of electrical current: output exceeds 2 million kW. The Swedish Board of Waterfalls, a State-owned enterprise, produces and sells a large part of the output and co-ordinates the whole of the electric power supply of the country. About one half of the State-owned railways and a considerable proportion of the privately owned railways are electrified. It is contemplated that the State should own all the railways and a wide extension of their electrification has been planned.

As a result of this development of power Sweden possesses first-class hydro-electrical experts and a flourishing electrical engineering industry which competes strongly in foreign markets. The authorities are active in encouraging the use of electric power which has led to a considerable expansion of general industrial activity, with the result that Sweden is becoming increasingly self-supporting, both in machinery and in the consumer goods industries.

In 1939 Sweden imported electrical machinery, apparatus and material to the value of £5 020 000, imports from the U.K. amounting to £219 000, U.S.A. £650 000,

Germany £2 997 000, Holland £564 000, and Switzerland £110 000.

The United Kingdom's trade relationship with Uruguay, the smallest of the South American republics, has a long and happy tradition behind it and an excellent understanding exists between the commercial communities of both countries. In 1937, 1938 and 1939 the U.K. was the principal source of Uruguay's supplies, with the U.S.A. and Germany in close competition.

For the four years 1936-39 the U.K. supplied electrical goods and apparatus to the value of £12 000, £11 000, £21 000 and £15 000, respectively.

The development of hydro-electric power on the Rio Negro is a scheme which Uruguay has had in mind for many years. Considerable preliminary constructional work had been done by German engineers on the site before war broke out: the war interrupted progress. Whilst it is improbable that the U.S.A. firm to which the contract has been transferred will be able to complete the plant for some time, some electric power is expected to be generated late in this year. The power developed here and transmitted over several hundred miles to the Montevideo and other areas, should provide an abundant supply of cheaper power than is now available and will provide the basis for a considerable expansion of industrialisation.

Among imported lines for which future prospects appear good are industrial electrical equipment and domestic appliances.

[Extracts from previous reviews appeared in THE ELECTRICIAN on March 23 and May 11.]

X-RAY ANALYSIS IN INDUSTRY

The X-ray Analysis Group of the Institute of Physics held its 1945 conference in London recently, the opener being Professor Sir Lawrence Bragg, F.R.S., chairman of the group. Thursday morning was devoted to short contributions on new and improved methods, and in the afternoon there was a symposium on the equipment of X-ray laboratories, at which papers were read by Dr. R. F. Hanstock, of High Duty Alloys, Ltd.; Mr. H. S. Peiser, of Imperial Chemical Industries; and Dr. W. A. Wooster, of the Department of Mineralogy and Petrology at Cambridge University. In the evening Professor J. D. Bernal, F.R.S., gave a talk on the future of X-ray analysis. Friday was devoted to a discussion on the application of optical principles to the interpretation of X-ray diffraction photographs, among those taking part being Professor Sir Lawrence Bragg, Dr. H. Lipson, Mr. G. B. Hey and Professor J. M. Robertson.

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

As announced in our last issue, **Sir James S. Pringle**, whose portrait is reproduced on this page, is to act in an advisory capacity for the Metropolitan-Vickers Electrical Co., Ltd. He was Director of Electrical Engineering for the Admiralty.



Sir James S. Pringle

Mr. R. S. A. Thwaites, chief electrical engineer and manager, Liverpool electric supply department, has been appointed by the C.E.B. to the National Consultation Committee.

Bradford Electricity Committee has expressed appreciation of the services of **Mr. F. H. Barnett**, consumers' superintendent, who is retiring after 41 years' service.

Mr. William L. Marshall, formerly manager of the English Electric Company's Preston works, who was appointed on the Labour Supply Committee in 1940, and as technical adviser to the Man-Power Board, has been made a member of the Preston Bench.

Mr. C. M. Cock, whose appointment as chief electrical engineer of the Southern



Mr. C. M. Cock

Railway Co., was announced in our issue of May 4, was born in Melbourne, Australia, and received his engineering training in that country. After serving in the Navy in the last war he joined the staff of Messrs. Merz and McLellan, consulting engineers, and took part in railway electrification schemes in Australia and India, later becoming the G.I.P. divisional

superintendent for the area including Bombay.

Dr. Eric Balliol Moullin has been elected to fill the newly established Professorship of Electrical Engineering at Cambridge from October 1.

Councillor John Atkinson, who is employed by the North-Eastern Electric Supply Co., Ltd., has been elected chairman of Darlington Rural District Council.

The staffs of the Glasgow office and Edinburgh and Dundee depôts of the B.T.H. Company met to do honour to **Mr. R. McAllister** on his retirement after 45 years' service. Mr. Miller (manager of Glasgow office) handed to Mr. McAllister a cheque as a slight indication of the esteem of the friends gathered together, and a drawing by Mr. A. Edward, of the Glasgow stores department, with the signatures of the members of the staffs at Glasgow, Edinburgh and Dundee.



Mr. R. McAllister

The Aluminium Development Association has appointed its first council as follows:—Messrs. **The Hon. Geoffrey Cunliffe** (president), **Horace W. Clarke** (vice-president), **D. Cannon Brookes**, **W. C. Devereux**, **H. E. Jackson**, **E. Player**, **Austyn Reynolds**, and **G. A. Woodruffe**.

In the accompanying picture **Mr. Arthur Willis** is seen with the long service testimonial presented to him at the English Electric Company's Stafford works on his retirement after 48 years' service. As was



Presentation of long service testimonial to Mr. Arthur Willis at the English Electric Co.'s Stafford works

mentioned in our last issue, the presentation was made by **Mr. J. W. C. Milligan**, manager of the works.

Mr. P. H. Coales retired from the Witton works of the General Electric Co., Ltd., on April 30, after 37 years' service. He had held the post of chief draughtsman of the switchgear department since 1911. He is succeeded by **Mr. S. R. Spruce**, who has been with the G.E.C. for 35 years, during 15 of which he was Mr. Coales' chief assistant.



Mr. P. H. Coales

The G.E.C. Well Wishers Club at Magnet House, Kingsway, —formed early in the war to maintain contact with men and women drafted into the Forces, and provide them with parcels of comforts—in April sent out the 30 000th parcel. It was an extra large one and the recipient was decided by ballot.

No fewer than 101 employees of W. T. Henley's Telegraph Works Co., Ltd., received long service certificates for twenty years' service at a recent gathering at the company's Gravesend works. Mr. E. E. Judge, works manager, presided, and the



Mr. Leslie Gamage, vice-chairman of the G.E.C. and president of the Well-Wishers Club packs the 30 000th parcel

presentations were made by Sir Montague Hughman, chairman of the company. Dr. P. Dunsheath, the chief engineer, mentioned that 1500 certificates had been awarded. Mr. Richard Charles Fox received a gift of war savings certificates and a framed copy of a resolution of the board in appreciation of fifty years' service. Personal gifts from Sir Montague and Lady Hughman to Mrs. Fox were also presented.

Sir Donald Fergusson, Permanent Secretary, Ministry of Agriculture and Fisheries, has been appointed Permanent Secretary,



Mr. R. C. Fox, on completion of 50 years' service, receives a testimonial from **Sir Montague Hughman** at W. T. Henley's works

Ministry of Fuel and Power, in succession to **Sir Frank Tribe**, who is to be Permanent Secretary, Ministry of Aircraft Production.

Obituary

Mr. Norman Shaw, vice-chairman of Dictograph Telephones, Ltd.

Mr. Arthur Dickinson, superintendent of Agecroft power station, on May 1.

Sir William G. Max-Muller, chairman of the Bagdad Light and Power Co., Ltd., aged 77 years.

Mr. Joseph Hepworth, M.P., chairman of the Bradford Piston Ring Co., and formerly managing director of Hepworth and Grandage, Ltd.

Mr. A. V. M. D'Arcy, aged 71 years. Before his retirement in June, 1943, he had been in the service of the British Thomson-Houston Co., Ltd., for forty-eight years. He joined the company in 1895 as a tester in the meter department, Westminster. In 1902 he was transferred to their Rugby works, and put in charge of standardising work and the experimental laboratory. When the meter department was moved to the B.T.H. Willesden works in 1916, Mr. D'Arcy went there as its head. He returned to Rugby in 1931 to take charge of the instruments and meters in the research laboratory, and retained this position until he retired.



Mr. A. V. M. D'Arcy

Instrument Bearings

A Survey of Research on Behalf of the E.R.A.

THE subject of discussion at the meeting of the I.E.E. Measurements Section on May 4 was a paper by Mr. G. F. Shotton on "Meter and Instrument Jewels and Pivots."

With a view to obtaining a more fundamental knowledge of the phenomena relating to meter and instrument bearings and to improve such bearings, research has been carried out for a number of years on behalf of the Electrical Research Association at the meter testing laboratories of the Northmet Power Company. The paper gave a brief survey of the various aspects covered by this research, dealing mainly with the sapphire/steel combination, both dry and lubricated, but also included other combinations of materials.

The apparatus and methods of test were outlined, followed by a survey of the results from life tests, including an analysis of the various factors which contribute to wear. The results of a microscopical examination of the units at the end of their life run were discussed. A brief theory of the boundary lubrication existing in such bearings was given, with a short extract of the detailed discussion of the various factors disclosed in E.R.A. Reports T/T31 and T/T39.

Mathematical formulæ developed during the research had been simplified into nomograms.

The results of experiments on the resistance of sapphire jewels to impact forces were given. The phenomena associated with bottom bearings at various loads, caused by parasitic forces existing in meters, were also dealt with.

The actions of the ball-type bearing and that of the pivot bearing were compared, and an approximate estimation of the life of bearings in practice, based on life tests, was made.

Mr. E. Fawssett (North Eastern Electric Supply Co.) said the paper was a condensed account of a very fine example of a carefully planned research in which, as far as possible, interfering variables had been eliminated. There was no mention in the paper nor in the E.R.A. report on which it was based, of the speed at which the tests were made, but an earlier report in 1937 referred to a speed of 280 r.p.m. This seemed to have been the ruling speed throughout and no doubt was adopted to save time. This, however, was very different from the average actual meter speed, and it was felt it was no criterion of what would happen in an ordinary meter, the speed of which varied from 0 to 60 r.p.m. There was justification for the author's

conclusion that ball bearings "if in perfect order to start with" should last very much longer than the pivot type "in present designs." The paper clearly indicated it was not wise to over-run a meter of the present conventional design, or contemplate a considerably larger full load torque on such a meter, though it must be remembered that the number of hours in a year during which the meter was operating at high loads was usually very small. Much more serious, probably, was the statement—which ought to have been in italics or capitals—that "a normal meter has no-load wear equivalent to 157 million revolutions per annum." If the author could combine the effect of this with the load tracking, and apply it to a typical meter load programme over the year, we should get an extremely interesting answer, not too comforting to the meter engineer, and likely to reduce the term usually thought satisfactory for a meter to remain out on service. Oils other than those mentioned in the paper, had been developed with similar properties of dispersion, stability, etc., and with a flatter viscosity curve, and he had heard it said that these gave better results in a cold climate.

Dr. D. Clayton, representing the Institution of Mechanical Engineers, and the Government expert on lubrication, dealt mainly with this aspect and said the differences between oils could be very great according to the part of the friction/velocity curve on which they fell. He asked how much work had been done in selecting Pennsylvania No. 2 oil and wondered whether oils from other sources would not be equally satisfactory. He did not think this particular job called for anything special in the way of the source of the lubricant. Also, the author was a little too strong in his statement that medicinal paraffin was practically devoid of lubricating value, as evidence existed that for clean steel surfaces the friction could be reduced one-third by the use of such an oil. He was surprised at the statement that Pennsylvania oil was the only one to maintain a film and some justification for this should be provided.

Mr. L. J. Matthews (Electrical Apparatus Co., Ltd.) said he would like to know to what extent the tests approximated to service conditions, and whether the same results could be expected under service conditions. Even under controlled test conditions there was very considerable variation in performance in units which, so far as could be seen, were identical, and under service conditions the variation was

likely to be wider still. After discussing the relative merits of the jewel bearing and the ball bearing and suggesting that before final comparisons could be made it was necessary to test the two types under precisely similar conditions, Mr. Matthews said it was obvious from these researches that in order to obtain the results set out in the paper it was necessary to use the very best sapphire obtainable in respect of optic axis and particularly in respect of the operating surface.

Mr. P. Grozinski (Diamond Research Department) said it was not clear whether other jewels than sapphire had been experimented with, for instance, diamond. If there had been such tests, it would be interesting to know the results, and, in particular, the effect of orientation. Whilst it was suggested in the paper that the sapphire was "softer" in the direction of the optic axis and "harder" at right angles to it, this was the opposite to findings by other workers in this field. The paper dealt only with plate and v-type jewels, but data on the wear and performance of ring-type jewels as applied to watches and instruments would also be interesting.

Mr. L. B. S. Golds (Edmundsons Electricity Corporation) said that the paper indicated how unwise it would be to attempt to standardise meter design at the present stage of development, and it was also important not to jump to conclusions as the result of the work dealt with in the paper. Therefore, he hoped that Mr. Shotter would continue his work on the fundamental analysis of other parts of the meter, such as the top bearing. Having had some 18 years' experience with the ball bearing, he had found that this gave as good results as, if not slightly better, than the pivot bearing.

Dr. N. L. Anfilogoff (Texas Oil Co., Ltd.) said that since this work was started a great number of changes had taken place in the refining of oils and it did not follow now that Pennsylvania No. 2 oil, as used in these experiments, would give the best results. Moreover, there was no reason to think that a less, or more, viscous oil would give better lubrication.

Mr. H. Cobden Turner (Salford Electrical Instruments, Ltd.) expressed the view that the instrument bearing was a much greater problem than the meter bearing, but nothing had been said about the former in the paper. The point was that meters came in for recalibration after so many years' service and it was easy to put a new jewel in, but the instrument was not so well placed in that respect and might go throughout its life with the bearing it started with. He thought the diamond would be better than the sapphire be-

cause it was the hardest jewel known, and he expressed the hope that Mr. Shotter, with all the resources of the Northmet Co. behind him, and also with the help of the instrument makers, would try to provide better bearings.

Mr. G. E. Moore (Sunderland electricity supply department) referred to the use of springs with jewels, and asked if there was any intention of investigating whether jewels should be sprung or not. He also suggested that the jewel should be cemented into the mount, as otherwise a certain amount of oil was bound to seep away in the interstices between the mount and the jewel. Again, would the author recommend that the jewel should be more deeply sunk into the mount so that a fair amount of oil could be put into the well and if a meter was laid on its side a certain amount of oil would always be retained on the inside walls of the well? Finally, he asked if consideration had been given to the importance of always carrying meters upright when being taken from the testing station for fixing on site? That, would prevent the loss of oil.

Mr. L. C. Maskell (Silvertown Lubricants Ltd.) said that whilst he had been responsible, with others, for developing the oil used by Mr. Shotter, there appeared no reason why other oils should not be equally satisfactory.

Mr. Shotter, in reply, said a speed of test at 200 r.p.m. was adopted because if any lower had been decided upon, it would have taken too long for the tests to be completed. He did not expect to live until he was 150! The effects of the viscosity of oil was an old argument, but the oil used was adopted having regard to the conditions under which the research was carried out, and he thought the results showed there was a decreased coefficient of friction with the oil that was used. It was not suggested that the sapphire was "softer" than the diamond in the direction of the optic axis, and Mr. Grozinski had misread the paper in that respect. He had never claimed there was no oil in existence as good as Pennsylvania No. 2, but it was necessary to start somewhere. The problem was put up to the oil people and that was the oil they provided. He did not agree that the instrument was a more difficult problem than the meter from the point of view of bearings, and certainly had never seen an instrument which went through its life with the same jewel. He agreed that the spring would help the jewel, but some makers, when they put in a spring, used one strong enough to hang the meter on. The real solution of keeping the oil in the bearing and preventing damage during transport was to lift the disc off the jewel.

Excess-Current Protection

H.R.C. Fuses and Relays for Medium Voltage Circuits

TWO papers on excess-current protection—one by Mr. R. T. Lythall, dealing with the use of h.r.c. fuses on medium-voltage circuits, and the other by Messrs. A. G. Shreeve and P. J. Shipton, reviewing the application of over-current relays—were read before a meeting of the I.E.E. Installations Section on May 3.

The first paper reviewed the problems of excess and fault current protection in so far as they might be solved by the use of h.r.c. fuses, or by developments based on these fuses. Following a brief commentary on two types of fuse (non-tripping and tripping) and on the fault-clearance ability of the cartridge fuse, consideration was given to the various forms of protection afforded. A survey was made of future possibilities, with special reference to a scheme for open-circuit protection, a new time-limit fuse with an accuracy equal to the h.r.c. cartridge fuse which might supersede the overload coil with a fuse in shunt, and a solution of the earth-fault protective problem. Consideration was also given to the selection of fuses for different duties, to the economics of fused switchgear, and to the need for fuse designers to attempt a greater measure of standardisation.

The second paper reviewed existing methods of protection from excess load current in medium-voltage circuits, and outlined problems encountered with the wide variation of industrial applications. The need was stressed for full co-operation between engineers, and also between engineers and the user, in the control-gear, motor and distribution fields. B.S. specifications dealing with excess current were considered, suggestions were made to correlate them, and a review was made of the main factors which determine the protection required. Motor starting loads, starting times, and various duty cycles, were mentioned, coupled with faults which could be caused by the inherent characteristics of some electrical equipment. Existing basic designs of overload relays, and some of the difficulties experienced with them, were dealt with. The effect of temperature variation on thermal and oil devices was outlined; also excess current due to lost-phase faults, with suggestions for the type of protection required to meet various circuit conditions. General design points were reviewed in the light of past experience and recent developments. The relation of equipment to both excess load-current capacity and short-circuit rupturing capacity was considered; also the correlation of fuses and overload relay design

with the thermal rating of electrical gear in the protected circuit.

Mr. H. W. Swann emphasised the statement in the second paper that "The problem of providing excess current protection in medium voltage circuits can be solved by co-operation between user and manufacturer of electrical equipment," and added that a great deal more should be done to facilitate that co-operation. The earth fault striker described by Mr. Lythall was a welcome innovation. The fact that the earth fault striker carried with it the additional advantage of being a protection against single phasing on local circuits, was all to the good, because single phasing led to burn-outs which resulted in fires. He asked why we had not kept track of leakage currents which definitely occurred when a single-phase earth fault developed, and mentioned cases of fires occurring in this connection. Referring to Mr. Lythall's comments on the dangers of haphazard selection, he said he wondered how many of them had been taught at school or technical college the fundamental principles of circuit protection against excess current earth leakage. There was room for that kind of thing in the curricula of technical colleges. Undoubtedly the theme of both papers was the need for studying and tackling this problem from a strictly technical angle and he emphasised what an unbridged gap there was between engineers and a considerable section of people who used these products. He was thinking of the small one-man contractor and the single-handed electrician in the works who was sometimes just a "handy" man.

Mr. H. E. Cox (B.T.H. Co., Ltd.) remarked that although the h.r.c. fuse had already carved a place for itself, it suffered from certain disadvantages, although the paper went far to suggest that most of these disadvantages had been removed. Nevertheless, it was necessary to make a critical examination and try to determine the scope of these fuses. The question was whether these new devices became a member of an already existing family, with complementary functions, i.e., did they increase the usefulness of an already existing family, or did they displace existing members because they could do the job better and more economically? As to the second paper, there was a large number of difficulties and the authors themselves gave the clue when they pointed out that there was no existing overload device in general use whose characteristics matched the thermal characteristics of the motors which

were being protected. If they did match there would be no difficulty because a relay which would match could be selected. It was possible to obtain the average characteristic for types of motors and make relays to match that average and he hoped eventually it would be possible to solve this problem along those lines.

Mr. L. H. Welch (Central London Electricity, Ltd.) spoke of the difficulty of identifying the capacity of fuses by different makers, and suggested that each manufacturer should have a distinctive number or letter so that the user would know what it meant. Commenting on the use of h.r.c. fuses to back up a circuit-breaker, he said that if the job was best done by a circuit-breaker, then a circuit-breaker should be employed and not a hybrid affair of a fuse and a circuit-breaker. He appreciated that economically at present that was not possible, but he hoped that switchgear designers would be able to give the correct article for the job. He favoured earth fault indicators, but was against earth fault trips.

Mr. J. W. Gibson (General Electric Co., Ltd.) asked for the views of all the authors on the question of single phasing, and added that the solution put forward by Messrs. Shreeve and Shipton was much less complicated than that of Mr. Lythall. On the question of selection, he agreed that design conditions should be brought into consideration, and said that too often the designer heard nothing more about his design except when there was trouble. For slip-ring motors he suggested that a larger fuse than was recommended by Mr. Lythall should be put in, but a 60 A fuse for a 1.5 h.p. motor, as indicated in one of the illustrations, was too large. He did not think the 6 per cent. tolerance recommended by Mr. Lythall on fuses in service was high enough, and suggested that the correct figure was somewhere between that and the 33 per cent. given in the other paper.

Mr. S. J. R. Allwood (L.M.S.), said there could be no disagreement on the principle of using h.r.c. fuses for fault protection of equipment and leaving the overload protection to the switchgear, but there was necessity for a satisfactory overload relax. The majority of machine tools were now driven by a.c. squirrel cage motors (self-contained with the machine), and it was necessary to provide a time delay in order to cope with the starting current. From graphs in the first paper it was seen that the sizes of the fuses to allow for starting the current depended on the rate at which the switch operated, but the problem which confronted the user was to know what was the speed of operation of his switch, so that he could instal the lowest value of fuse rating to make up a satisfactory com-

ination. The satisfactory operation of the combination depended on the uniformity of fuse performance under the conditions of load and fault current which might be imposed, and more particularly that the fuse should maintain its rated fusing and clearing time under these conditions. There were various factors which affected this, such as fuse temperature, the nature of the load and the quenching powder with which the fuse was filled. This latter was most important for he recently had a case in which a fuse, filled with the wrong grain of powder, performed in a most unsatisfactory manner. The physical dimensions of the fuse and its associated mountings should receive careful consideration, as on several occasions he had experienced severe flashovers between the caps of the fuses on their attempting to clear inductive loads on 440 V a.c. circuits and 600 V d.c. circuits. This could have disastrous effects if other circuit fuses were in close proximity. Further, the contact area of the connecting tabs and their clamping and mounting arrangements should be given close attention to prevent heating and thereby reducing the carrying capacity of the fuses; this was most important in the higher capacity fuse.

Mr. J. Collins (English Electric Co., Ltd.) said the popularity of the standard h.r.c. fuse was the simplicity of the equipment with which it was used, but he wondered whether the advantages claimed for equipment incorporating the tripping type of contacts would make up for the very considerable elaboration of switchgear necessary, if the advantages of the tripping fuse were to be fully utilised. The whole question of motor protection was tied up with the heating caused by the excess current, and it would be better to use this heating to operate some sort of relay rather than use the current itself. In other words, he was pleading for co-operation between the control gear manufacturer and the motor manufacturer, for the incorporation of a thermal type of relay in the motor windings on the lines suggested by the authors of the second paper. Then it would be possible to use a simple type of switch fuse and a simple type of fuse board; these were the lines on which development should take place.

Mr. H. W. M. Parker (Brookhirst Switchgear, Ltd.) said the fuse had many advantages which were not always appreciated and the circuit-breaker could be used in a different field in many cases. The h.r.c. fuse could protect cables against sudden shocks and had a considerable advantage over the circuit-breaker. With regard to single phasing, there were cases where it was dangerous, particularly on fans. In boiler house equipment single

phasing protection was particularly necessary.

Mr. J. R. Taylor also stressed the importance of co-operation between the manufacturer and user, especially in the enquiry stage. The control gear maker should be told what the motor was going to drive because the starter was there more for starting the machine than starting the motor.

Mr. F. C. Fuke said Mr. Lythall rather implied that there was strict interchangeability between fuses, and asked if that were so.

Mr. N. N. Humphreys called attention to the fact that no mention was made in Mr. Lythall's paper to the ambient temperature in which the fuses were installed. A fuse might be installed in a cold place or in a boiler house and it was advisable to ask the fuse maker what effect this would have on the fusing curve. With regard to the second paper, it was about time that somebody spoke up in public and exposed the inconsistencies of the British standard specifications. A starter maker had the motor specification brought up against him, and the motor maker had the starter specification brought up against him. The motor specification had nothing to do with the time constant of the motor. Starter makers would be glad of any guidance which the motor manu-

facturers could give as to what shape of curve would suit the majority.

Mr. J. Solomon said that in regard to earth fault protection it was necessary to educate users as to the limits of the cartridge fuse in relation to earth faults.

Mr. R. Shinnie said he did not quite understand Mr. Lythall's definition of earth faults and asked for a clearer one.

Mr. Lythall, in a brief reply, said he believed that the correct answer to correct fuse selection—or the biggest part of the answer—lay in the user giving the manufacturer much more information than usual about the circuit on which the apparatus was to be used. Then there was the point as to whether these new developments were part of an existing family or did they form a new family? The new fuses fell into the category of a new family.

Mr. Shreeve, in his reply, said trouble was found most frequently when the problem was not handled by a professional electrical engineer, or where there had not been co-operation between the various manufacturers. Generally, the trouble was due to the manufacturer not obtaining the necessary information from the user. As regards education, if equipment based on British standard specifications was to be used, there must be education of the user; without that, he did not see how mechanical or non-electrical engineers could select apparatus.

Hydro-Electric Development in Australia

TWO major hydro-electric developments in Australia are planned for the immediate post-war period. The first involves harnessing the Clarence river, and the second the waters of either the Snowy or Shoalhaven rivers. The former, known as the Clarence Gorge scheme, and estimated to cost some £5 million, will entail the construction of a dam and power house 103 miles from the mouth of the Clarence river, at a site immediately below its junction with the Mitchell river. The dam, which will be the largest in Australia, will back up the waters of the two rivers for some 80 miles, establishing a reservoir of 93 155 million cu. ft. The water will be drawn through a two-mile pressure tunnel and the power generated will serve the northern part of New South Wales and Southern Queensland. Brisbane will benefit by this development to the extent of 50 000 kW at a cost of 1s. 2d. per kWh.

The final plan for the second scheme has not yet been decided upon, but the most favoured proposal calls for the utilisation of Snowy river and a concentration on the production of electric power rather than irrigation.

The estimated cost of the proposal is £10 600 000, of which 80 per cent. would be labour costs. Development would include a 15-mile tunnel through granite with an 1 850-ft. drop, an underground generating station and a secondary dam.

The output will be distributed to Canberra and Sydney and intermediate towns, with a branchline to Port Kembla, by 265 miles of h.t. lines carried on steel towers.

Electric Irons and Cleaners.—The Central Price Regulation Committee have approved the following prices, exclusive of purchase tax, for electric irons manufactured by British Diamix, Ltd.: B.D.L.S. Type A electric iron, manufacturer's selling price, 18s. 6d.; wholesale, 23s. 1½d.; retail, 30s. 10d.; type B, 16s. 7d.; 20s. 9d.; and 27s. 8d.; type C, 8s. 7d.; 10s. 9d.; and 14s. 4d. The Committee has also approved the following prices for "Tireless Tim" vacuum cleaners manufactured by Hogan and Wardrop: Manufacturer's selling price, excluding settlement discounts, £4 4s. 0d.; wholesale, £5 5s. 0d.; retail, £7 0s. 0d. These prices do not include purchase tax.

Institution of Electrical Engineers

Annual General Meeting—Proposed Record of War Work

THE annual general meeting of the Institution of Electrical Engineers was held on Thursday, May 10, the President, Sir Harry Railing, being in the chair.

The Council's report, of which abstracts were given in our last issue, was adopted.

Victory Celebration Suggested

In the course of a short discussion upon it, Mr. A. W. Phillips suggested that the institution should arrange a victory celebration worthy of the occasion, and again expressed dissatisfaction with the fact that nothing had been done to form an education section. He recalled that the best attended meetings had been those dealing with the training of engineers and, remarking that the old world had gone, said that if the institution was going to play its part in the new and broader world, electrical engineers must be educated in the truest sense of the word. He therefore asked the Council to give speedy consideration to the formation of an education section. He also called attention to the fact that there was not a single representative of technical schools and colleges on the Post-war Planning Committee of the institution, and said that whilst he personally did not object, there was a large number of people throughout the country who had voiced their dissatisfaction with the position and asked that it should be remedied.

With regard to the joint engineering lectures for young people and others mentioned in the report, Mr. Phillips said these would be very helpful if run on the right lines. The lecturers chosen should be those who could interest an audience and did not merely give a lantern show with a prepared script.

He also asked that consideration should now be given to social functions.

The President said the General Purposes Committee was considering the question of social functions now that the war in Europe was over. He assured Mr. Phillips that everything was being done to ensure that the lecturers to young people and others would be chosen to fit the audience. With regard to the formation of an education section, he recalled that Mr. Phillips had raised this matter on a number of previous occasions, but there was no disinclination on the part of the Council to have educational lectures and anything relating to education. The formation of an education section, however, depended upon the number of papers available and the fact was that the Council had been trying to get such papers without much success. Ob-

viously, if a specialist section was to be formed there must be ahead sufficient papers, and not only a few, immediately available. Then there would be no inclination on the part of the Council to hold back.

In reply to further questions put by one or two other speakers, the President said that although the institution had taken up, through the Post-War Planning Committee, the needs of graduates and students who were serving in the Forces or engaged in similar work of national importance, the placing of these men in industry was not strictly within the sphere of the institution. It was being handled by the Ministry of Labour, and a circular letter had been sent by the Ministry to all firms asking them to give a forecast of their vacancies for a period of years ahead.

Overcrowding of Lecture Theatre

As to the possible overcrowding of the lecture theatre in the future, having regard to the attendances being so much larger (mentioned by Mr. Rowland of the G.E.C.) Sir Harry said that certain discussions on this matter took place in 1939 and they had been resumed now that conditions had changed.

Finally, concerning a suggestion that a second volume of the history of the institution should be published as a memorial to the work done by the institution during the war, or that it should be recorded in some suitable manner, the President said that was a good suggestion and would be considered. What form it would actually take it would be premature for him to say, but one of the ways in which it was hoped to celebrate the finish of the war would be the provision of a fund—for which a provisional appeal was made last year—to provide a number of homes for members of the institution. Another appeal might soon be made with regard to this.

The President promised that all the points raised would be given careful consideration by the Council.

The accounts were adopted without discussion.

Tynemouth.—Charges for supplying electricity to temporary houses have been considered by the T.C. A charge of 2s. 6d. weekly (to be collected with the rent) has been fixed for a four-roomed house using electricity for cooking, washing, lighting and heating in bedrooms.

News in Brief

Reduced Electricity Charges Campaign.

—The Great Clifton (Cumberland) P.C. has complained that electricity charges for households are too high and is inaugurating a campaign to have them reduced. All the parish councils in the area which are supplied by the Mid-Cumberland Electricity Co., Ltd., are being urged to press for a reduced and uniform household tariff.

Kitchen Display.—The St. Pancras Electricity Committee has given a display at the showrooms of an electric kitchen unit borrowed from the Poplar B.C.

Social Item.—Ferranti Ltd., recently bought the whole of the 2 300 seats in a Manchester theatre, seat tickets being sold to the employees at the firm's various works in order to assist the comforts fund for the crew of the Canadian frigate, Loch Polick.

Institute of Fuel Students' Medal.—To encourage the reading of papers by student members of the institute, also those taking courses at universities and technical colleges, the Council has decided to make an annual award of a medal, together with a prize consisting of books and instruments to the value of £5.

Trolley-bus Scheme.—The South Shields T.C. is to buy three trolley-buses from Bradford Corporation at £300 each. At a town's meeting, the Council's plans to convert the remaining tram routes to trolley-buses and operate trolley vehicles over other routes, were approved.

School Wireless Installations.—The question of installing wireless in schools throughout the Durham county area, is to be considered by the County Education Committee. At present 222 schools have wireless receiving sets which have been supplied through the co-operation of teachers, children and parents.

I.E.E. Transmission Section.—The meeting fixed for May 9, was cancelled in consequence of the National Holiday. The Committee have, therefore, arranged for the paper by Mr. J. H. Savage on "Localisation of Faults in Low-Voltage Cables, with special reference to Factory Technique," to be read at a further meeting of the Section on May 30, at 5.30 p.m.

University College Lecture.—Prof. R. O. Kapp, will deliver a public lunch-hour lecture on "The Future of Domestic Heating and Lighting" in the Anatomy Theatre of

University College (entrance, Gower Street) on May 29, at 1.15 p.m. No fee or ticket is required. This lecture was originally arranged for May 8, but had to be postponed on account of the National Holiday.

Cardiff Trunk Calls.—For the third month this year Cardiff had the shortest average time for telephone trunk calls—3 min. 14 sec.

Scottish B.B.C. Anniversary.—The Scottish Region of the B.B.C. recently celebrated its twenty-first anniversary with a reception in Broadcasting House, Edinburgh, at which Mr. Melville Dinwiddie, the Scottish Director received the guests. Mr. George Marshall, the first Scottish Director recalled the early days of Scottish broadcasting and many other veterans of the earlier days attended.

Electricity in

Madrid.—It is announced that on account of drought, electric light is to be cut off from 9 p.m. to 9 a.m. two days a week.

Wireless Licences Record.—The number of wireless receiving sets for which licences are in force in Great Britain and Northern Ireland has reached the record total of 9 710 850.

Electricity in Eire.—It is announced that work on the £3 000 000 River Erne power development scheme, which will involve the flooding of some 900 acres of land in the River Erne basin, will begin very shortly.

Deaf-aids Appliances.—Mr. Dalton stated recently in the House of Commons that the Central Price Regulation Committee were examining the question of the high cost of deaf-aids appliances, in consultation with the Electro-Acoustic Committee.

Electrical Firms' Savings.—In the Slough National Savings Industrial Groups League, employees subscribed the following amounts from their wages: Seiaiky, Ltd., 9d. in the £; Ferguson Battery Co., Ltd., 1s. 1½d.; Hanovia, Ltd., 2s. 5½d.; Lindley Thompson Transformer Co., Ltd., 1s. 1½d.

Principles of Triode Design.—At a meeting of the Institution of Electronics to be held on June 4, at the Royal Society of Arts, London, W.C.2, at 5.30 p.m., Dr. J. H. Fremlin will give a lecture on "Principles of Triode Design. Application for tickets should be made to the Secretary, 64, Winifred Road, Coulsdon, Surrey.

TWENTY-FIVE YEARS AGO

FROM THE ELECTRICIAN of May 14, 1920: The death is announced of Mr. Edward Bull, the last survivor of the party who laid the first Atlantic cable between Great Britain and the United States. For many years he was superintendent of the Eastern Telegraph Company's station at Porthcawl. Mr. Bull was 90 years of age.

A.S.E.E. Prize Papers

District Heating—Maintenance Recording—Domestic Installations

THE papers that were awarded prizes in the branch competition for the year 1944-5 were read at the meeting of the Association of Supervising Electrical Engineers at the Lighting Service Bureau, Savoy Hill, London, on Tuesday, May 15.

Mr. J. F. Bridge, of Manchester, the winner of the first prize, took for his subject "District Heating." He said it was estimated that there was sufficient heat rejected from a typical 50 000 kW turbo electric-station, working at 80 per cent. full load, to the condenser in the form of saturated steam at a temperature approximating 228° F., to supply 4 900 five-roomed houses with hot water for central heating and domestic purposes. Instead of passing the steam rejected from the turbine through the condenser in the normal manner it could be directed through a steam-to-water calorifier before being passed to the hotwell. In this way, the heat in the waste steam would be used to raise the temperature of the district heating water which could then be pumped at high velocity round a single ring main and returned to the station for re-heating. The ring main could be tapped for each consumer, and a portion of the hot water diverted through a water-to-water calorifier installed on the consumer's premises. In order to make this action effective, a valve, or orifice plate, would be inserted in the main at a point between the consumer's flow and return tapplings, thus restricting the flow of water in the main slightly and forcing circulation through the consumer's calorifier. The heat in the mains water would then be imparted to the water in the consumer's calorifier, and hot water would flow round the internal pipework by natural circulation. The calculated heat drop in a circuit consisting of an insulated main 6 000 ft. long and 8 in. diameter, from which 700 dwellings were served, would be about 30° F. This limit would not have to be exceeded, and in order to obviate an excessive heat drop on an estate composed of 4 900 houses, seven separate circuits would have to be arranged.

Cheap Tariff Claim

If existing stations were converted to thermo-electric operation he felt experience would prove that the cost of the generation of electricity would be reduced to such an extent that tenants of property erected beyond the limits of the district heating main would be able to take advantage of an all-electric installation at a

tariff which would be far cheaper than any other form of heating.

"Recording of Maintenance" was the title of the paper by Mr. C. Rhodes, of Leeds, who was awarded the second prize.

Importance of Systematic Checking

Maintenance of plant, he said, was due to man made-equipment and man-handled equipment—the latter being chiefly responsible. To keep plant operating it was necessary on the one hand to give it a certain amount of attention and on the other to check up on the operator to see that it got a fair deal. The latter point was very essential.

The system of keeping the records must be simple, must tell the whole story at a glance, must be absolutely correct, but still not take much time to keep up to date.

The first step was to divide the works into various departments or sections and he had found it best to stick to the officially recognised names for those if at all possible.

He went on to describe a scheme divided into two parts, the first covering spares, installation, material, etc., used for the various machines; the second recording the history of the machines.

The third prize was won by Mr. F. S. Ibbs, of Liverpool, with a paper on "Post-War Domestic Installations."

His proposals for a sound and reasonably cheap electrical installation for a small or medium-sized house included:—

(a) A cooker (say 6 kW), wash-boiler (3 kW), immersion heater (3 kW), and 1½ gall. storage cylinder. (b) The service and intake panel to be fixed in a recessed cupboard in the hall. (c) The main switch to be interlocking. (d) The system of wiring to be v.i.r., or similar cables enclosed in enamelled light gauge welded steel conduit with grip fittings. All conduit to be erected first and the cables drawn in afterwards. (e) All fittings to have machined entries, free from enamel. (f) The ends to have the enamel removed for the exact distance required to enter the fittings. (g) The following circuits to be run from the intake panel: Lighting, 3/.029 cable; cooker and wash-boiler, 7/.044 cable; immersion heater, 7/.029 cable; ring main for socket-outlets, 7/.029 cable. (h) Tapplings off the ring main to the socket-outlets to be in 7/.029 cable, using special tee-boxes and line taps. (i) All sockets to be of 10 A (2 kW) rating and fixed 1 ft. from the floor. (j) All portable appliances to have fused plugs.

Electricity Supply

Lichfield.—The Electricity Committee has obtained sanction to borrow £965 for an additional feeder to the Trent Valley area.

South Shields.—The T.C. has approved revised charges for street lighting prepared by the North-Eastern Electric Supply Co., Ltd.

Hydro-Electric Undertakings.—The Hydro-Electric Undertakings (Valuation for Rating) (Scotland) Bill has been read a third time, and passed.

Bedford.—Sanction has been obtained to borrow £3 028 for mains and equipment and £115 000 for the technical development of the electricity undertaking.

Gateshead.—The T.C. has approved a new schedule of charges submitted by the North-Eastern Electric Supply Co. Ltd., for the lighting of street lamps.

Hastings.—The Electricity Committee is seeking sanction to borrow £5 000 for mains and services, £3 000 for meters, £3 000 for sub-stations and £3 000 for apparatus.

Toronto, Ontario.—Central electric stations generated 917 232 000 kWh in the first two months of the year, compared with 893 004 000 kWh in January and February of last year.

Hazel Grove and Bramhall.—The U.D.C. is applying to the Commissioners for sanction to borrow £5 215 for the purchase of 1 025 relays for the remote control equipment of water heaters.

Stretford.—The Corporation is seeking sanction to lend the Stretford and District Electricity Board a further sum of £850 000, the Board to pay the Corporation an agreed proportion of the Corporation Loans Fund.

Tummel-Garry Inquiry.—The inquiry into the Tummel-Garry hydro-electric project which opened in Edinburgh on April 25, before Mr. John Cameron, Sir R. Bruce Walker and Maj. G. H. N. Brown Lindsay, ended on May 5.

Glasgow.—The Electricity Committee has decided to defend any action that may be taken to claim damage said to be due to property and tenants' furnishings as a result of the deposit of grit emissions from Dalmarnock power station lodging in the roofs and gutters of adjoining premises.

Southwark (London).—Objections to the proposal of the City of London Electric Lighting Co., Ltd., to rebuild its Bankside power station because it will seriously prejudice any scheme for the redevelopment of the south bank of the Thames are being raised by the Works Committee.

Bradford.—The Electricity Committee recommends that in all cases where a change of tenancy takes place and the out-

going tenant does not desire to take the hired apparatus away, and consequently terminates the agreement in respect thereof, the new tenant be allowed to retain such apparatus on hire.

Manchester.—Owing to the increased load which necessitates improving the transformer capacity at the Denton West transforming station, the Manchester Electricity Committee proposes to replace a 4 500 kVA transformer, purchased in 1922, by a 10 000 kVA transformer with automatic voltage variation equipment. The cost will be £12 000.

Supply in Lakeland.—The Cocker-mouth R.C. is supporting the petition of the Buttermere Green Slate Co., Ltd., to obtain a supply of electricity. Regarding the position which may arise under the National Park project. Mr. F. W. Walker, advocated an underground cable to avoid the erection of pylons. It was pointed out that Borrowdale had agitated for a supply for eight years and that the slate would be an asset to the R.C. in connection with its housing programme.

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.

Adwick-le-Street U.D.C., May 19.—Supply, delivery, direction and laying and jointing of (a) e.h.t. steel wire-armoured cable; (b) l.t. steel tape-armoured cable; (c) 250 kVA 3 300/400/230 V indoor transformer and (d) l.t. sub-station distribution panel. Specification from the Electrical Engineer, Electricity Department, Church Lane, Adwick-le-Street, near Doncaster.

Salford Electricity Department, May 26.—Supply and delivery of 36 steel street lighting standards. Particulars from the City Electrical Engineer, Frederick Road, Salford, 6.

Dunbar, B.C., June 9.—Supply, delivery and installation of street lighting equipment, including poles, lanterns, wiring, and control gear. Specifications 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.

Industrial Information

British Admiralty Charts.—The British Nautical Instrument Trade Association have published a pamphlet outlining a post-war chart service for British shipping.

War Damage Insurance.—The issue of policies of insurance under the Commodity Insurance Scheme, the Business Scheme (including the Farming Scheme) and the Private Chattels Scheme has ceased. Current policies will remain operative until their dates of expiry.

B.S.S. for Light Sensitive Recording Material.—With a view to reducing the number of sizes of light-sensitive film and paper for recording instruments, thus facilitating the supply of the material from stock, a specification (B.S. 1193: 1945) has been issued by the British Standards Institution. Copies may be obtained from Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. post free.

Notes for Contractors.—The National Joint Industrial Council for the Electrical Contracting Industry announce that in accordance with an agreement dated April 28, 1945, the hourly rates payable on and from the third pay day in May, 1945 (for the pay period covered by that pay day) shall be, until further notice, as under.

To these rates is to be added the current amount of cost of living (war) adjustment applicable to the age groups concerned.

Category II.	Grade "A."	Grade "B."	Mersey Dist.	Grade "O"
Age 16 (19%*)	0 4½	0 3¾	0 4	0 3¾
Age 17 (25%*)	0 5½	0 5	0 5½	0 5
Age 18 (30%*)	0 7	0 6	0 6½	0 5½
Age 19 (45%*)	0 10½	0 9	0 9½	0 8½
Age 20 (60%*)	1 2	1 0½	1 0½	0 11½

Category III.	Grade "A."	Grade "B."	Mersey Dist.	Grade "C."
Age 16 (25%*)	0 5½	0 5	0 5½	0 5
Age 17 (35%*)	0 8½	0 7	0 7½	0 6½
Age 18 (40%*)	0 9½	0 8	0 8½	0 7½
Age 19 (55%*)	1 0½	0 11½	0 11½	0 10½
Age 20 (70%*)	1 4½	1 2½	1 3	1 1½

* Of Journeyman's Rate.

This agreement supersedes that dated March 20, 1945.

It is also agreed that the cost of living (war) adjustment applicable to Categories II and III labour, as defined in the First Schedule to the Agreement dated June 14, 1943, shall be as follows: Under 18 years of age, 33½ per cent. of the Journeyman's Cost of Living (War) Adjustment; between 18 and 21 years of age, 66½ per cent. of the Journeyman's Cost of Living (War) Adjustment.

Commissioners' Memoranda

THE Electricity Commissioners have informed chief engineers and general managers of electricity undertakings that the Civil Defence organisation is no longer needed, and can now be disbanded and all A.R.P. measures discontinued. There should not, however, be any abatement of measures relating to matters such as fire-prevention and first-aid in so far as they are desirable in the operation of the undertaking.

Air raid shelters provided for the protection of the staff, and structural or other measures taken for the protection of plant, etc., which seriously impede the efficient working of the undertaking may be removed as and when labour can be made available from within the undertaking's own resources, and subject to any necessary authorisations being obtained under Regulation 56A of the Defence (General) Regulations.

No assistance by way of grant will be available in respect of expenditure incurred in the removal of the protective measures referred to above.

The Central Electricity Board have had

under consideration the necessity for the retention of the national stores of emergency equipment, and have come to the conclusion that, in view of the war situation, a considerable amount of such equipment can now be sold. The Electricity Commissioners, after consultation with the Ministry of Fuel and Power, concur.

Requests are being received from liberated and other allied countries for the sale to them of some of the equipment, but before coming to a decision on such requests the Commissioners desire to ascertain whether and to what extent authorised undertakers in this country wish to purchase any of the equipment to meet urgent requirements.

The equipment was mostly purchased in 1939-1940, since which date prices have materially increased, and after consultation with the National A.R.P. Committee for the Electricity Supply Industry and the Treasury, it has been decided that the price to be asked for each item should be the original cost plus 21 per cent. to cover accrued storage and other charges.

Company News

F. BRABY AND CO. LTD.—Intm. div. 2½% (same).

LAKE AND ELLIOTT LTD.—Intm. on ord. 5% (same).

JOHN RIGBY AND SONS LTD.—No intrm. on ord. (5%).

GENERAL ELECTRIC (U.S.).—Qtrly. 40 cents (35 cents).

R. W. CHABTREE AND SONS.—Net pft. after all taxn. £37 519 (£39 229).

ALTRINCHAM ELECTRIC SUPPLY CO., LTD.—Fin. on defd. 4s. 4.19d. per sh.

RANSOMES SIMS AND JEFFERIES LTD.—Fst. and fin. div. on ord. 7½% (same).

WALTER SPENCER AND CO., LTD.—Intm. div. 5% (same).

ST. AUSTELL AND DISTRICT ELECTRIC CO., LTD.—Fin. div. 6%, mkg. 10% (same).

STREAM LINE FILTERS, LTD.—Sec. intm. and fin. 7% mkg. 10% (same).

TUBE INVESTMENTS, LTD.—Intm. on ord. 10% (same).

WESTINGHOUSE ELECTRIC AND MANUFACTURING CO. (U.S.)—\$1 on com. and prefd. (same).

EVER READY CO. (GT. BRITAIN).—Fin. div on ord. 25%, mkg. 40% (same) for yr. to Mar. 31.

LEWIS BERGER AND SONS.—Intm. div. 6%, less tax, on ord., for yr. ending July 31, payable May 19 (same).

BROOM AND WADE LTD.—Div. on ord. 5s. shs. numbered 1 to 600 000 inclusive, 11½%, less tax, (7½%) for yr. ending Sept. 30, 1945.

ASSOCIATED EQUIPMENT CO., LTD.—Intm. div. 6d. per unit (same), payable May 25.

GLENFIELD AND KENNEDY, LTD.—Fin. div. 5% and bonus 10%, mkg. 20% (same). Net pft. £59 684 (£60 871).

BRITISH OXYGEN CO., LTD.—Fin. div. on ord. 8%, mkg. 16%, less tax (15%). Net pfts. for 1944, after deprecn., inc. tax and E.P.T. are stated at £370 369 (£384 527).

AYRSHIRE ELECTRICITY BOARD.—It is understood that negotiatns. are in progress for the conversion of the outstandg. blee. of the Ayrshire (Local Authorities) Electricity 4½% redeem. stk. 1945-55, of the Ayrshire Electricity Bd.

RADIOMOBILE, LTD.—Co. has been formed with a cap. of £10 000 to manufacture, distribute and service motor-car radio exclusively. The shareholders, in equal parts, are Smith Motor Accessories and The Gramophone Co. It is intended to specialise entirely on "mobile" radio.

WALLSEND SLIPWAY AND ENGINEERING CO., LTD.—Net tradg. pft. £144 855, £92 347 increase, after deprecn., inc.-tax and E.P.T. With pft. on sale of investmnts.,

etc., £3 149 (£629), pft. total £148 004 (£53 137). Dirs.' fees £4 500 (£4 494), divs. on prefee. and ord. £95 958 (£66 152), A.R.P. £12 000 (£5 000), and genl. res. £30 000 (nil). Surplus of £5 546 makes £34 881 (£29 335) fwd.

NORTH BRITISH RUBBER CO. LTD.—After deprecn., A.R.P., etc., trdg. pft. £163 797 (£160 276), plus £89 803 (£84 111) brot. in. To deb. int. £12 750 (same), dirs.' fees £2 500 (same), inc.-tax and E.P.T. £85 000 (£70 000), war dam. insur. £2 531 (£3 084), leavg. avail. blee. £150 819 (£156 053). Pref. divs. absorb £11 250 (same), ord. div. 6% (5%) £30 000 (£25 000), to gen. res. £45 000 (£30 000), fwd. £64 569.

ALLEN WEST, LTD.—Trdg. pft. to Jan. 31 (after tax) £102 281 (£97 294), divs. and int. £5 757 (same), mkg. £108 038 (£103 051). To deb. int. £8 838 (£9 080), dirs.' fees £3 000 (same), deprecn. £15 000 (same), bldgs. res. £10 000 (same), defd. repairs £10 000 (nil), deb. skg. fund £4 585 (£4 350), war risks ins. £6 418 (£11 747), leavg. net pft. £50 197 (£49 874). Brot. in £62 104. To gen. res. £15 000 (same), div. 7½% £36 563 (same), fwd., £60 738.

(Continued on page 456)

Metal Prices

	Monday, Price.	Mar 14, Inc. Dec.
Copper—		
Best Selected (nom.) per ton	£60 10 0	—
Electro Wirebars	£89 0 0	—
H.C. Wires, basis ... per lb.	9½d.	—
Sheet	11½d.	—
Phosphor Bronze—		
Wire (Telephone) basis	1s. 0½d.	—
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	£28 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) Ware-house 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.

NORTH SOMERSET ELECTRIC SUPPLY.—Gross rev. for 1944 £467 446 (£411 232), expend. (includg. deprecn.) £404 566 (£348 998); net rev. £62 880 (£62 234), add int. and divs. £1 380 (£1 048); to int. nil (£6), tax provn. £40 500, less £22 350 from gen. res., mkg. £18 150 (nil), insurance and contings. £4 000 (same), gen. res. £5 000 (same). Pref. net div. £5 500 (same), ord. div. 7%, less tax (same), £17 500 (£35 000 gross), fwd. £6 434 (£6 074).

Company Meetings

JOHNSON AND PHILLIPS LTD.—In the course of his address at the annual meeting held in London on May 10, Mr. G. Leslie Wates, the chairman and managing

director, said that in view of the near approach of the change over from a war basis to peace, they were increasing substantially the allocation to research and development, and also the allocation to their contingencies reserve. As to research and development last year the company increased the amount set aside to £15 000—this year they proposed an allocation of £25 000. He was now able to state that the three electricity distributing companies had all carried on their work without interruption or major incident. They had all increased their turnover and their profit. Since the close of the financial year the company had purchased the whole of the issued share capital of Aurora Lamps, 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.*

BIRKENHEAD ELECTRIC AND ACETYLENE WELDING CO., LTD.—Apr. 18, deb., to District Bank Ltd., securing all moneys due or to become due to the Bank; general charge.

ELECTRICAL AND RADIOLOGICAL INSTRUMENT CO., LTD., Ruislip.—Apr. 26, £500 mort., to A. Lightfoot, Lansallos; charged on part of Brent Field, Killigarth, Lansallos.

PAGE AND MILES LTD., Brighton, elec. engrs.—Apr. 14, £8 000 mort., to Mrs. N. E. Burgoyne, Haywards Heath; charged on 60 Western Road, and 43, Castle Street, Brighton, also £2 500 second mort. to Miss D. I. M. Whittaker, Hove; charged on same ppies. *£1 678. Nov. 9, 1944.

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.

PATTERSON, Craster, 152, Windsor Avenue, Gateshead, electrician. £11 19s. Mar. 22.

RADIO AND ELECTRICAL SERVICES, 21, Newport Court, London, W.C.2, radio and electrical engineers. £14 12s. 2d. Mar. 8.

MULLEN, Thos., 2, Burnville, Heaton, Newcastle-on-Tyne, electrical welder. £13 0s. 3d. Mar. 22.

WILKINS, W. E., Banbury Street, Kine-

ton, Warwick, electrical engineer. £38 1s. 6d. Mar. 23.

WOOD, Thos. C., 78, High Street, Aston, radio dealer. £17 7s. 2d. Mar. 12.

ANDERSON (male), 1a, Sheldon Road, Chippenham, electrician. £39 16s. 8d. Feb. 13.

KAYE, Maurice, 9, Burdale Place, Bradford, electrician. £18 2s. 5d. Mar. 20.

LINDECK, Gustave W., 1, Freshfield Place, Brighton, radio engineer. £53 4s. 2d. Feb. 28.

RODGERS, Sydney, 125, Bolsover Road, Sheffield, electrical engineer. £26 19s. 3d. Feb. 27.

Coming Events

Friday, May 18 (To-day).

I.E.E., MEASUREMENTS SECTION.—London, W.C.2. Lecture, "Magnetic Materials," Sir L. Bragg. 5.30 p.m.

Tuesday, May 22.

I.E.E., RADIO SECTION.—London, W.C.2. Discussion, on "Non-Ferrous Contact Springs," H. G. Taylor and L. B. Hunt. 5.30 p.m.

Wednesday, May 23.

ROYAL SOCIETY OF ARTS.—John Adam Street, London, W.C.2. Thomas Howard Lecture, "Wire Broadcasting," Paul Adorjan. 1.15 p.m.

Thursday, May 24.

I.E.E.—London, W.C.2. "High-Voltage Steel-Tank Mercury-Arc Rectifier Equipments for Radio Transmitters." J. C. Read, and "The Application of High-Voltage Steel-Tank Mercury-Arc Rectifiers to Broadcast Transmitters," P. A. T. Bevan. 5.30 p.m.

Saturday, May 26.

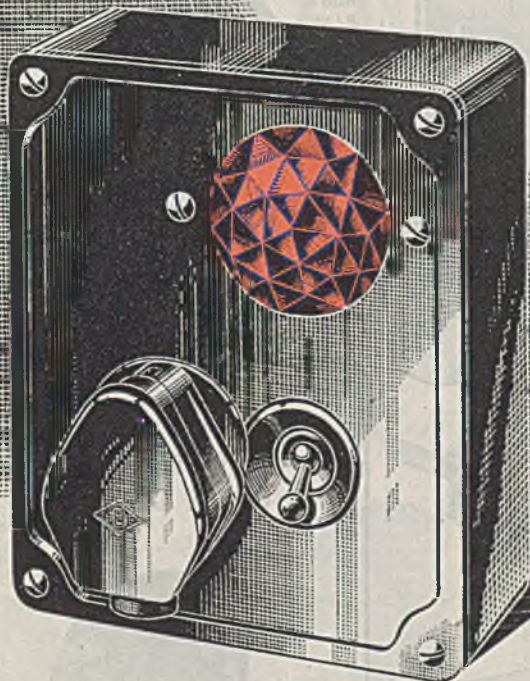
BIRMINGHAM ELECTRIC CLUB.—Grand Hotel, Luncheon-Reunion. 12.30 for 1 p.m.

I.E.E., BRISTOL STUDENTS' SECTION.—Bristol. Annual general meeting. "Some Hydro-Electric Possibilities and Achievements," W. A. Hatch.

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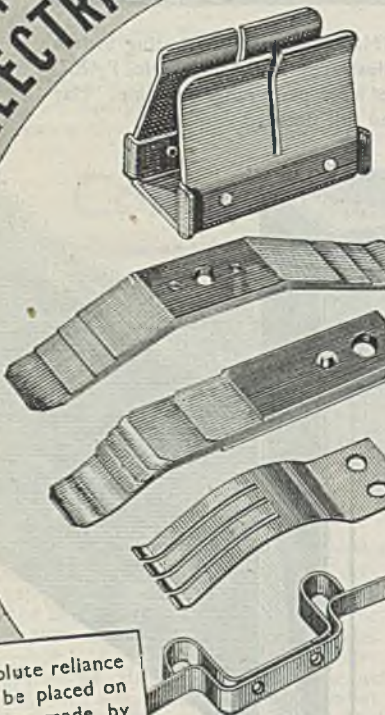
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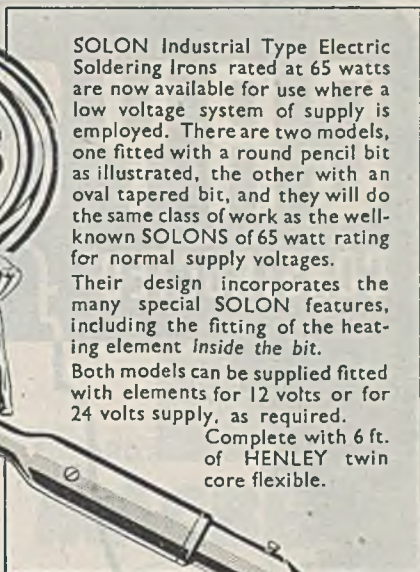


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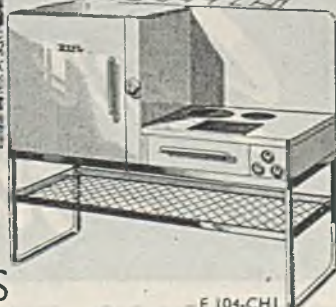
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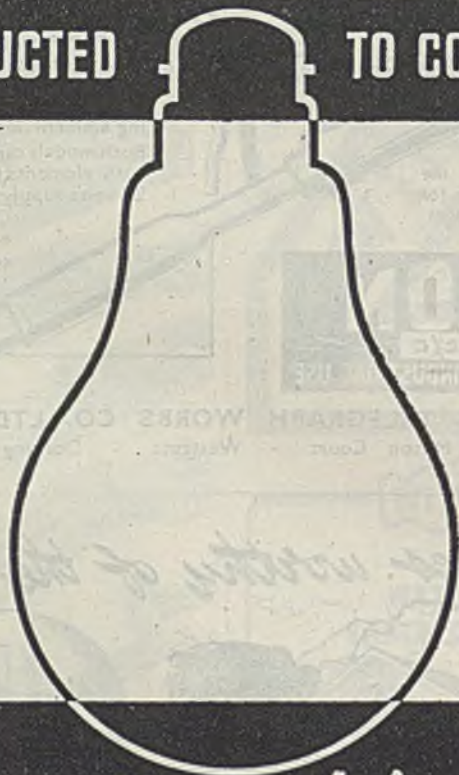
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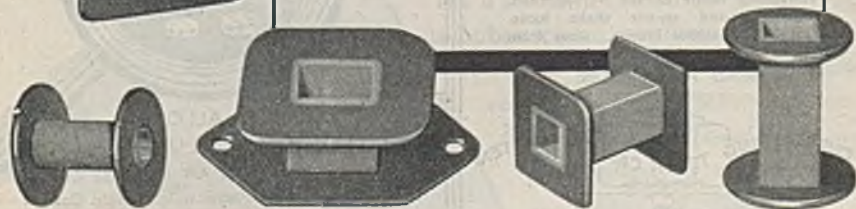
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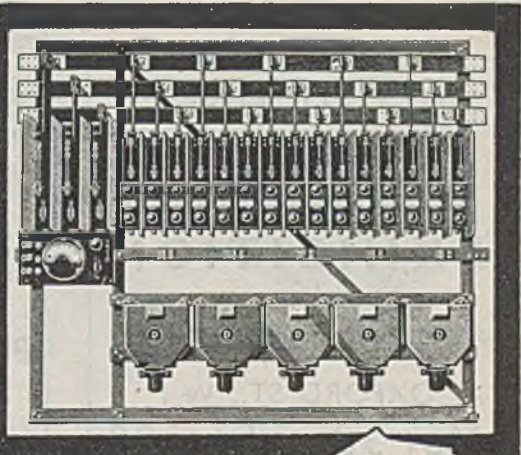
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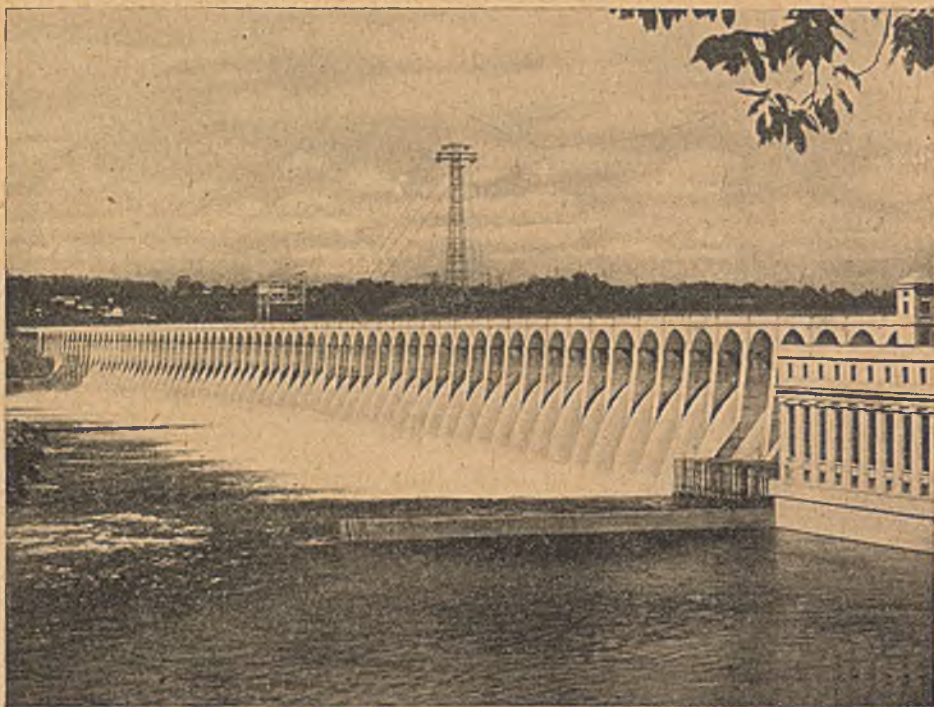
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