ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXVI. No. 3523 JUNE 1, 1945 9d. WEEKLY

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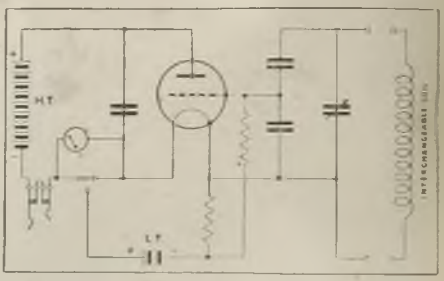

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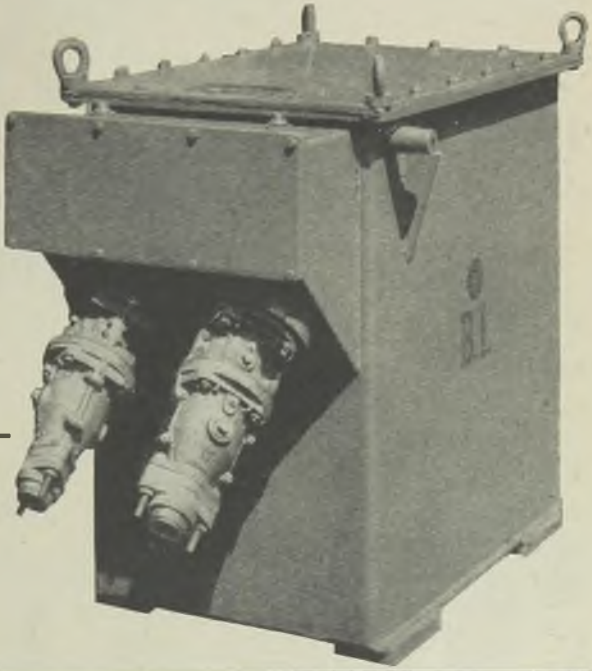

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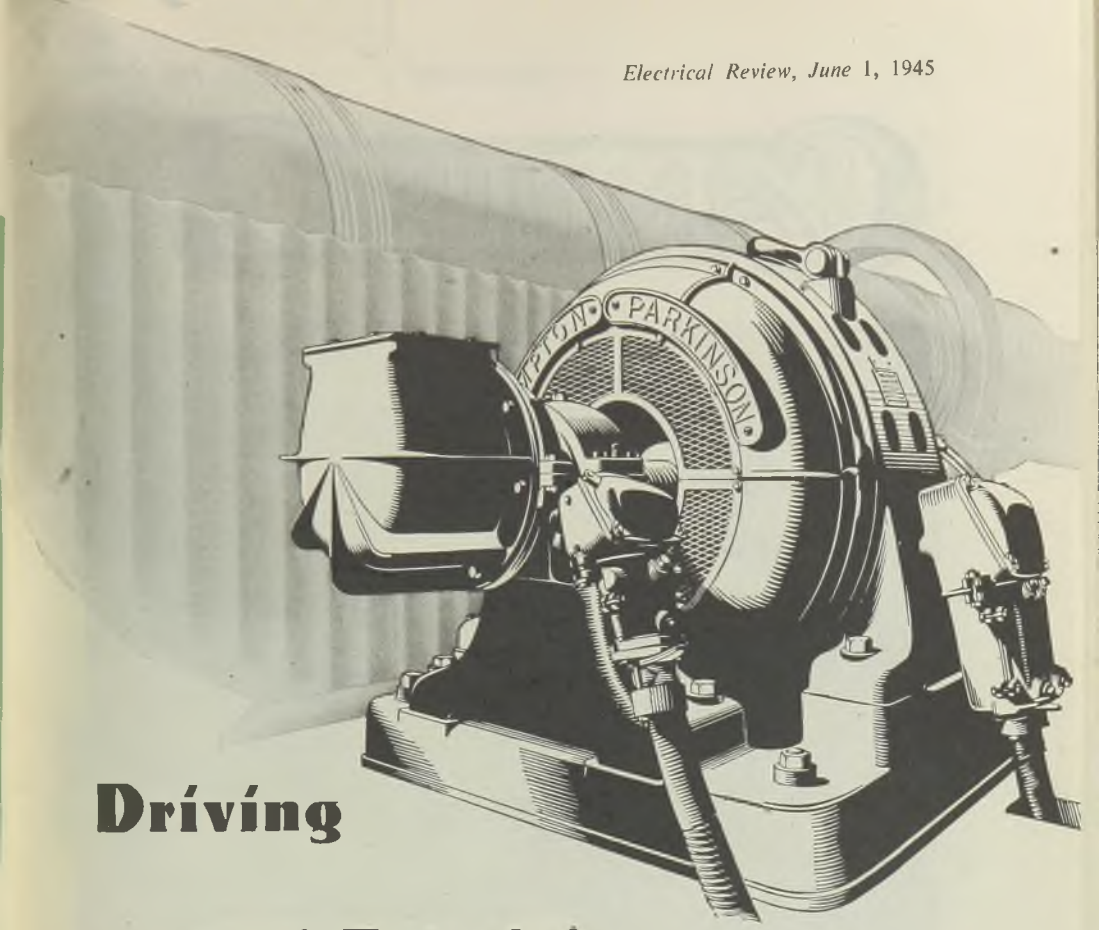

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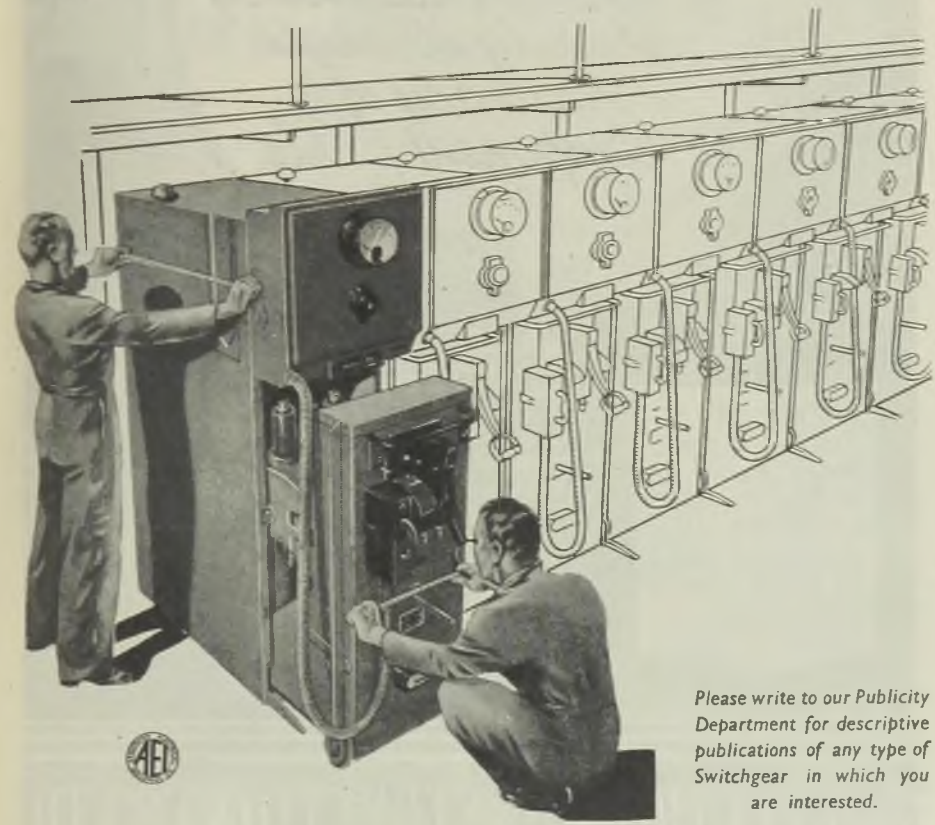

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June 1, 1945

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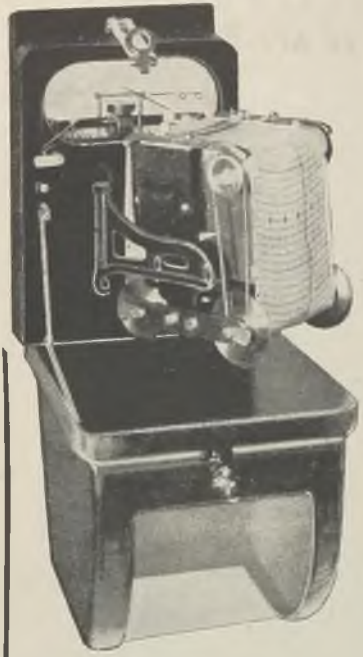

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXVI. No. 3523. JUNE 1, 1945 9d. WEEKLY

Power Station Sites

Amenity and Public Service Considerations

ON several occasions lately we have referred to the grave possibility of a deficiency of generating plant capacity. Some relatively minor indications of this have been manifest during the past six months, but of far greater moment now is the probable position over the next few years. We have previously discussed the reasons that have led to this state of affairs in so far as they have been due to precedent claims of the military services on labour and material. Parenthetically, in view of attempts by gas interests to make propaganda capital out of this aspect it should be stated that gasworks extensions are in no better case.

Our present concern is with further delays entailed in securing statutory consents for the installation of power-station plant after the Government, in according it manufacturing priority, has recognised its urgency. Objections entered to a scheme in public inquiry may hold up work for months. The most serious objections are on account of fear of damage to amenities, but experience has shown these to be groundless in most instances.

Wishes and Actualities

In other directions there is also found to be a reluctance to admit that increasing mechanisation is an ingredient of modern social life and entails some sacrifice of ways to which one has become habituated. Many objectors are clearly unaware that the fulfilment of their wishes would be incompatible with the provision of either cheap or readily available electricity, or even of a supply of any kind.

It is no doubt easier for engineers, who base their decisions on deductions from scientific facts, as tempered by economics, and who have to make their plans several years ahead, to state their minimum technical requirements than it is for those who are guided by less well-defined opinions on æsthetic questions. On the other hand the electrical industry has the right to expect the grounds of opposition to its schemes to be based upon reasonably consistent general principles and to conform to some recognisable natural laws.

Fitness for Purpose

An article published in this issue gives some indication of the difficulties that face engineers in attempting to meet legitimate criticism. Even power station buildings designed by eminent architects are regarded by a few as no more worthy than those which are frankly utilitarian. Is it in the last word that the chief offence lies to some, even though others admit the more virile concept of fitness for industrial purpose as a guiding principle? A viewpoint worth noting is that a modern power station tends to dwarf neighbouring buildings. So long as its physical proportions are pleasing, however, this peculiarity will no doubt come to be accepted as part of the natural order of things.

In any case nothing can be done about it, since the ratio of cubic space to horse-power installed has been progressively minimised on other grounds. Those who desire to use electricity should know something of the fundamental requirements for its production and the popular lectures on

engineering, foreshadowed in the latest I.E.E. Council Report, might well include a course on power station siting. If the rudiments of the subject were more widely known there would be less fear of delays due to opposition that may adversely affect the nation's industrial future.

The New Government

FOR the electrical industry the most interesting feature of Mr. Churchill's "caretaker Government" is the retention of Major G. Lloyd George as Minister of Fuel and Power. No doubt the Prime Minister and his colleagues are grateful to Major Lloyd George for consenting to continue in this difficult post, for it can be said with truth that a new man would find it extremely hard to grasp all the intricacies of the fuel industries between now and the General Election in July. It is unlikely that the Minister will do more than maintain the existing arrangements; any measures for the reorganisation of the coal, gas and electricity supply industries will have to await the results of the election and their nature will, of course, depend almost wholly upon the political colour of the Government then set up. Among the changes is the appointment of Mr. Oliver Lyttelton to the Board of Trade, with which the Ministry of Production is to be coupled, and the continuance of Sir Andrew Duncan as Minister of Supply.

New Zealand Contract

MR. ERNEST BEVIN'S reference to a lost New Zealand transformer contract at the Labour Party conference last week presumably related to a statement which, according to *Reuter*, Mr. C. W. Bridgen, of Ferranti, Ltd., made in New Zealand recently. This was to the effect that, tendering for transformers and switchgear, British makers quoted prices 30 per cent. higher than offers by United States and Canadian manufacturers. As a consequence, it is said, orders to the value of £1,000,000 were lost. We have no doubt that there is more in this than appears on the surface and we await more definite details.

Electricity in France

ADVOCATES of nationalisation of electricity supply in this country may derive some satisfaction from General de Gaulle's announcement of his Government's intention to nationalise the French supply system. But they should remember that conditions in England and France are hardly comparable. Here, electricity supply—on the generation side—has already been welded into a national co-ordinated system; there, the ravages of war and the effects of the occupation have placed the industry (which was never so orderly as the British) in a most unsatisfactory position accentuated by a continued shortage of coal. General de Gaulle seemed to refer only to the *production* of electricity and then in rather general terms. We shall have to wait and see what it is intended to do about distribution—the crux of the matter in this country.

Cable Makers' War Work

BRITISH cable manufacturers have added to the wartime laurels of the electrical industry. Their feat in producing the "Hais" cable used in "Operation Pluto" for carrying petrol across the English Channel in bulk at the rate of a million gallons a day, ranks with the "Mulberry" harbour in its importance, for the maintenance by tankers, vulnerable to air attack, of the large supplies of petrol required was regarded as one of the weak spots of the invasion. The battle of the magnetic mine was also finally and decisively won by the development of self-buoyant cables which were towed by mine sweepers employing the "Double L" or double-longitudinal sweep. Allied superiority in oil supplies and on the seas were among the major factors contributing to victory.

Cheaper Electricity

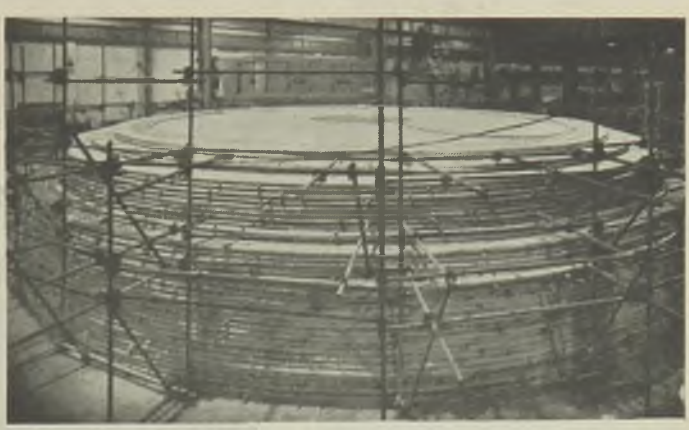
IN spite of the steep rise in the price of coal, as well as the general increase in the prices of everything else, to say nothing of taxation, Edmundsons Electricity Corporation, Ltd., has not only managed to keep prices stable but has actually reduced them in a number of cases. The result has been that the average price per kWh to the consumers has fallen from 1·27d. in 1938 to 1·08d., a decrease of nearly 15 per cent. In the case of domestic and commercial consumers alone the decrease has been even more striking, from 2·77d. to 1·94d.—about 30 per cent. Improved load factor has no doubt helped to bring this about, but the principal factor has been the company's policy of serving its customers at the lowest price consistent with the maintenance of financial stability.

"Operation Pluto"

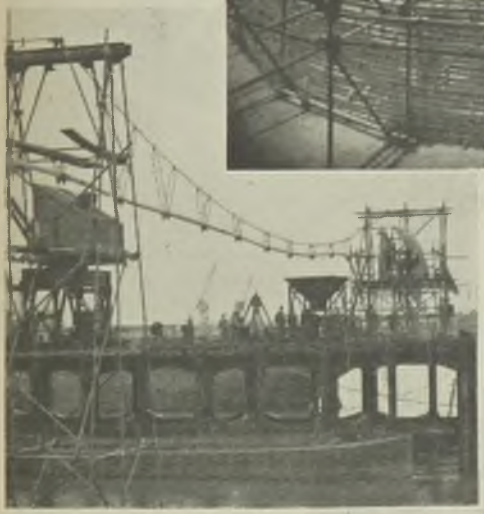
Submarine Cable Technique Used for the "Hais" Cross-Channel Petrol Pipe-line

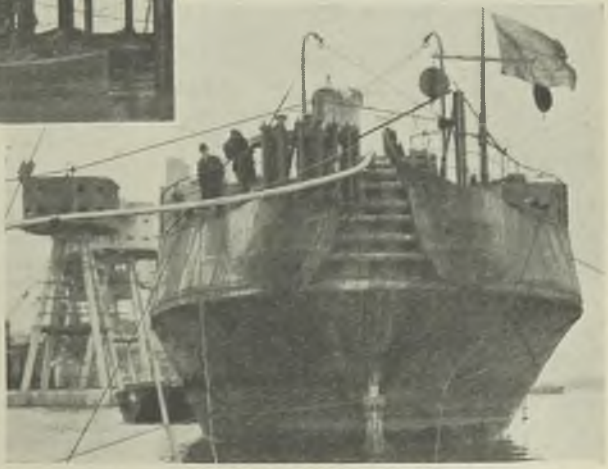
SINCE shortly after "D-Day" about 120 million gallons of petrol, sufficient to meet the entire requirements of Field-Marshal Montgomery's armies, have been taken across the English Channel by means of submarine pipe-lines, thus maintaining a continuous flow of petrol by pipe-line from tankers discharging at Liverpool to as far as Frankfurt, a distance of over six hundred miles. This remarkable achievement, "Operation Pluto" (Pipe-Line Under The Ocean) as it was named, was made practicable by the co-operative effort, ingenuity and skill of British cable makers in the design, development and speedy manufacture of a hollow cable capable of transmitting large quantities of petrol at high pressure.

The idea of a cross-Channel cable was first conceived in April, 1942, when at a special demonstration of flame throwers Mr. Geoffrey Lloyd, Minister in charge of the Petroleum Warfare Department, asked Lord Louis Mountbatten, then Chief of Combined Operations, whether,



Sixty miles of completed "Hais" cable in Henley's factory



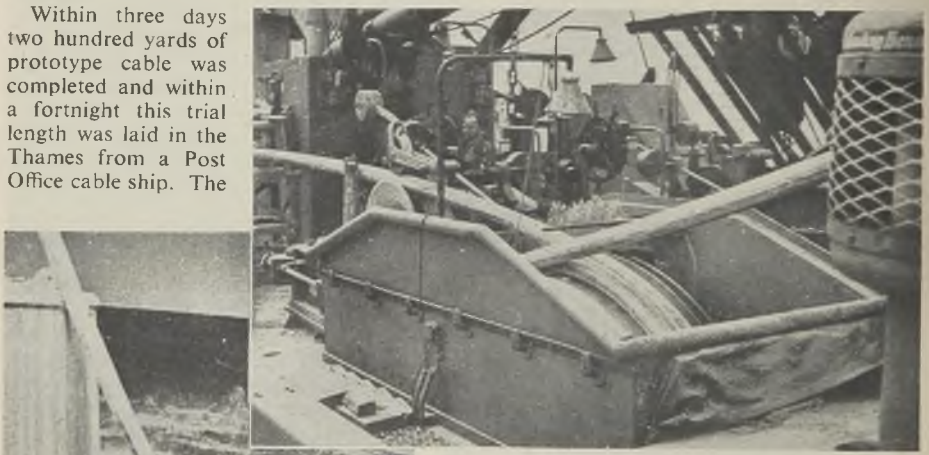


Above: Overhead catenary carrying the cable direct from the factory to the laying vessel. Right: Cable-laying ship alongside Henley's jetty taking the cable on board

on the petroleum side, anything more could be done to assist the Continental operations which were being planned. Lord Louis' reply was, " Yes. Can you lay an oil pipe-line across the Channel ? "

This was thought to be impossible, but a few days later Mr. A. C. Hartley, chief engineer of the Anglo-Iranian Oil Co., suggested that it might be feasible to make a pipe-line somewhat like a submarine electric power cable without the cores and insulation and to lay this across the Channel in a few hours from cable-laying ships. Mr. Lloyd accordingly placed an order the next day for several hundred yards of this pipe-line with Siemens Bros. & Co., Ltd., the pipe-line subsequently being called " Hais " from the initials of Hartley, Anglo-Iranian and Siemens.

Within three days two hundred yards of prototype cable was completed and within a fortnight this trial length was laid in the Thames from a Post Office cable ship. The



" Hais " cable in the hold of H.M.S. *Latimer* in one continuous length and (above) cable passing round the cable drum for controlling the speed of laying on board the ship

results were so promising that the Prime Minister was informed of the initiation of the project and he gave instructions to press ahead with all speed.

The first cables made were of 2-in. internal diameter; these were designed to operate at an internal pressure of 350 lb. per sq. in., but as under test breakdown did not occur until a pressure of 1,950 lb. per sq. in. had been reached, the operational pressure was raised immediately to 750 lb. per sq. in. Generally following submarine cable practice, the lead alloy " E " (tin antimony) tube 0·19 in. thick was covered with two layers of compound impregnated tape, one layer of bitumen prepared cotton tape, two (later four) layers of 2 in. wide, 2 mils thick, polished high-tensile steel strip, one serving of 12 lb. gas-tarred jute yarn, galvanised-steel armouring wires coated with compound, and finally two more layers of jute yarn serving. In view of the high internal pressure, accurate positioning and correct tensioning of the steel tapes was essential and special tensioning methods had to be devised. The armouring machinery had also to be specially adapted to ensure uniformity throughout the whole length. The cable was manufactured and laid with water inside at a pressure of 100 lb. per sq. in. for the original 2-in. type and 70 lb. for the later 3-in. type.

Further tests of a two-mile length of the cable at Chatham under very severe conditions revealed that two steel pressure-retaining tapes were insufficient and four were employed thereafter. Otherwise the cable was found to operate satisfactorily and accordingly, to provide enough pipe-line for full-scale trials, an order was placed with Siemens Bros. & Co., Ltd., and W. T.

Henley's Telegraph Works Co., Ltd., for two 30-mile lengths, to the original 2-in. diameter design, this design being subsequently modified to provide larger carrying capacity by increasing the diameter to 3 in. and when the daily output was 1·75 nautical miles, the manufacture of " Hais " cable was being considered in America and at the request of the Petroleum Warfare Department the company's plant engineer visited

Special building erected by Siemens for coiling long lengths of the cable and special coiling gear

strengthening the cable for working pressures in excess of 1,200 lb. per sq. in. (a maximum bursting test pressure of 4,350 lb. per sq. in. has actually been attained).

Following the successful operation of an experimental cable laid in December, 1942, across the Bristol Channel from Swansea to Ilfracombe, large supplies of " Hais " cable were then ordered, not only from Henley's and Siemens but also from Callender's Cable & Construction Co., Ltd., Pirelli-General Cable Works, Ltd., W. T. Glover & Co., Ltd., Standard Telephones & Cables, Ltd., the Edison Swan Electric Co., Ltd., and the Telegraph Construction & Maintenance Co., Ltd.

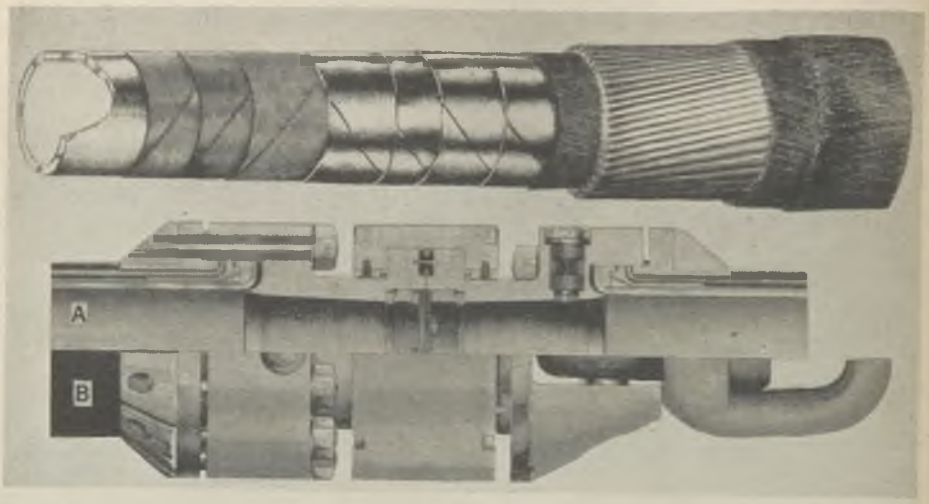
At the Erith works of Callender's Cable & Construction Co., Ltd., the very large new armouring shops were employed in the production of the pipe-line. Four large armouring machines were used and they ran 24 hours a day for seven days each week and produced over 250 miles.

During the period of peak production, the United States to organise production.

Side by side with problems of manufacture was the difficulty of handling the enormous quantities involved. In addition to facilitating loading direct into ships, special arrangements were provided for coiling down the 30 nautical mile lengths on sites also convenient for subsequent re-loading. From the Erith armouring shops a steel gantry 1,584 ft. long was erected on towers across the works sports ground to a jetty on the bank of the Thames. On this gantry were mechanical facilities for handling five separate cables simultaneously and at the extreme end, alongside the river, were housed powerful winches for pulling the long lengths of cable either direct from the works or from the coiling-down sites.

To protect the coiled-down cables new buildings were erected, the largest being 487 ft. long by 74 ft. wide and the arrangements permitted two cables to be loaded simultaneously. The steel gantry and other handling equipment were designed and con-

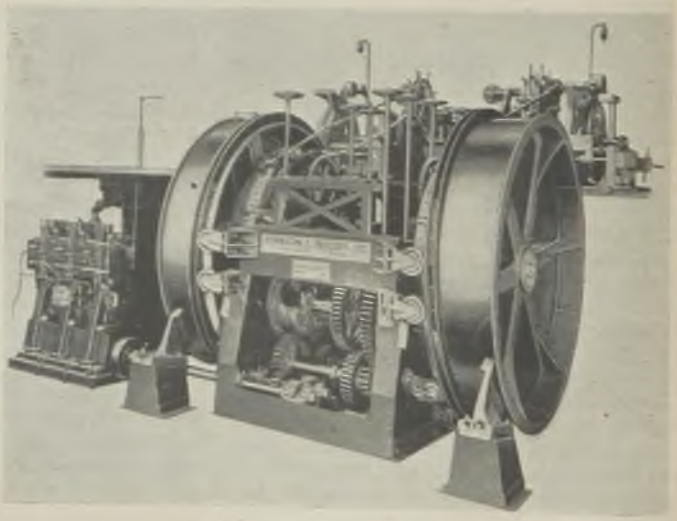
structed by the company's civil engineering department. The period for loading each individual cable occupied several days and the whole length. For this purpose the Henley design of straight-through lead press (already described in the *Electrical Review*) was considered to be the most suitable and actually over 80 per cent. of the total was produced in presses of this type, mostly in Henley factories, but partly in the works of other cable manufacturers.



Section of the "Hais" cable and the special cable coupling, showing (*a*) the method of coupling two cable ends by means of the split muff and (*b*) the coupling end with swivel yoke end attached

for long periods one or other of these cable ships was continuously alongside the works jetty.

For use in the manufacture of "Hais" cable Richard Johnson & Nephew, Ltd., supplied 4,700 tons of galvanised cable wire, representing 20,295 miles of 0·192 in. diam. wire. At the peak period over 200 tons a week were produced.



Johnson & Phillips' combined picking-up and paying-out gear specially designed for handling "Hais" cable

Of the major problems of manufacture involved in the making of these 30-mile and longer lengths of cable (30 nautical miles of 2-in. cable weighs 1,000 tons and 35 nautical miles of 3-in. cable weighs 2,000 tons), none was perhaps more important than the question of the integrity of the lead alloy tube throughout

No lead press or cable-makers' works was capable of producing or handling lengths of lead alloy tube of the total length required

for these cables and consequently operatives had to be specially trained in the technique of making special lead-burnt joints which would enable individual lengths to be joined up without affecting the overall integrity of the tube, the resultant weld being at least as strong as the tube itself.

Many other major problems were involved in the successful completion of installations of this type of pipe-line, not the least being the production of suitable couplings. These couplings were required to connect individual lengths of cable together if necessary and also to be suitable for the repairing of the cables should they become damaged as a result of accident or enemy action. A special feature was the use in these couplings of light copper diaphragms which are blown out by the pressure of the oil on the completion of the coupling. Valves are also provided to enable the pressure to be tested and adjusted if necessary during manufacture.

Immense Quantities of Materials

Some idea of the colossal quantities of raw materials required for this vast project may be gathered from the fact that approximately 12,000 tons of lead, 5,600 tons of steel wire and strip and large quantities of other materials were consumed. A 35-nautical-mile length of the cable makes a coil 65 ft. 6 in. in diameter by 10 ft. 6 in. high and weighs about 2,000 tons.

Simultaneously with the development of the " Hais " cable an alternative system was prepared employing 20-ft. lengths of 3-in. diameter steel pipe welded together into 4,000-ft. lengths, which were wound on floating drums (H.M.S. *Conundrums*) 40 ft. in diameter by 60 ft. long and carrying 70 miles of pipe-line. Among those co-operating in producing this " Hamel," as it was called, were A.I Electric Welding Machines, Ltd., British Insulated Cables, Ltd., Renold & Coventry Chain Co., Ltd., J. & E. Hall, Ltd., and the British Thomson-Houston Co., Ltd.

It was not unnatural that it should be decided to use Johnson & Phillips' paying-out and picking-up gear for laying the pipe-lines across the English Channel. For over sixty-five years J. & P. submarine cable-laying equipment has been used in many parts of the world. To meet the urgent need, the G.P.O. placed at the disposal of the Petroleum Warfare Dept. a complete J. & P. submarine cable picking-up and paying-out gear, which had just been completed for them, and also gave the makers valuable technical information in redesigning the haul-off arrangements.

As in no circumstances was the first pipe-line (2 in. dia.) to be bent to a smaller radius than 5 ft. this meant an alteration of standard designs. A new haul-off drum of 10-ft. dia. and fleeting ring, together with roller-type bow and stern gear, were produced and subsequently fitted to H.M.S. *Holdfast*. The decision in June, 1943, to increase the bore of the cable to 3 in. necessitated further alterations and additions to the gear on H.M.S. *Holdfast*, and in the meantime instructions had been received to duplicate the equipment for installation in a second ship. Later, further orders were given to equip two larger vessels, H.M.S. *Sancroft* and H.M.S. *Latimer*, which could each take and handle 100 miles of 3-in. cable, weighing approximately 6,000 tons. At the same time the second set of equipment of the *Holdfast* type was installed in H.M.S. *Algerian*, and a spare set of laying equipment was manufactured for stock. Special J. & P. tubular steel bridges and hauling gears were also designed and manufactured to unload cable brought to storage sites. During the trials at Swansea the shore ends were handled by tank-landing craft using large cable drums, but this was not entirely successful, and five shore end barges were therefore specially equipped.

Laying Operations

In order to be of the maximum value to the invading armies these cables had to be in position and capable of service as soon after " D Day " as possible, and the whole of the careful planning and concentrated efforts which had gone into the manufacture of the cables would have been wasted without the courage, initiative and resource of the crews manning the cable-laying craft. As soon as the mines had been swept to the approaches to the tip of the Cherbourg Peninsula, " Operation Pluto " began and by August 12th the first pipe-line was in operation. Now no fewer than twenty are in use, sixteen of 35 nautical miles between Dungeness and Boulogne (ten " Hais," six " Hamel ") and four of 70 nautical miles between Sandown, Isle of Wight and Cherbourg (two " Hais," two " Hamel "). Those responsible for the construction of the pumping terminals and the supply of pumping plant, etc., included A. Reyrolle & Co., Ltd., the Isle of Wight Electric Light & Power Co., the Folkestone Electricity Supply Co., Ltd., and the County of London Electric Supply Co., Ltd.

Views on the News

Reflections on Current Topics

AS I hinted a fortnight ago, it now seems almost certain that the next British Industries Fair will not be held until 1947. February 20th I have heard mentioned as the probable opening date so it appears that the wishes of those who wanted the Fair to be held later in the year, in May or June, are not to be gratified. On the other hand I gather that a venue in or near London is practically certain. A full statement giving definite details is expected to be made in the House of Commons within the next few days.

* * *

Should our factories "go to ground" even now security considerations no longer operate? Raising this question in *The Times*, a correspondent suggests that the Government should appoint a commission to inquire into the advantages and disadvantages which have been experienced both in Britain and Germany from the establishment of underground factories. He points out that the use of electricity for power dispenses with the necessity for chimney stacks, that daylight is inadequate and too variable for modern factory requirements, and that air conditioning has made open windows unnecessary. The surface of the land could be used for houses and sports facilities. Most of the above-ground factories too, he says, have worked in artificial light because of black-out precautions and nightwork. There is no reason why a properly electrified underground factory should not be as efficient and healthy as one on the surface.

* * *

Readers may remember that in the *Electrical Review* of December 29th, Mr. Ernest R. Gilbert gave details of his plans for a kitchen for "better-class" houses. An opportunity is now given of seeing these abstract ideas in concrete form, though "concrete" is scarcely an apt word to use, for the whole assembly is in aluminium. The kitchen forms part of an exhibition now being held for a month at Selfridge's, London, and which later is going to Birmingham, Manchester, Liverpool and Glasgow. Practically no deviations have been made from Mr. Gilbert's original scheme, the only really conspicuous alteration being the moving of the clock to its more logical position above the time-controlled cooker. With its carefully-thought-out mixture of plain and coloured aluminium, the kitchen is certainly one of the most attractive I have seen and it is surprising how much apparatus has been fitted into an actual working area of 88 sq. ft. while still leaving plenty of room to move about. Considerable attention has been paid to detail both as regards convenience and appearance. Housewives will particularly appreciate the plentiful provision of hot-plates (three) and the permanent fixing of the wringer over the washer in such a manner that it can be swung out of the way parallel with the wall when not required. The working level has been fixed somewhat lower than that generally accepted now as being the most convenient, 32½ in. instead of 36 in. Unfortunately it has been possible to include only dummy electrical apparatus and it is a pity that E.D.A. and electrical manufacturers have been unable to see their way to co-operate in providing the finished product.

* * *

An Ipswich butcher was recently fined £5 for wasting electricity in his shop. This was a lighting offence but apparently by no means a light one, for the *East Anglian Daily News* reports that "in the shop window the inspector found two electric lamps alight, each of 60 kilos, and in the shop itself, which was quite well lighted and well-equipped, were five similar lamps alight, making a total of 420 kilos." The man must have been using small searchlights.

* * *

Last week I paid a visit to Mr. A. Montgomery, secretary of the National Register of Electrical Installation Contractors, at the Register's new offices, 13, Victoria Street, S.W.1. "New" is perhaps a strange word to use for they are in one of the older buildings in the Street of Consultants next door to a large gap where before the war stood the offices of Handcock & Dykes (Mr. A. H. Dykes is vice-chairman of the Registration Board). Mr. Montgomery tells me that he and helpers spent a great deal of time repairing and decorating the rooms and I must say that the result is very creditable, for a lot needed doing after the shaking up and subsequent vacancy for a long period.

* * *

Leaving my radio set on after the one-o'clock news last Saturday I accidentally heard a talk on bee-keeping, a subject of which I know little, although I appreciate the results. But I was immediately interested when I heard the speaker refer to Wedmore's "Manual of Bee-keeping." I have since ascertained, as I expected, that the author of this book is no other than Mr. E. B. Wedmore, who has just retired from the directorship of E.R.A. As his friends know, Mr. Wedmore is an authority on bee-keeping, which has been his hobby for many years and is now, no doubt, keeping him busy.—**REFLECTOR.**

Coil Forming

Improved Method of Manufacturing Toroidal Chokes and Transformers

By Ernest B. Driver

IT is well known that the magnetic core of toroidal chokes is a continuous ring formed of (or containing) a magnetic powder or, alternatively, of a number of stampings consisting of continuous rings of sheet iron, or other magnetic material, laid one upon the other in sufficient numbers to give the desired magnetic cross-sectional area.

The current-carrying winding or windings consist of one or more coils wound around the ring so that the material forming the ring becomes the magnetic core of the winding. In those cases in which a joint in the ring is not permissible, or desirable, the method hitherto adopted for making these coils is by winding slightly more than the requisite amount of wire on a small bobbin and by mechanical means causing it to wind round the core, passing through the ring once every revolution. The end of the wire is held fixed while this proceeds so that each revolution of the bobbin through the core winds on an additional turn of wire. The process is slow and has the disadvantage that the space at the centre of the ring unoccupied by the wire must be sufficiently large to allow the bobbin to pass through. Furthermore, it is difficult exactly to estimate the required amount of wire so that it is the usual custom to allow a small excess which remains on the bobbin when the desired number of turns has been wound around the core.

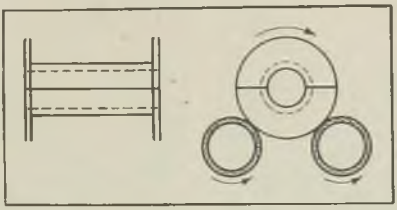


Fig. 1.—Split bobbin which, after assembly on core, can be rotated by pressing flanges against rubber-faced wheels

An improved construction is to wind the coils on one or more bobbins, or formers, which are subdivided and assembled in position either by means of a quick-drying adhesive material or by a simple mechanical interlocking device.

The actual operation of winding the necessary turns on the bobbins is accomplished by rotating them in any convenient manner, a suggested method (Fig. 1) being to press one or both of the flanges against rotating rubber-faced wheels.

With this method of winding it may be convenient to depart from the ring-shaped core and to substitute a core which is, for example, hexagonal in shape with one or more bobbins on each, or certain, of the six limbs forming the hexagon. In many cases a rectangular core will be preferred, in which event either one or two limbs can be wound. The depth of the windings on the bobbins can then be such that their external surfaces have only sufficient clearance between one coil and the other, or between the coil and the limbs of the core, as electrical and mechanical considerations deem desirable.

Generally the cross-section of the core under the windings will be circular, but, particularly if stampings are used, it may be stepped so as to approximate to a circle, or left square, if large clearances are not undesirable.

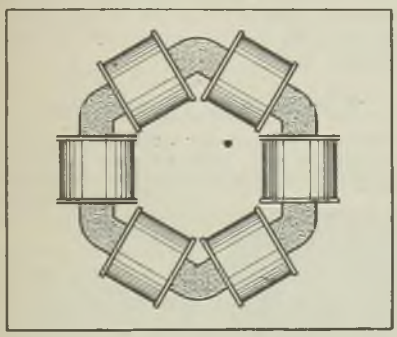


Fig. 2.—Hexagonal choke

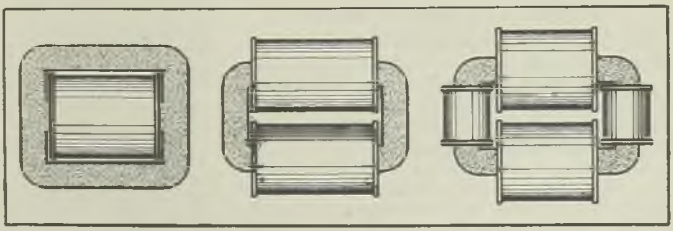


Fig. 3.—Alternative types of cores

Electrode Boilers

Non-Storage Off-Peak Heating

HEATING by electrode boilers without thermal storage is the subject of a paper by Mr. JAMES JAMIESON submitted last week to the Institution of Heating and Ventilating Engineers.

The author points out that the views he expresses are based entirely on results obtained. He explains that the decisive consideration is the load curve of the network supplying the electricity, but in the majority of cases restricted-hour or off-peak tariffs can be offered that do not necessitate heat storage. With the aid of typical load curves representing very dissimilar areas the author explains why restriction of supply (up to three hours) need not be an inconvenience, if the heating system is well designed, even in really cold weather.

Load Diversity

Heating, hot water and cooking loads in hospitals and institutional buildings tend to dovetail into each other, so creating reasonably good diversity. Indeed, with decentralised equipment it is commonplace to find that the maximum demand does not exceed 60 per cent. of the calculated maximum load; similar results are observed with self-contained units.

The author has somewhat laboured his approach to the subject, but claims justification by reason of the fact that non-storage off-peak heating has been put to the test time and again and has proved itself in practice. If the essential services in hospitals can be maintained in that way, then the same method can be applied equally well to other kinds of buildings.

Records need to be kept over an appreciable time, since the drying-out of a building can materially affect kWh consumption. The author's charts indicate a total drop of 16 per cent. before a stable state was reached after two years in a warehouse heated by a low-pressure hot-water installation with a low-voltage electrode boiler of 200 kW restricted for two hours during the afternoons.

Response to Climatic Changes

The ability of the electrode boiler closely to follow demands imposed by climatic changes is commended for consideration. The facility of almost instantaneous response is not possessed to anything like the same degree by any other types of heat producers.

An account is included of investigations into glasshouse heating, with day and night kWh consumption graphs, showing that the steadier temperature that can be maintained electrically results in a larger crop yield. But what is most interesting is the small amount of heat needed in daytime; the major requirement is at night (ratio of 1 to 4·5) and with the approach of better spring weather there are frequent occasions on which the electrode boiler is switched off entirely during the daytime. That condition would be quite impossible with a fuel-fired boiler; even a slow fire consumes fuel needlessly. Similarly in respect of office buildings, expressions of appreciation of "better" heating, especially in the mornings, would be more correctly expressed as "more regular" heating.

In general to-day, with basic costs as they are, electricity appears to be quite competitive. Decentralisation by the use of electrode boilers reduces the losses inherent in the distribution of heat through mains to dissociated buildings like hospitals and institutions, which can be likened to district heating schemes in miniature. In many instances which have come under the author's personal review, nearly one-third of the fuel consumed annually has been used for no other purpose than to compensate for losses from heat mains.

Crompton Centenary

IT is only five years ago since Colonel R. E. B. Crompton died. He had then reached the advanced age of ninety-four and so the centenary of his birth on May 31st, 1845, falls close upon his death.

Col. R. E. B. Crompton

For twelve years he was a soldier but left the service in 1875 and later formed the firm of R. E. Crompton & Co. (predecessors of Crompton - Parkinson, Ltd.), through which he introduced (in 1878) Gramme's dynamo into England. From that time onwards his arc-lighting installations had a great success and he was responsible with the Edison Swan Co. for the design of a power station near Victoria in the early eighties. He gave valuable evidence during the passage of the 1882 Electric Lighting Act and participated in the construction of further power stations on the Continent and in London.

But power and lighting work was only one aspect of his versatility. He was concerned in many other electrical developments and may truly be said to have done as much as any man to establish the British electrical industry. A brief study of his career was published in the *Electrical Review* of February 23rd, 1940.

Electricity Supply in 1943-44

Comparison with Earlier Years

THE Ministry of Fuel and Power has issued its second Statistical Digest which gives detailed information regarding the coal-mining industry and of the electricity supply and gas industries. The tables relating to electricity supply give particulars of generation by local authorities and companies, and the output of various classes of station (coal, water power, etc.); classification of stations according to kWh generated; employment in power stations; and details of consumers, sales and revenue. The last table is reproduced: we hope to publish the others next week.

CONSUMERS, SALES AND REVENUE

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

NOTES.—Consumption by domestic consumers is estimated to have been 5,360 million kWh in 1938. The corresponding provisional figure for 1944 is 7,000 million kWh. The companies' year is that ending December 31st and public authorities' that ending the following March 31st or May 15th.

CORRESPONDENCE

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

Catalogue Sizes

AS one who has to handle and place orders for a large range of products, electrical and otherwise, my catalogue shelf necessarily contains some hundreds of an ill-assorted collection of books large and small, and pamphlets. Attempts to keep these in alphabetical order are difficult. The result is that when I wish to purchase I invariably grab one of the convenient-size books and send my inquiries to the people concerned. Those who issue small-size books and pamphlets lose their fair share of chance of sale. Why not stick to a size approximately quarto?

Leeds. A. F. CARTER.

Portable Tools, Plugs and Sockets

THE references to portable tools, plugs and sockets, etc., in the May 11th issue of the *Electrical Review* evade the main issue as to why accidents occur in industry, with the present type of portable apparatus.

The solution does not lie in ensuring that the earth connection is in order, nor in the affixing of labels to portable tools. I agree with Mr. K. M. Mackenzie that a memorandum from the Factory Inspectorate would not only be timely, but is long overdue. The only solution to this very important problem is the use of low-voltage, *i.e.*, 25-V, apparatus. In my opinion low-voltage apparatus should be covered by a Factory Act Regulation. R. BENNETT,

Sheffield. *Chief Electrical Engineer,* Thos. Firth & John Brown, Ltd.

Wrongly Connected Switch.—At an inquest on a fourteen-months-old girl at Stockton-on-Tees it was stated that the child received a fatal shock while playing with the flex of an electric iron which her mother thought had been switched off. Evidence was given that the connection leading to the iron was broken and the terminals were exposed. The switch was wrongly connected so that when it was "off" the connector was still alive.

I.E.S. Annual Meeting

AT the annual meeting of the Illuminating Engineering Society on May 15th the president (Mr. E. Stroud) expressed the gratitude of members for the victorious conclusion of hostilities in Europe and read out a congratulatory telegram from the Illuminating Engineering Societies of Australia. He then presented the annual report showing a progressive growth in membership, which now exceeded 1,600, and stated that ten Centres and seven Groups were now in operation. Centre status was about to be granted to the recently formed Groups in Edinburgh and Liverpool, and since the opening of the present year a new Group had been formed at Halifax.

Reference was made to the successful publication of the six Lighting Reconstruction Pamphlets, and it was recalled that during the past year an increase in subscriptions, to provide for extension of administrative arrangements at headquarters and to facilitate the development of post-war activities, had been approved by members. In this connection the Council had appointed Mr. Raymond Pye as secretary of the Society.

A resolution approving the adoption of the report and accounts was proposed by Mr. A. E. Darlington, seconded by Mr. S. D. Lay, and carried unanimously. It was reported that new officers and members of Council for the forthcoming session would be as follows :—President: Mr. H. C. Weston; vice-presidents: Mr. Howard Long, Mr. H. E. Chasteney and Mr. J. M. Waldram; hon. treasurer: Mr. N. V. Everton; hon. secretary, Mr. J. S. Dow; members of Council: Mr. J. N. Aldington, Mr. M. G. Bennett, Dr. W. M. Hampton, Mr. A. G. Higgins, Mr. J. S. Preston, Mr. A. J. Pashler, Mr. E. B. Sawyer, Dr. W. S. Stiles and Dr. W. D. Wright.

After the formal business an address on "Daylight and its Penetration into Sea Water" was delivered by Dr. W. R. G. Atkins, O.B.E., F.R.S., in which measurement by photo-electric methods was described.

New Spectrometer

A NEW X-ray spectrometer has been developed by the North American Philips Co. Only one instrument has been produced so far. It is described as an extremely accurate means of directly measuring the distribution and intensity of X-ray reflections. For certain applications, it is claimed to have some advantage over conventional diffraction procedure, which entails exposure and development of film besides measurements and computations. A scanning device, having a Geiger counter tube arranged to traverse a graduated quadrant, is used in combination with suitable scaling circuits. The intensity measurements are quantitatively accurate and can, therefore, be used to determine composition of crystalline mixtures. Quantitative analyses of mixtures can be obtained in a few minutes. The specimen holder intercepts the X-ray beam and deflects portions of it at various fixed angles. When the Geiger counter tube is moved around its quadrant, it measures angular displacement and the intensity of the deflected beams. A DC microammeter reads the intensity and the quadrant, marked in degrees, shows diffraction angles. A stepping counter, employed in conjunction with a specially developed scaling circuit, provides a means for exacting quantitative determination of intensity.

The spectrometer is AC mains energised and its overall dimensions are 30 in. wide by 44 in. high by 44 in. long.

Power from Process Steam

INDICATIONS as to the most economical systems to adopt in works requiring both electricity and steam were given by MR. W. A. PAIN in a paper presented at a meeting of the Midland Section of the Institute of Fuel on Wednesday. Mr. Pain points out that one of the important advantages of steam as a heat-carrying vehicle lies in its high heat content, resulting from its latent heat. Steam can be made to give up its latent heat only by condensation and this heat is given up at a temperature depending on the pressure at which condensation is effected. Failure to appreciate this factor has resulted in a number of apparent breakdowns of power-process schemes.

Explaining the fact that in a typical super power station for every 100 units of heat energy obtainable from the fuel only 29 units are converted into power, the author points out that even this figure of 29 units is made possible partly by the use of bled steam. Providing the whole of the exhaust steam can be usefully employed for heating purposes the efficiency of a power heating installation is, except for losses by way of radiation, leakage, seasible heat in irrecoverable condensate, etc., 100 per cent., and the efficiency of the power-producing side of the system is of no great moment. It can of course be argued from the standpoint of national interest that the efficiency of the power unit should be as high as possible, so obtaining maximum power output from a given weight of steam, but efficient units are relatively costly and there is no incentive to a power-steam user to install expensive generating plant merely for the pleasure of passing steam direct to the heating system through a reducing valve.

The choice of plant to be installed in any given case requires the most careful consideration and analysis if all the possibilities of a power heating scheme are to be realised.

Buoyant Cable

PART of the story of the manner in which the menace of the magnetic sea mine was overcome has been released by the Admiralty. The most successful of the several methods tried was the "Double L" (longitudinal) sweep by two ships each towing a long tail of self-buoyant electric cable, energised in such a way as to produce "surges" downward into the sea, thus creating a magnetic field of sufficient strength and duration to explode the magnetic mines. The buoyant cable is manufactured by W. T. Henley's Telegraph Works Co., Ltd., and Callender's Cable & Construction Co., Ltd. The Henley variety consists essentially of a core of "flat" tennis balls round which are wound the copper strands which form the conductor, the insulation being rubberised tape which is vulcanised; the diameter is 3.5 in.

PERSONAL and SOCIAL

News of Men and Women of the Industry

ON Saturday last Mr. Churchill announced the composition of the Government which is to conduct the affairs of the country between now and the General Election in July. Major Gwilym Lloyd George is re-appointed Minister of Fuel and Power and Sir Andrew Duncan remains Minister of Supply. Mr. Oliver Lyttelton succeeds Mr. Hugh Dalton as President of the Board of Trade and will also act as Minister of Production. Mr. Bevin is succeeded as Minister of Labour and National Service by Mr. R. A. Butler and Mr. Herbert Morrison is followed as Home Secretary by Sir Donald Somervell. Mr. Duncan Sandys continues as Minister of Works and Mr. W. S. Morrison and Capt. Crookshank as Minister of Town and Country Planning and Postmaster-General respectively.

Among the new junior Ministers are the following:—Parliamentary Secretary to the Ministry of Fuel and Power, Capt. Sir Austin Hudson; Assistant Postmaster-General, Major W. J. Anstruther-Gray; Parliamentary Secretary to the Ministry of Supply, Mr. R. V. Grimston; Parliamentary Secretary to the Ministry of Town and Country Planning, Mr. Ronald Tree; Parliamentary Secretary to the Board of Trade, Capt. C. Waterhouse; and Secretary, Department of Overseas Trade, Mr. G. S. Summers.

Mr. E. Binns has been appointed chief electrical engineer and manager, Oldham Corporation. Hitherto Mr. Binns has been joint chief electrical engineer and manager with Mr. R. G. Whitehead, who has retired.

Sir George E. Bailey, C.B.E., has been appointed managing director of Associated Electrical Industries, Ltd.

Mr. Claude Wickard has become head of the United States Rural Electrification Administration upon resigning the post of Secretary for Agriculture.

Mr. A. V. Milton, head of A. V. Milton & Co., electrical engineers of Bevington Hill, Liverpool, has been elected chairman of the Merseyside district branch of the Electrical Contractors' Association. The vice-chairman is **Mr. T. R. Jones,** managing director of Tom Jones (Electrical Engineers), Ltd.

Mr. G. Geddes is recommended by the Hackney Establishment and General Purposes Committee for the position of shift charge engineer rendered vacant by the resignation of **Mr. H. Stanley.**

Mr. T. J. Parker has been appointed chairman of Amalgamated Wireless (Australasia), Ltd. Mr. Parker, who has been a director of the company for many years, succeeds Sir Ernest Fisk, who is now managing director of Electric & Musical Industries, Ltd.

Mr. C. H. Warne, F.C.C.S., F.I.A.C., has resigned his position as secretary of Constant Speed Airscrews, Ltd., Warwick, and is now the secretary of Lodge-Cottrell, Ltd., Birmingham.

Members of the United States Senate Committee on Communications, accompanied by the chairman of the Federal Communications Council and U.S. Army and Navy communications chiefs, visited Electra House, London, headquarters of Cable & Wireless, Ltd., on May 17th. The party was received by **Sir Edward Wilshaw,** chairman, and shown over the London telegraph station.

There will be general regret that **Mr. W. R. Rawlings** has found it necessary to retire from the Registration Board of the N.R.E.I.C. Since the inception of the Register Mr. W. R. Rawlings has been one of the representatives of the I.E.E.; he was elected honorary treasurer at the first annual meeting and continued to serve in that office until last week's meeting. He is one of the oldest members of the electrical contracting industry (if not the oldest) and was the first president of the Electrical Contractors' Association, occupying that position on two subsequent occasions.

Mr. W. R. Rawlings

Mr. E. F. Hollands, M.I.E.E., recently retired from the position of engineer and general manager of the Hutt Valley (N.Z.) Electric Power Board on account of ill-health. He had held the post for over fifteen years. Mr. Hollands is succeeded by **Mr. I. R. Robinson,** B.E., M.I.E.E., inspecting electrical engineer at the head office of the New Zealand Public Works Department, who was selected from sixty-eight applicants in his absence from New Zealand on Government business. We had the pleasure of meeting Mr. Robinson a short time ago while he was in London.

At the annual meeting of the New Zealand Institution of Engineers **Mr. W. L. Newnham** was elected president for the ensuing year with **Messrs. R. A. Campbell** and **L. B. Hutton** as vice-presidents.

Mr. Cyril G. Heywood, vice-chairman of Pinchin, Johnson & Co., Ltd., has been appointed chairman as from July 1st next. He succeeds Mr. Edward Robson who is retiring.

Mr. H. W. Graesser-Thomas (Yorkshire Tar Distillers, Ltd.) has been re-elected chairman of the British Plastics Federation for the year 1945-46. **Dr. W. J. Worboys,** Imperial Chemical Industries (Plastics Division), has been re-elected vice-chairman.

Mr. G. A. Reynolds, B.Sc. (Eng.), A.M.I.E.E., has been appointed mains superintendent in the Fulham Electricity Department at a salary of £652. Mr. Reynolds has been with the Yorkshire Electric Power Co. since 1933. He was educated at the Ashford Technical School, the Gillingham Technical College, the Leeds College of Technology and the Bradford Technical

College. After training at the Maidstone Corporation electricity works, he occupied positions with the Mid-Southern Utility Co. and the Mid-Cumberland Electricity Co.

Mr. J. A. Amschel has retired from the board of Lightalloys, Ltd., on account of ill-health, and **Mr. C. J. Fear,** secretary of the company, has been appointed in his place.

Appointments Vacant.—Among vacancies advertised in this issue are the following:—Principal for Newton Heath Technical School (Manchester Education Committee); senior charge engineer (Chesterfield Electricity Department); apparatus sales manager (West Gloucestershire Power Co., Ltd.); and public lighting engineer (Yorkshire Electric Power Co.).

Mr. L. J. Hunt, M.Inst.C.E., M.I.E.E., has retired and has resigned from the board of the Electric Construction Co., Ltd.

We are sorry to learn from Mr. F. Peake Sexton, managing director of the Thames Electric Co., Ltd., Kingston-on-Thames, that his elder son, **Lieut. Douglas F. M. Sexton,** R.N.V.R., has been reported missing since the landing at Walcheren, where he was in command of a craft in the support squadron. Before the war Lieut. Sexton was on the London sales staff of the Simplex Electric Co., Ltd.

Presentation to Sir Harry Railing

From G.E.C. Members of the I.E.E.

LAST week at the General Electric Co., Ltd., an event of particular interest occurred when a presentation was made to Sir Harry Railing on behalf of nearly 400 members of the Institution of Electrical Engineers in the G.E.C., to commemorate his year of office as President of the I.E.E., and as a token of the subscribers' affection and esteem. The presentation, which consisted of a silver cigarette casket and a book containing the signatures of subscribers inscribed on vellum, was made by Dr. C. C. Garrard, chairman of the organising committee, supported by Dr. C. C. Paterson. There were also present representatives from the various sections of the organisation, including home works and sales sections, the research laboratories, associated and subsidiary companies, the overseas organisations as well as from the armed forces.

The presentation to Sir Harry Railing
From left to right: Col. R. E. Keelan, Mr. J. E. Collyer, Dr. C. C. Paterson, Mr. J. R. Harding, Mr. A. B. Raworth, Sir Harry Railing, Mr. F. E. Rowland, Mr. E. G. Taylor, Dr. C. C. Garrard, Mr. H. Cobden Turner, Mr. F. Smith and Mr. J. Y. Fletcher

Dr. Garrard in a few informal remarks expressed the pleasure which was felt throughout the company when their chief was elected as head of the electrical profession. It was a unique achievement for Sir Harry to be at one and the same time head of the largest electrical manufacturing organisation in the British Empire, President of the Institution of Electrical Engineers, and chairman of the British Electrical and Allied Manufacturers' Association. The speaker also referred to the ties which united the chairman of the G.E.C. with the members of the staff and workpeople, which, he said, rested on the great tradition founded by the late Lord Hirst and sustained by the late Mr. M. J. Railing. In Sir Harry this tradition was continued, and he wished him sound health that he might continue his leadership for many years to come.

Sir Harry was deeply touched by this expression of affection and esteem, and expressed his gratitude and appreciation of the presentation.

Permanent Magnets

INFORMATION about the composition and treatment of metals used for making permanent magnets as well as comments on their design and testing are contained in Circular C.448, by Mr. R. L. Sandford, issued by the National Bureau of Standards, U.S.A. The summary of available information was originally intended to be supplemented by data obtained experimentally with the newer alloys, which work was interrupted by the war, but it was decided not to defer publication until the investigations had been completed. The Circular, of 39 pages with a bibliography of 38 references to the subject, shows that the advantages to be gained by the use of new and superior alloys cannot be realised unless the magnets are properly designed.

Critics of Our Industry

Ill-informed and Loose Thinking

By "Omicron"

BY virtue of their training, electrical engineers have acquired a knowledge of certain natural laws, in the application of which they are continually called upon to exercise powers of logical deduction. Their sense of responsibility has been developed through the onus that is on them to carry their ideas through to the end in giving practical shape to scientific principles within the limits prescribed by economic considerations over a term of years. Their projects often take time to mature and so planning ahead has become second nature. For such reasons electrical engineers are rather prone to be out of sympathy with those whose mental processes lack a similar definite background.

Influence of Politics

Steadfastness of purpose among electrical engineers is shown in their refusal to be unduly disturbed by a sense of frustration suffered through early restrictive legislation (one of the effects of which was to confine electricity distribution mainly to urban areas) or through the misuse of their industry as a counter in party politics or through the baulking of their efforts to supply electricity to the public at the lowest terms by such obstacles as discriminative coal prices and subsidies to local rates.

No doubt self-criticisms indulged in by a healthy industry have been taken too literally by more complacent people outside. We are not concerned here with those having political ends in view but rather with those who, no doubt disinterestedly, regard themselves as guardians of the public welfare but in whom the power of self-expression is more pronounced than is a grasp of the essentials of electricity supply conditions. These sometimes desire incompatible things. The first is a cheap supply of electricity available everywhere immediately. The second is that the well-considered plans of engineers for making the first possible shall fit into an old (and in its time, no doubt, useful) framework or else conform to some possibly desirable scheme that may for long years ahead exist only on paper.

Engineers and Public Opinion

As a rule engineers waste little time in answering criticisms that they would term "half-baked." Their close and successful association with the general public in disposing of their product on an ever rising scale in a highly competitive market leads them to believe that they know something of popular wishes. Nevertheless there is another contact with public opinion which counts and which may lead to protracted delays, the consequences of which (financial, operating and provision of service) may be serious. The democratic procedure of public inquiry into projects involving the construction of new power stations or extensions to existing ones may, if invoked at every opportunity, well defeat its object of securing overall advantage to the people of this country. It therefore behoves electrical engineers to understand the nature of all reasonable objections to their schemes and to meet them as far as may be consonant with the provision of electricity at prices that permit intense electrification.

Engineers, who do not profess to be authorities on many of the aspects involved, would naturally like some guidance on the siting of power stations. They are unlikely to obtain much help in this way from the April number of the *Architectural Review*, which deals with electricity in its regional setting and consists of a symposium prepared by the Association for Planning and Regional Reconstruction. This publication includes some candid opinions on the shortcomings of engineers and plenty of instructions on how they should order their own affairs, but not a similar measure of certitude regarding the conditions that engineers should strive to meet.

Duties of the C.E.B.

Judgment is passed on the Electricity Commissioners, the Central Electricity Board and the North of Scotland Hydro-Electric Board for not having realised their public responsibilities. How the Commissioners have failed, within the powers conferred upon them by Parliament, is not stated. The Central Electricity Board, it is averred, was not created to interconnect generating stations but to universalise and cheapen electricity by that means. Actually the duties of the Board are clearly laid down in the Act of 1926 as the giving of bulk supplies to authorised undertakings and the interconnection of selected stations. The Board may not give other supplies except (since 1935) to railways, the sole rights of distributing undertakings to deal with local consumers being jealously safeguarded. Yet the Board is held responsible for not having more fully electrified the countryside, as though this work by undertakings had not been proceeding apace for a number of years and makes a very favourable comparison with conditions which exist abroad, despite war restrictions.

In any case, easily obtainable authoritative evidence of the rapid growth of the consumption of electricity and progressively lowered average price, as well as of the reduction in the amount of coal used per kWh, should be enough to refute the charge of lack of administrative ability in the electricity supply industry. Even better results would have been achieved had not the scales been weighted against electricity supply, for instance, by steep rises in the cost of coal without regard to its heat content.

Policy of Co-operation

To what extent these achievements are to be credited solely to the C.E.B. cannot, of course, be exactly assessed, but there can be no doubt that very much has been due to its policy (for which it is, curiously, condemned) of close co-operation with the supply undertakings and of taking advantage of the practical experience of manufacturers and specialised consultants. The larger undertakings are alleged to have derived most financial advantages from the grid—a statement with which these undertakings are most unlikely to agree. The grid has been only a "piece-meal" development, it is stated; another contributor, however, more understandably regards it as one of the few examples of national planning we have.

In view of the numerous references that have appeared in the technical Press to research initiated by the Board, it is surprising to read here that it has carried out none. Only a couple of weeks ago an article in the *Electrical Review* on 132-kV cables illustrated the kind of aid it is giving manufacturers in providing facilities for testing high-voltage apparatus under operating conditions.

Water and Coal

None of the authors appears to be aware of the importance of water in the siting of power stations or even of the need for coal delivery facilities which, it is supposed, can be got as easily in the country as in a town, and all the thought devoted by engineers to these preliminaries of cardinal importance is dismissed as merely "unintelligent." Some object to the ugliness of power station buildings as such. Design by eminent architects provides no shield against censure, Battersea and Ironbridge being dismissed as decorative curiosities. Others see in chimneys and cooling towers the chief offenders though scouting the suggestion that has been put forward elsewhere that cooling towers should be designed in the same style as a neighbouring cathedral tower. Again, there is the view that power stations are too large in relation to other buildings to be æsthetically satisfying. They should therefore not be situated in urban areas; neither should they be constructed near mining towns, because, somehow, they would thus be destructive of "spiritual values." They can hardly be placed in the "wilds" of the country, because there they would spoil amenities of one kind or another.

How district heating, which obtrudes itself once more, is to be reconciled with such situations is not divulged and cooling towers would have to be provided in addition. The Gordian knot thus tied is cut by the simple assurance of one writer that a properly designed modern station need have no buildings, chimneys or cooling towers. As a contribution towards the serious problem of providing enough generating plant to meet the most conservative estimates of demands over the next few years comes the pronouncement that power stations on the Thames should be gradually extinguished by ukase of a committee presided over by an architect. The South-East England area was importing nearly 100,000 kW before the war, and the m.d. on its stations was over 2 million kW, so a good many additional "pylons" would be needed (but pylons are execrated) if, indeed, electricity were allowed to be generated anywhere for them to transmit.

British Achievements Disregarded

The eulogies bestowed upon the T.V.A. and other foreign hydro-electric schemes find support in the illustrations presented, but British engineers are not credited with similar capabilities, despite the monuments to their prowess that are to be found throughout the world.

Turning from the question of site to the actual buildings, engineers will naturally find themselves more in accord with those contributors who hold that the industry should not pretend to be other than it is, that power station buildings could be among the great architectural features of the age, that fitness for purpose should be a salient feature and that modern steel and concrete offer more scope for flexibility in treatment than do many of the older materials.

Regarding the view that power stations are too large to harmonise with the general scale of construction, engineers can only reply that power is being increasingly concentrated into as small a compass as possible. They can also point out that the smoke and dirt inseparable from the use of many small combustion appliances can be almost eliminated by centralising combustion and carrying it out under controlled conditions. They will also be inclined to agree with the writer who points out that no amenity can be obtained without something else being foregone to pay for it and that people whose demand impels the provision of any services should know something of their complexities.

Megawatt Telemetering

Distant Summation and Indication at Llynfi and Upper Boat

THE general telemetering requirements at two stations of the South Wales Power Co. were to sum the outputs of four generators at Llynfi* as well as of six machines at Upper Boat; also to indicate remotely the output of Llynfi at four different positions within that station and to indicate at Upper Boat (*a*) at two points, the output of Upper Boat, (*b*) at two points, the output of Llynfi, and (*c*) at one point, the combined outputs of Upper Boat and Llynfi.

The only pilot available between the two stations was a single line of 500 ohms resistance with an earth return. At neither station system was adopted, embodying a DC amplifier already described.* Essential features of this system are the absence of all moving contacts, independence of voltage variations, pilot resistance, etc., as well as the ease with which the outputs of a number of stations can be summed on a single indicator, or recorder.

Dealing first with the auto-repeater at Llynfi, alternating voltage is applied to the condenser F (*Fig.* 1) in series with the photo-cell. The point of junction of these two is connected to the grid of a Thyratron and the voltage at this point shifts its phase according

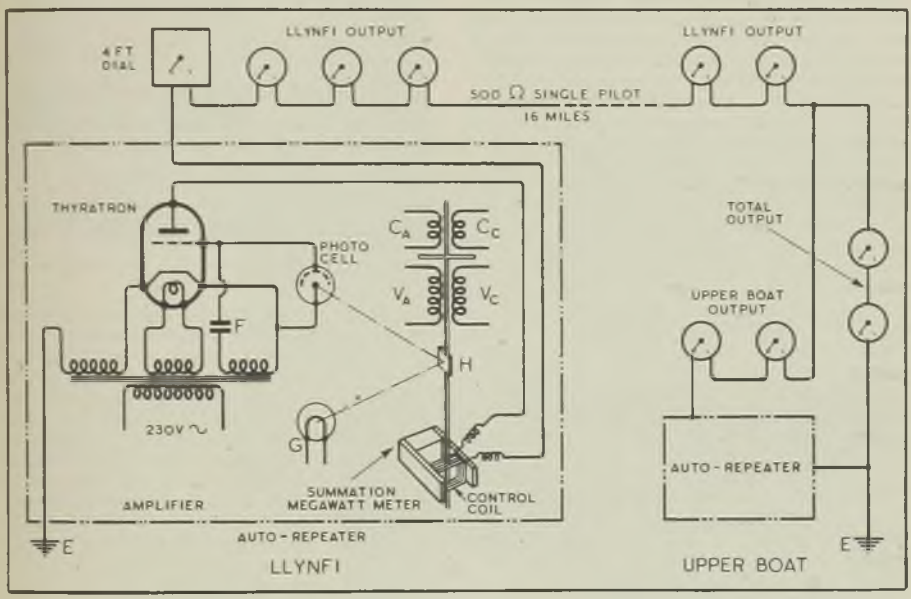


Fig. 1.—Diagrammatic representation of auto-repeater principles

could the output be regarded as being balanced between the three phases, and the measurement was complicated at Upper Boat by the fact that the generators were operating on two different systems (some at 33 kV and others at 66 kV) so that common voltage windings could not be used in the megawattmeters and, moreover, the indicators called for varied greatly in size, that in the power house at Llynfi being 4 ft. square.

To meet these various requirements the Everett Edgcumbe — Tinsley auto-repeater

to the resistance of the photo-electric cell, which is in its turn dependent upon the illumination falling upon it. According to the magnitude of this phase shift, the Thyratron becomes conducting for a longer or shorter period during each positive half-wave, since current flows so soon as the grid has reached a given voltage relative to the cathode and ceases directly the anode voltage has fallen to zero. In this way the mean value of the current passed by the Thyratron depends upon the quantity of light reaching the photo-cell. This current is passed through the control coil of the summation mega-

* *Electrical Review*, March 2nd, 1945, p. 297.

wattmeter, which coil is mounted on the same spindle as the induction disc, and this spindle also carries the mirror H.

A beam of light is projected from the lamp G on to the mirror and, after reflection, reaches the photo-cell, so shaded that, as a deflection of the mirror causes the beam of light to pass across it, the illumination changes from zero to the maximum. The torques due to the wattmeter disc and the control coil are in opposition and the layout is such that should the torque of the disc exceed that of the control coil, the beam of light will travel across the photo-electric cell in such a direction as to increase the illumination and, with it, the current through the control coil. The travel of the beam will therefore continue until this current is just sufficient to make the torques equal once more, when the movement will stop. The net result is that the mean value of the current flowing is directly proportional to the torque on the wattmeter disc, that is, to the power measured, without throwing any frictional or other load on the wattmeter movement. The controlled current, amounting to a few milliamperes only, is passed, after appropriate smoothing, through any number of moving-coil indicating instruments, some of which are situated at Llynfi and others at Upper Boat, 16 miles distant.

A similar auto-repeater is installed at Upper Boat where it sums the outputs of six generators (four at 33 kV and two at 66 kV) on a double disc megawattmeter employed for the purpose. The controlled DC output of this repeater is, as before, passed through a number of moving-coil instruments, each therefore indicating the Upper Boat output.

Fig. 3.—Megawattmeter (4 ft.) at Llynfi surmounted by station clock

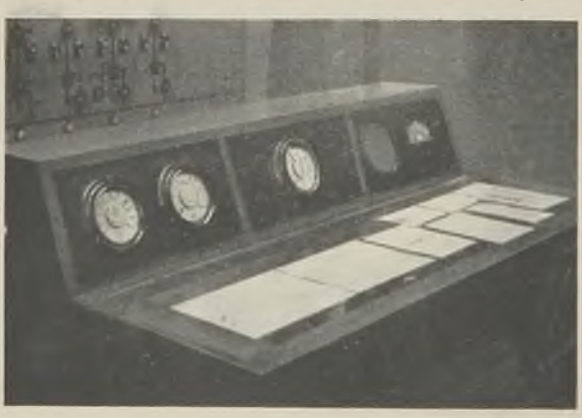


Fig. 2.—Three-instrument control desk at Upper Boat

In addition, by adding this current to that received from Llynfi and passing the sum through the winding of a single moving-coil instrument, the latter will indicate the total output of the two stations, as shown to the right of Fig. 1, on the control desk at Upper Boat (Fig. 2) carrying the three instruments just alluded to. The 4 ft. megawattmeter in the power house at Llynfi (Fig. 3) is surmounted by the station clock, the latter being operated, together with a number of other clock dials, from a standard "Synclock" master pendulum.

The work was carried out in conjunction with the Engineering Department of Edmundsons Electricity Corporation, Ltd., which acted on behalf of its subsidiary, the South Wales Electric Power Co.

Recording Film

IN order to reduce the variety of sizes of light-sensitive film and paper utilised for scientific and industrial recording instruments, excluding those employed for copying documents, B.S. 1193-1945 has been issued (2s. post free, from the British Standards Institution, 28, Victoria Street, S.W.1.) Six widths of film and five widths of paper are standardised; the lengths are 50 and 100 ft. for both with an additional 25 ft. for use in portable instruments. Thickness, perforations, dimensions of the cores and method of winding are prescribed.

COMMERCE and INDUSTRY

Industrial Finance. Higher Cable-making Wages.

Financing " Big Business "

THE recently-announced Finance Corporation for Industry, Ltd., has been registered with a capital of £125,000,000 for the purpose of providing medium and long term capital for " big business " in the immediate post-war years. The company, which has been formed jointly by the Bank of England, insurance companies and investment trust companies, will have as its chairman, Lord Hyndley, chairman of the London Committee of the Combined Production and Resources Board.

Correct Light and Colour

The advantages of studying colour and artificial light jointly are demonstrated in an engineering shop at Vickers-Armstrongs works on the Team Valley Estate.

The lighting plan, consisting of rows of 500-W " Cosmos " tungsten lamps in dispersive fittings symmetrically spaced at a height of 14 ft. above the floor, is of conventional design, but the walls and floor of the shop are all light coloured, and as a result it is possible to obtain a service illumination of 12-15 ft.-candles over the whole of the floor area. In addition, this combination of correct lighting and light coloured surroundings benefits operatives by reducing marked differences in brightness, and so preventing eye-strain.

Another feature of interest is the provision of an emergency low-voltage lighting system, supplementary to the main lighting, which is supplied by storage batteries. An illumination of 25-30 ft.-candles is obtained in the inspection department by utilising 80-W, 5-ft. fluorescent lamps housed in " Metrovick " patent continuous troughing which is mounted 10 ft. above floor level. This lighting scheme was designed by Metropolitan-Vickers lighting engineers, the wiring installation being carried out by F. Reid, Ferens & Co., Ltd.

Engineering shop at Vickers-Armstrongs' factory illuminated by 500-W " Cosmos " tungsten lamps in dispersive fittings

The National Register

The address of the National Register of Electrical Installation Contractors is now 13, Victoria Street, London, S.W.1 (Abbey 3132).

Contract Price Adjustment Formulæ

Increases are shown in the latest figures for the B.E.A.M.A. contract price adjustment formulæ which are as follows: (*a*) Rate of pay for adult male labour at April 25th, 95s. (against 90s. 6d.); (*b*) Costs of material: the index figure for intermediate products last published by the Board of Trade on May 19th is 181·0 and is the figure for the month of April (against 179·6 for March).

American War Contracts Cancelled

Approximately $11,000,000 of war contracts was cancelled in the first fortnight of May, according to the chairman of Westinghouse Electric Corporation. Operations most affected include the production of radio and electronic apparatus, propulsion equipment for ships and material for aircraft and tanks.—*Reuter* (New York).

Cable Makers' Wages Increased

The Joint Industrial Council for the Electrical Cable Making Industry has decided that a wages increase of 4s. 6d. per 47-hour week shall be granted to all adult males in Districts Nos. 1 and 2 (timeworkers and pieceworkers) with appropriate increases to all males under adult age; the increases to be added to the cost-of-living bonus. These increases will take effect on the third pay-day in June in respect of the period for which payment is made on that pay-day. The wages of female employees are not affected.

Furnace Discharge Indicator

A photo-electric amplifier has been successfully used to give automatic indication when a charge travelling through a 100-kW roller hearth G.E.C. electric furnace arrives at a position near the door and is ready to be discharged. The unit is AC mains operated and incorporates a C.M.G. 8A photocell which controls the anode current of an " Osram " L.63 valve in the anode circuit of which is a relay of the telephone type. So long as the projector lamp mounted on the opposite side of the furnace illuminates the photocell the grid of the valve is maintained at a negative potential and the valve anode current is zero. As the charge passing through the furnace

interrupts the beam the anode current rises and causes the relay to sound a warning buzzer or bell to indicate that the furnace is ready to be discharged.

The projector lamp is fed from a low voltage winding on the transformer and provision is made for checking the emission of the valve while in service. The interior of the furnace is capable of being raised to a temperature of 1,000 deg. C., but heat resisting glass windows protect the photocell.

"Sabre" Aero Engines

D. Napier & Son, Ltd., who are associated with the English Electric Co., Ltd., held an exhibition this week at the English Electric showrooms in London of the Napier "Sabre" aero engine. At a press gathering on Monday, Sir George Nelson told the story of the part played by the Napier company in the development of aircraft and made special mention of the "Sabre" engines employed in the Hawker-Typhoon and Hawker-Tempest machines. The latter was said to have been the only aircraft possessing the speed and fire-power necessary to catch and destroy the flying bomb in level flight during the attack on London and Southern England.

Disapproval of Central Board's Policy

At the annual meeting of the Association of Municipal Corporations at the Guildhall, London, on May 24th, the Mayor of Bolton moved a resolution that in connection with extensions at electricity generating stations, the association strongly disapproved of the Central Electricity Board's policy forcing generating station owners either to engage expensive consultants or pay large fees for professional services to local authority officials. The resolution was accepted and referred to the General Purposes Committee.

Farmers Visit Electrified Farm

A party of sixty Cheshire farmers, together with Mr. P. Bregazzi, borough electrical engineer and manager, St. Helens, and members of the Electricity Committee, recently visited the farm of J. Heyes & Son, Mossborough Hall, Rainford. The advantages of grain drying, pea vining, sterilising and milking by electricity were explained and demonstrated by Mr. Parkinson and Mr. Tomlinson of the Electricity Department and Mr. B. Heyes.

Control of Labour Relaxed

In accordance with the plan outlined in the White Paper on the control of industrial manpower between the end of the war in Europe and the defeat of Japan, a Control of Engagement Order which comes into operation on Monday restricts control of engagement to men in the age-groups 18-50 and to women in the age-groups 18-40 inclusive. The Essential Work Orders remain in force to ensure supplies of munitions for the Far East war, housing (including the housing materials), and essential civilian commodities. Direction will not be used, however, so long as the new Order smoothly effects the necessary re-allocation of labour. Managers, including superintendents and head foremen, and those engaged in a professional, administrative or executive capacity, other than certain "scarcity categories" (including professionally qualified engineers) are outside the scope of the Order. Any person within the scope of the Order is not prevented from approaching an employer with a view to engagement but no engagement can be made except through an employment exchange or approved agency.

Licensing of Building Work

Modifications have been made by the Ministry of Works in the arrangements for the licensing of building work. As from August 1st, for a period of six months, building work costing up to £10 may be undertaken without a licence (*i.e.*, at the rate of £20 per annum). In addition £2 of work may be undertaken in each calendar month from August to January, 1946. This monthly allowance, which is not cumulative, has been introduced primarily to avoid applications for licences for trifling repairs. Work of an emergency character may be carried out without waiting for a licence and Government-authorised work, work undertaken by a municipal authority and work carried out before August 6th will not be reckoned in arriving at the amount of work permitted without a licence.

The allowances will be applied to all separate dwellings individually; hitherto the great majority of blocks of flats or tenements were reckoned as one unit. Owners of large properties, such as blocks of flats, offices, etc., will be able to obtain licences to cover specified categories of maintenance and repairs over a period of twelve months. The Minister of Works will delegate to local authorities power to issue licences in respect of work costing less than £100; licences for greater amounts will be granted by the regional licensing officers.

Hearing Aid Association

The Hearing Aid Manufacturers' Association and Society of Aural Technicians, Ltd., has been registered as a company limited by guarantee without share capital to take over the assets and continue and develop the activities of the Hearing Aid Manufacturers' Association. The president is Mr. O. Ç. Leadbitter and the vice-president Mr. A. Poliakoff.

Carbon Products Association

The Carbon & Graphite (Products) Association, Ltd., has been registered as a company limited by guarantee without share capital, with the object of promoting and protecting the interests of British manufacturers of carbon and graphite products with due regard to the interests of the public. The first members are the Morgan Crucible Co., Ltd., the General Electric Co., Ltd., Reckitt & Colman, Ltd., James C. Waterhouse, Ltd., the Ever Ready Co. (Great Britain), Ltd., and the Ship Carbon Co. of Great Britain, Ltd. The registered office is at 1, Old Broad Street, E.C.2.

Radio Industry Council

The Radio Industry Council has now been registered as a company limited by guarantee without share capital. Its objects are to promote the interests of the British radio and television industry, to take over such of the property and fulfil such of the obligations of the Radio Manufacturers' Association as may

legally be taken over and carried out by the Association. Membership is to be confined to persons nominated as follows, viz., not more than four persons by each of the British Radio Equipment Manufacturers' Association, British Radio Valve Manufacturers' Association, Radio Component Manufacturers' Federation, and Radio Communication and Electronic Engineering Association. The subscribers are: Messrs. C. W. Eve, F. S. Mockford, and E. M. Lee, Major L. H. Peter, and Messrs. J. W. Ridgway, E. J. Power, H. Slater and F. B. Duncan.

Future of Electricity Supply

Regret at an important public supply service such as electricity being made the cockshy of political parties was expressed by Mr. W. P. Lilwall, president of the I.M.E.A., at a luncheon given to members of the Scottish Centre in the City Chambers, Glasgow, last week. During the last ten or eleven years, he said, the industry had been badly handicapped by the fact that no one knew what exactly was going to happen. Whatever the outcome of future reorganisation, it would not be so bad as the uncertainty which had prevailed during the past few years.

Lord Provost Welsh said that most of them recognised the need for a reorganisation of all the electrical undertakings of this country if they were going to give to the community the service that was needed. What form the changes would take would largely depend on elements they could not see clearly, but he had no doubt the tendency would be more and more towards public control. To give the cheap power that was needed something in the nature of a pooling of resources would be necessary. Complimenting the industry on its work during the war the Lord Provost said that it had stood up to a tremendous test, though the Germans, considering the opportunities they got, had done remarkably little damage. In Glasgow, he said, they missed the main station by about 200 yards.

America and the British Market

The American Chamber of Commerce in London has published a booklet entitled "American Participation in British Industry" covering the principal points which must be studied by any firm which contemplates extending or establishing the manufacture of its products in Britain. It is stated that an increasing number of inquiries is being received from American concerns for ways and means of establishing manufacturing facilities in this country.

X-Ray Crystallography

A summer school in X-ray crystallography will be held again this year in the Department of Mineralogy and Petrology, and in the Cavendish Laboratory, Cambridge, from September 3rd to 14th.

The school is conceived as a means of providing an introduction to the fundamental theory, methods and techniques of X-ray diffraction, so that those whose researches, whether in the universities or in industry, lie in the field of physics, chemistry, metallurgy, mineralogy, or biology may be able to recognise in their own work the types of problem to which these methods may with advantage be applied. The greater part of the course will be devoted to practical work on the interpretation of the various types of X-ray photograph. For the last two days, however, alternative lectures and demonstrations will be offered in A and B sections. The A section will include further steps, theoretical and practical, in the study of crystal structures, while in the B section some applications of the earlier work of the course to metallurgical problems will be studied.

A detailed syllabus and form of application for admission may be obtained from Mr. G. F. Hickson, M.A., Secretary of the Board of Extra-Mural Studies, Stuart House, Cambridge, to whom the completed application form should be returned not later than June 23rd.

Swedish Latin-American Trade

Swedish manufacturing interests have opened an extensive campaign to obtain a major share in Latin-American trade in the next few years, it is reported in U.S. trade circles. Some companies are said to be advertising in South American papers that they are ready to supply products immediately. The L.M. Ericsson Company is reported to have contracted with South American republics for over $7,000,000 worth of telephone equipment. This company, according to some reports, is installing automatic telephones in Medellin, Colombia, as well as extending lines in Bahia and Foraleza, Brazil, and carrying out a large extension in Bogotá.

M. Helge Ericsson, director of the Ericsson Company, has rejected an accusation made in the *New York Times* that his and other Swedish companies are competing "aggressively" with American enterprises for South American markets and are taking an unfair advantage of America's preoccupation with the Japanese war. He stated that the orders of which the *New York Times* complained were placed long before the war. Mr. Ericsson says:—"I cannot find that this is 'aggressive' as for a long time we have had a large market in South America with an appropriate selling organisation. I hope that free trade competition will be resumed as soon as possible as I am convinced that reconstruction and material prosperity can best be served by such a system."—*Reuter.*

Trade Announcements

The Northern Aluminium Co., Ltd., is opening sales and inquiry offices for the benefit of manufacturers throughout the country. The first of these offices to be opened is at 4, Chapel Walks, Manchester, 2, and plans are in hand to open others in London, South Wales, the North-Eastern area and Scotland. Arrangements have already been made to deal with inquiries at the company's works at Middlemore Road, Birmingham.

The Johnson Engineering Co. has returned to its premises at 86, Great Portland Street, London, W.1 (telephone: Museum 6363), its temporary premises at Leamington Spa now being closed.

Catalogues Wanted

Mr. H. H. Hywood, electrical engineer and contractor (temporary office 40, Coram Street, Woburn Place, London, W.C.1), asks for trade lists and catalogues, relating to cables, lighting and power accessories, lamps, motors, etc.

Export Prospects

The Part of the Consulting Engineer

AFTER a lapse of three years members and guests of the Association of Consulting Engineers, which now has a record membership of 188, gathered for luncheon at the Waldorf Hotel in London on Empire Day, following the annual general business meeting. Mr. D. W. Watson (Birmingham) chairman of the Association, presided. Mr. Spencer Summers (Secretary, Department of Overseas Trade) said it was unnecessary for him to dwell on the important part exports must play in the future of this country, or the handicaps under which it would labour due to loss of overseas investments in addition to increased local production in overseas markets. Last year he visited Australia and New Zealand and saw abundant evidence of a desire to make many things which formerly they obtained from home. Another fact that was sometimes insufficiently appreciated was that Britain had imported vast quantities of materials for the war on credit terms, so there were many countries holding large sterling balances which regarded payment in goods as the only satisfactory form of repayment. This country's change from a creditor to a debtor nation not only added responsibility to the task of expanding exports, but also made it the more difficult for Britain to help in the development of backward countries.

Home and Overseas Requirements

Manufacturers could not change over from war to peace production, or export methods, without help in the practical form of the return of their key men. It was tempting to regard overseas visitors anxious to know to what extent Britain could help them to obtain capital goods and all forms of equipment for a policy of industrialisation as customers whom, at all costs, one must endeavour to serve. Yet it would be a mistake to overlook the immense task of re-equipment in this country which could not be deferred while we supplied other countries with industrial equipment. It followed that a balanced judgment would need to be exercised between the supply of capital goods as an export in itself and the supply of capital goods for the cheapening of the goods for export.

The part which consulting engineers could play in exports was of the first importance and fully recognised in his Department. They were the "reconnaissance corps," for members would make contact with overseas projects at a very early stage, and certainly be in a position to influence the source from which the engineering supplies were obtained.

He sometimes wondered whether, in certain fields, British manufacturers had formulated plans sufficiently ambitious to cater for the demand which appeared imminent, and on a sufficient scale to make adequate contribution to the increased exports required. Consultants might come across shortages not so much based on temporary scarcity as upon fundamental deficiencies. There was widespread ignorance of the Department of Overseas Trade's constitutional limitations. The Board of Trade was responsible for policy and the Department of Overseas Trade was the instrument available to help carry it out. It provided the intelligence service but too few people had availed themselves of that general information and, more particularly, personal introductions in foreign countries which were of the greatest help to individuals abroad. The war had tended to prompt people to look to the Government for everything as a result of having to ask permission to do almost anything. Mr. Summers hoped that tendency would be short-lived and that the urge for self-help, enterprise and initiative would be given full scope once again.

Dr. J. F. Crowley, M.I.E.E. (London) spoke of the desire for close co-operation with the sister Association in the United States. Problems of reconstruction were peculiarly affairs for the engineer, but could not be proceeded with without priorities for materials, release of staff and permits for staff to travel wherever the work needed them. There should be close contact between the Association and Ministries, Embassies and Consulates to establish contact with engineers specially concerned in other countries. Government Departments could not take over the functions of individuals professionally abroad.

Consultants' Function

Sir Herbert Williams, M.P., proposed the toast of "The Association," remarking that the function of its members was to design works and select plant, but not to design plant, which was the manufacturers' concern. Mr. D. W. Watson (chairman), responding, wondered where all the engineers with adequate staffs and office equipment, etc., to deal with the reconstruction of devastated countries were to come from. They would have more than they could comfortably manage in this country for some years to come, but they must seriously consider their duty to humanity in helping to reconstruct abroad.

Sir Cyril Kirkpatrick proposed the toast of "the Guests" and Mr. John Green (B.B.C.) responded.

Control Relays

Service Experience and Operating Results of "Rythmatic" Equipment

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

ONLY comparatively few electricity supply authorities have been fortunate enough to have the facilities provided by one or other of the superimposed-current switching systems which were gaining attention just before the war. Facts relating to their general dependability will therefore be of service to every potential user requiring particulars of their reliability.

To give accurate percentages of failures during the war years is most difficult because staff shortage has made it impossible to keep elaborate life and maintenance records of each component part of the equipment. However, where A.R.P. devices were dependent upon relay operation more precise and comprehensive details have been recorded and, although these particular relays represent only 2 per cent. of the total number in use, the results are significant.

Taking such a group, there has been 0·3 per cent. failure in a total of 3,396 relays × signals in three years. It is important to note that this group was distributed over an area of 100 square miles, the farthest being 15 miles from the transmitting equipment, and that during this period five "maintenance and test" visits were made annually to comply with Ministry of Home Security directions.

RYTHMATIC CONTROL No.

Public Lighting/Restr. Hour Tariff. Relay No.

Police/Ordinary Relay Type

Misc. Volts Amps

Date Fixed	Address and/or Lamp No.	Date Defective	REMARKS (Defect and if changed)

Sample card for indexing relay faults

The relays are installed, where possible, inside buildings to protect them from the effects of the weather, but in several cases they are fixed in wooden boxes in the village constable's back garden. The actual causes of failure were as follows:—

(i) Faulty adjustment of the swinging armature, (ii) broken connection inside relay, (iii) relay adversely affected by a temporary borehole motor being used at a local pumping station, (iv) large power factor correcting condensers used in a brickworks and (v) network faults. Case (iii) trouble has occurred only once on the whole network and the peculiarities of the motor are being investigated, while in case (iv) an alternative supply point was found and that trouble has not recurred.

Street Lighting

With regard to street lighting, when one considers the totally unsuitable housing of such apparatus, as in the bases of lamp columns, especially the ancient ones where dampness and corrosion are given every chance to creep up the inside and where the vagaries of climate have full play through the badly fitting doors, it is small wonder that failures tend to become slightly more numerous. The relay case is initially very tightly sealed and is provided internally with a de-humidifier. Subsequently the proper fitting of the front case well repays inspection by the mechanic who has occasion to remove it, especially if the relay is to be housed in a none-too-weatherproof position.

Taking in this instance an average figure, owing to the absence of accurate records, the failures approximate to 2 per cent. for nearly 1,000 relays at any given inspection during the present winter. When substation control is more generally used and modern lamp columns with more suitable control compartments are erected, also the rewiring of mould-infested columns is carried out, it is confidently felt that this figure will be reduced more nearly to that given for the previous group of relays mentioned.

As soon as practicable it is intended to institute a card index system whereby the life of each relay, the fault-causing influences and the weakness of component parts or design will be more readily tabulated. This will allow the necessary action to be taken to correct or stem faults in good time.

Roughly 700 relays (1,500 cycles, 0·54/0·66 sec. rhythm) are in use for controlling the 0·2 ft.-candle intensity street lamps and all are extinguished within 50 sec. of a "purple" message being received, by pressing a remote-control push-button at the central station. Conversely, they can be re-lighted by the

pressing of another button after the " white " or " all clear " message.

To guard against total black-out, a further 300 relays (1,500 cycles 0·54/1·0 sec. rhythm) operate " Police " lighting at 0·02 ft.-candle intensity and these lamps remain on until dawn and throughout raid periods. The normal switching on and off is carried out automatically at dusk and midnight, or dawn, by means of time switches fitted with solar dials.

Test Set

Experience soon dictated that to test the relays thoroughly it was necessary to have at hand some form of miniature transmitting equipment, thus eliminating the uneconomical and inconvenient running of the main equipment every time a batch of relays required checking. Such a portable testing equipment which was devised by the manufacturers (Automatic Telephone & Electric Co., Ltd.) measures 13 in. by 16 in. by 8 in. and weighs 27½ lb. It has proved an invaluable adjunct both for test room use and more especially for tests *in situ*. The control frequency, selected on a multi-way switch, together with the rhythm, similarly selected, is superimposed on the local test leads to which the supply voltage is connected. It is valve operated and means are provided for adjusting the superimposed voltage (shown on voltmeter) so that the sensitivity of each relay under test can be checked on minimum (0·3 volt) as well as normal signal strength.

Portable valve-operated test set

Operation of the relay can be observed by signal lamps, should the relay front case not be removed, and a supply switch provides for isolating the set from the mains. To facilitate its use a specially made test clip is provided for clipping over the relay terminals in such a manner that it becomes unnecessary to wire each terminal separately, connection being made from the set through a multi-core flexible cable and spring-loaded stems to the terminal block.

Acknowledgment is made to Mr. P. G. Campling, chief engineer and general manager of the Bedford electricity undertaking, for permission to publish this information.

Cathode-ray Tubes

Characteristics of Luminescent Materials

AT a meeting of the Radio Section of the Institution of Electrical Engineers on May 15th MR. C. G. A. HILL, B.Sc., opened a discussion on the characteristics of luminescent materials for cathode-ray tubes. He stated that the accuracy with which the characteristics of a particular cathode-ray tube screen could be predicted from a knowledge of the phosphors before they were applied to the bulb was still very limited and varied considerably with the type of phosphor. This was chiefly due to insufficient control in some stages of tube manufacture and of some of the materials used.

Although several thousand different materials had been tried, the phosphors in common use could be classified, on the basis of both chemical composition and luminescent behaviour, into the following three groups:—Zinc and zinc-cadmium sulphides activated by silver, copper or manganese, or without added activator; manganese activated silicates, borates or phosphates of zinc or cadmium, with various matrix additions; and tungstates of a number of divalent metals. New materials about which little was at present known included a number of alkaline-earth silicates activated by europium, cerium or other rare elements. They were claimed to emit in the blue and near ultra-violet. A wide range of materials was available for white television screens. For colour television the best emission spectra depended on the system of transmission used. From purely optical considerations, the best solution was to choose three phosphors with colour co-ordinates as close as possible to the spectral locus in the blue, green and red, and to avoid the use of filters in front of the viewing screen. The emission spectra must always be matched with the spectra sensitivities of the pick-up devices to assure good colour rendering.

After briefly referring to phosphorescence, Mr. Hill discussed the efficiency of cathode-luminescent material, saying that it was important to distinguish between real variations in the efficiency of conversion of electronic energy into light and those effects due to the electrical properties of the screen. Sulphide phosphors in general showed a greater efficiency than other types. He also referred to secondary-emission, mechanical properties and general stability.

In the discussion which followed it was generally agreed that the present-day knowledge of the fundamentals underlying cathode-ray-tube screen behaviour was incomplete. A broad attack on the problems, with full collaboration between chemists and physicists, and dealing with the optics and electron-physics of screen behaviour on a logical basis was urgently needed. The use of the term " phosphorescence " was criticised on the grounds that this term was more commonly used in connection with long afterglows. In remarks on the mechanism of the excited luminescence, it was explained that with some phosphors ionisation was always associated with the existence of electron traps.

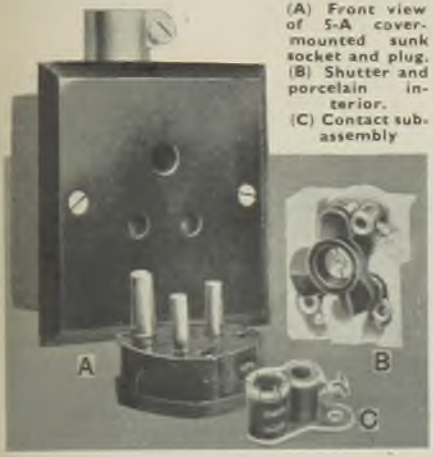
The difficulties experienced from the extreme susceptibility to contamination of some phosphors was stressed. The sulphides presented particular difficulties in this respect, and also in grinding operations. The importance of visibility as the ratio of trace brightness to background illumination was discussed.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Shuttered Socket Outlets

A NEW range of shuttered socket outlets for household use is being produced by VICTOR H. IDDON, LTD., Harper Road, Wythenshawe, Manchester, in association with Cooke & Ferguson, Ltd. The sunk type B.S. 5-A size



(A) Front view of 5-A cover-mounted sunk socket and plug. (B) Shutter and porcelain interior. (C) Contact sub-assembly

is fixed to the insulating cover (A in photo) of a 2¾ in. square by 1¼ in. deep sheet metal box by two captive 4BA screws with countersunk heads at 2⅜ in. centres, as suggested by the Ministry of Works for incorporation in factory-made houses.

Apart from the special mounting of the socket to the cover of the box, the new feature of the design is the patent anti-flash shutter which gives greater protection than the conventional type because the live terminals cannot be exposed by inserting anything in the earth socket. Only by the insertion of all three plug pins can contact be made with the live tubes, which safeguard is accomplished by shaping the three wings of the shutter B to operate in the following manner. An anti-clockwise motion is started by the insertion of the longer earth pin at the plug top and is completed by the shorter current-carrying pins. Each pin slides down an inclined plane, which forms part of each shutter wing. To ensure good electrical contact a special steel spring embraces each multi-split tube C to maintain pressure and prevent distortion. Each socket and its wiring terminal are rigidly riveted to a connecting plate firmly anchored in the porcelain interior of the socket which, in case uprating is adopted, can carry 10 A continuously.

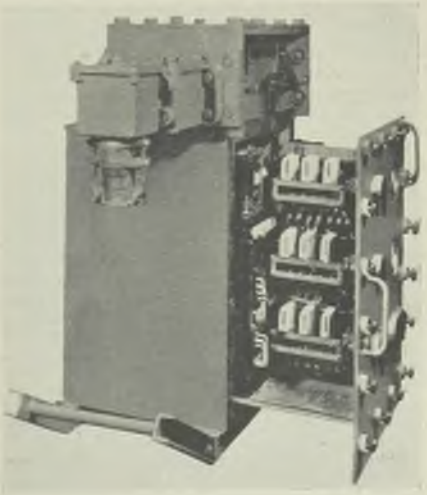
In order to satisfy other demands, apart from factory-made houses, the new safety socket is alternatively manufactured as a standard type with the porcelain interior partly sunk into a loose pattress, which can be readily detached. When the socket is mounted on the surface the pattress is automatically secured by the fixing screws, which simultaneously clamp the porcelain to the skirting board; when it is semi-sunk the pattress is omitted. Both are available in 5- and 15-A sizes, but to fill the gap between them prototypes of 3-kW all-purpose socket-outlets have been made in accordance with the recommendations listed in Par. 84 of Post-war Building Study No. 11, and will be available as soon as agreement has been reached on pin diameters and spacings.

Coal-drill Panel

Flameproof switchgear for coal drilling machines recently introduced by SIEMENS-SCHUCKERT (GREAT BRITAIN), LTD., Great West Road, Brentford, Middlesex, is a gate-end panel of the draw-out type which is unusual in that the whole of the gear within the main chamber is mounted on the inside of the front cover and is consequently withdrawn with the latter, so simplifying its maintenance. The front cover, which is supported on rollers, is withdrawn in carriage fashion to provide ready accessibility without the necessity of removing any piece of gear. The connection between the fixed isolator switch in the upper busbar chamber and the movable apparatus on the front cover is made by means of an internal free plug socket.

If a major repair becomes necessary the complete cover can be removed and a spare cover, with the apparatus already mounted on it, put in its place. No electrical connections have to be taken off or remade and the panel itself remains in its place, connected to the supply, so that it can be put back into operational order with the minimum loss of time.

Another useful feature is the method of



Gate-end panel for coal drill with withdrawable carriage

bolting the front and the top covers. Captive bolts are used, so that when loosened they are not removed entirely, but remain in the bolt holes of the covers. Thus, the bolts cannot be laid aside, with the risk of becoming dirty, or even lost, which might introduce a grave danger that a lost high-tensile steel bolt might be replaced by one made of ordinary mild steel.

The electrical gear, as in the case of the "fixed" drill transformer panels made by the company, comprises the busbars and isolators in the top chamber and, in the lower chamber, all mounted on the front cover, the air-cooled transformer for the low-voltage output for which the portable drills are wound, the pilot transformers and contactors for remote control of the drills, the circuit-breakers with overload, short-circuit and earth-leakage trips, the midget reversing switches to ensure correct drill rotation, the spark suppressors for intrinsic safety of the pilot circuit, and the plug sockets for the trailing cables.

Wire-Broadcasting

Obtaining High-Quality Reproduction

THE history and various forms of wire-broadcast systems were described by Mr. PAUL ADORJAN, M.I.E.E., when he gave the Thomas Howard Lecture to the Royal Society of Arts in London on May 23rd. He spoke of the effects of interference on radio reception and said that there was a great danger that our ears were being educated to accept musical reproduction utilising only a limited range of the frequencies which should be received for true reproduction.

The development of remote radio receiving stations supplying broadcast programmes by wire to a number of homes eliminated certain types of radio interference and later, by joining these systems to the national and international broadcast networks, systems were developed which had realised the true ideals of wire-broadcasting, that is, distribution of programmes by wire from studio to the listener. The number of programmes given on wire-broadcast systems varied from one to six, two being the most common. There was little information available on the number of homes receiving their broadcast programmes by wire in different countries, but in the United Kingdom there were 500,000 subscribers at the end of 1944.

In some countries wire-broadcast systems had now been joined up by direct wire link with the studios of their own broadcasting service. Before the war a scheme was started for providing a European network with headquarters at Zurich. It was proposed to have two or three circuits running through all large towns in Europe and into these circuits, according to a prearranged plan, the two or three most important or interesting programmes were to be supplied. The local wire-broadcast systems would then have a choice of these two or three foreign programmes besides their own home broadcasts. The system was, in fact, in operation between Switzerland, France, Germany, Austria and Italy, with occasional co-operation from other countries.

The cost of wire-broadcast systems in different countries had varied, but in most cases the charge to subscribers was (before 1939) 1s. 6d. a week, plus the cost of a wireless licence and loudspeaker.

Details were given of the different wire-broadcast systems, and the author stated that at least one form (audio-frequency rediffusion) was in operation covering several hundreds of thousands of homes. The advantage of audio-frequency over radio-frequency distribution was that the subscribers' apparatus was very simple. On the other hand with radio-frequency distribution it was possible to distribute a larger number of programmes on a common network. However, if restrictions were not imposed on the development of wire-broadcast systems there would be no difficulty in providing any reasonable number of audio-frequency channels. In any case three truly alternative programmes appeared to be sufficient.

I.M.E.A. Annual Meeting

Tredegar and South Shields Resolutions

AS we have already announced, the annual general meeting of the Incorporated Municipal Electrical Association is to be held at the Kingsway Hall, Kingsway, W.C.2, on June 14th. It will be the Association's fiftieth meeting and the agenda includes two resolutions from members. The first, to be moved by Mr. W. Davies, electrical engineer, Tredegar, requests the Minister of Fuel and Power to "consider the bringing into operation the Special Committee which was appointed in 1939 under the chairmanship of Lord Sankey to enquire into the control of gas, water and electricity undertakings by holding companies." The meeting is to be asked to express the view that "unless the power and ramifications of holding companies are fully investigated and understood by all sections of the community, any scheme of reorganisation, based on a desire to serve the best interest of the consumer, will inevitably fail."

The other resolution comes from South Shields and is to be moved by the chairman of the Electricity Committee, Councillor A. Stephenson. It calls for the rescission of Part III of the memorandum on the future of electricity distribution presented to the Minister of Fuel and Power by the Joint Committee of Electricity Supply Organisations (the "White Memorandum"). Part III forms the principal section of the memorandum; it recommends the setting up of an advisory committee by the Electricity Commissioners for the division of the country into electricity distribution areas and the establishment of area committees for those areas whose proposed duties are defined.

The resolution further proposes that the Minister shall be informed that the parties to the memorandum have been unable to agree upon the principles to be observed in relation to the ownership of distribution undertakings; the ownership of generating stations; and a national bulk supply tariff; and that, in the circumstances, the Minister shall be asked to seek the separate views of the various associations and groups on these important matters.

It concludes with the statement: "That this Association re-affirms its faith in the continuation and extension of public ownership and control of the electricity supply industry, as set out in the Association's Memorandum of Association, and that the Council be instructed to proceed in the conduct of the Association's affairs in accordance with this declaration."

Steel-Tank Rectifiers

Application to Broadcast Transmitters

MERCURY-ARC rectifiers of the high-voltage steel-tank type made in this country for energising the anodes of transmitting valves in radio broadcasting stations are the subject of two papers presented to the Institution of Electrical Engineers last week. The first two sets for furnishing 600 kW of DC at 20 kV were installed in the Droitwich station of the B.B.C., which has fostered the manufacture of such rectifiers in England since 1932.

The paper by MR. J. C. READ (B.T.H. Co.) describes the rectifiers with their cooling systems and accessories. The reasons for particular arrangements are stated in detail and an account is given of certain problems encountered in the development of such sets. The effect of the particular circuit utilised on some of the factors that affect backfire at high voltages is briefly discussed; also alternative methods of arc suppression as well as alternative means of exciting the control grids.

Normal working voltage is selected by transformer tapping, sometimes off-load and at others on-load, regulation of the output voltage down to the low values needed for starting the transmitter being effected by grid-controlling the " firing " of the main anodes. Grid control is additionally utilised for " automatic restoration " after tripping of the arc-suppression relay due to backfire or transmitter faults. This feature is of considerable value since it so shortens programme interruptions (to the order of one second) due to normal kinds of fault that they are hardly noticeable to the ordinary listener.

Performance in Service

In the other paper MR. P. A. T. BEVAN (B.B.C.) reviews the performance of rectifiers in service, including the more recent pumpless air-cooled equipment employed for furnishing DC anode power of from 400 to 600 kW at from 12 to 20 kV. They have superseded rotary machines and those of larger ratings appear to have advantages over the hot-cathode mercury vapour valve.

Rectifiers lend themselves conveniently to the control of voltage and high-speed circuit protection. They are some 10 per cent. more efficient than high-voltage motor-generators, which fact, in view of the long service hours worked and large number installed, results in a considerable saving in power cost. In addition the high-voltage mercury arc rectifier is inherently a device of low internal impedance and consequently is particularly well suited to transmitters of the Class B modulated type in which the DC anode power taken by the modulator varies rapidly within wide limits at syllabic frequency in response to the level of the programme.

Appendices to this paper contain some analytical and design data relative to different kinds of rectifier connection utilised in practice, smoothing circuits and grid control features.

Discussion

Referring to the use of the rectifiers in connection with the extension of high-frequency treatment of metals and plastics, MR. B. N. MACLARTY (B.B.C.) said that the development of these machines began in this country at the end of 1932 when the B.B.C. was contemplating the design of the high-power 1,500-metre transmitter at Droitwich. The steel-tank rectifier was adopted then as its efficiency was 96 per cent. as against 84 or 85 per cent. for the high-voltage machine, and as it could be started up much more quickly. After two years' experience with the steel-tank rectifier, the B.B.C. turned over to it entirely. In the early days of the Droitwich station everyone was scared about the high-voltage transmitting valve, but it had actually proved to be the toughest component in the equipment.

MR. W. T. DITCHAM (Marconi's Wireless Telegraph Co.) said that in 1928 he visited a certain chemical factory in Germany and saw there a steel-tank mercury arc rectifier operating at about 10,000 V. The Marconi Co. installed a 400-kW, 12,000-V equipment in the Chelmsford laboratories in 1929 experimentally. The results were encouraging and the company fitted a large number of Continental broadcasting stations with that equipment.

MR. J. E. BOUL (English Electric Co.) said that arc suppression and automatic voltage recovery would presumably still be required to cope with transmitter faults, etc., and he suggested that simplification of the ignitron had been over-emphasised. American experience at voltages as low as 600 V, DC, had shown that anode baffling was necessary, and the rate of de-ionisation after arc extinction did not appear to be sufficiently rapid in the absence of anode baffles to withstand the voltage jump which occurred when commutation of the arc released the anode from cathode potential. He did not subscribe to Mr. Read's view that with the pumpless type rectifier the complication of refrigeration or water cooling of the air was either desirable or necessary unless ambient

temperatures exceeding 130 to 140 deg. F. were experienced. One factor favouring the pumpless type rectifier was that of maintenance.

MR. E. GALLIZIA (G.E.C.) stressed the importance of designing the equipment as a whole to avoid the possibility of other parts reducing the performance of the rectifier.

DR. W. G. THOMPSON (G.E.C.) said that in this country we looked to a higher standard of prevention of backfire than they did in America, but with the pumpless rectifier it was essential to reduce backfire to the absolute minimum. He asked what proportion of the operation of the automatic restoration feature was due to troubles in the valve and what proportion was due to the rectifier; also what the authors regarded as the most effective feature from the point of view of de-ionisation and the prevention of backfire. The mercury arc rectifier provided a similar problem to that of re-striking voltage on switchgear. It was a race between dielectric recovery and the recurring voltage. In the mercury arc vapour there was definitely a new medium with which to establish the necessary dielectric strength.

Larger Capacities

MR. H. T. RAMSAY (M.O. Valve Co., Ltd.) said that Mr. Read's paper conveyed the impression that the hot-cathode mercury rectifier was limited in size to 50 kW, but some dozen were in service in this country and elsewhere of 150 and 200 kW capacity. He thought the economic range would be from 150 to 200 kW, although below that there was a field for other purposes.

MR. S. G. KING referred to the possible use of the steel-tank rectifier for industrial heating with powers of the order of 1,000 kW at radio frequencies. There were some induction heating furnaces of 1,500 kW capacity in this country running at 1,000 cycles and the efficiency was 89 per cent. at full load although it fell away considerably at half load. The most recent development in the United States was the use of DC for excitation. As the Americans were using single anode valves, there might be some particular advantage in using DC in that case.

MR. J. L. NORTH thought the interior of the pumpless rectifier tank was extremely complicated. He said that fully grid controlled high-voltage units of the mercury-vapour hot-cathode and glass bulb rectifier type had been constructed and in 1938 there was installed for broadcasting a water-cooled glass bulb 500-kW rectifier. Glass bulb cold cathode rectifiers of 50 kW capacity were available and experiments were going on with 100- and 150-kW types which would certainly be seen in this country within the next twelve months.

MR. BEVAN, in his reply, said it was very difficult to give a general idea of the outage time due to backfires because with the use of arc suppression and automatic voltage restoration the time now was in seconds only and the total number of backfires in a day or week was relatively small. It was true there were a number of simplifications in the design of the steel-tank rectifier which could be effected by elimination of backfire. Whether the steel-tank rectifier could be stored for a period and then put on load, depended on the type of rectifier. It was the B.B.C. practice with the water-cooled pump type rectifiers not to leave them standing for too long. Service experience with the pumpless type had not been sufficiently long to enable a definite conclusion to be arrived at.

MR. READ said he could not give any figures with regard to backfires because whilst they did occur they were of very short duration and did not present any practical problem. Damping circuits need only be considered for exceptional cases. He had no personal experience of rectifiers of the type described in the papers for 1,000 or 1,500 cycles but knew the difficulties were great. The problem was different from that of the design of a rectifier for the purpose described in the paper. Nevertheless, he would not say it was impossible.

Registered Contractors

Annual Meeting

LAST week we reviewed the report for 1944 of the National Register of Electrical Installation Contractors. This was presented and approved at the annual meeting on May 24th at which the chairman (Mr. P. V. Hunter) presided.

The accounts and balance sheet were submitted by Mr. W. R. Rawlings, the hon. treasurer, who pointed out that there was very little variation in receipts. A decrease in expenses due to the reduction of the inspection staff from two to one and the office staff by two was more than offset by increased income tax and an allocation to a staff pension fund of £200. In addition to this sum £3,000 had been set aside for this fund and a scheme was now being prepared. The Register was still financially strong and continued to improve year by year in its total assets which now stood at £9,987. Mr. Rawlings thanked the staff for its work under difficulties and the chairman, vice-chairman and committee for their kind expressions of appreciation of his work as hon. treasurer during the past twenty years.

Changes in the Registration Board were announced as follows:—*Incorporated Municipal Electrical Association:* Messrs. E. A. Mills, A. Kelso and S. Tillotson to take the places of Messrs. Barham, Breckell and Spark. *Institution of Electrical Engineers:* Mr. Forbes Jackson to take the place of Mr. Rawlings. *Electrical Contractors' Association of Scotland:* Mr. W. A. Smith to succeed Mr. Munro. *Association of Consulting Engineers:* Mr. H. M. Winstanley to succeed Mr. H. W. Couzens.

Mr. P. V. Hunter was re-elected chairman and Mr. A. H. Dykes vice-chairman and Mr. E. A. Mills consented to act as hon. treasurer.

ELECTRICITY SUPPLY

Cost of Ballylumford Station. West Midlands Extensions.

Argyll.—FARMS AND INDUSTRY.—The County Council has asked the Grampian Electricity Supply Co. to extend the supply to farms and crofts in the 40-mile stretch between Connel and Kinlochleven. Supplies are also asked for Ballachulish and Glencoe, where developments are expected in the slate industry.

Bedford.—COAL PRICE.—It was reported to the Electricity Committee recently that the latest increase of 3s. 6d. per ton for coal represented an aggregate increase of about £12,600 per annum, of which approximately £4,500 would be recoverable from the power consumers under the coal clause. Since the outbreak of war the cost of coal had increased by 97 per cent., which represented an additional expenditure of £86,000 per annum.

Dartford.—GAS AND ELECTRICITY COSTS.—The Housing Committee has considered representations and questions received from the South Suburban Gas Co. and the Corporation Electricity Department with reference to temporary houses. For gas the costs are: laying services, £650 12s. 2d.: estimated cost to consumer, 3s. 2d. per week: meter rents, 1½d. per week. For electricity they are: laying of service, no charge: estimated cost to consumer, 2s. 11d. per week: estimated cost including lighting, 3s. 3d. per week. The Committee recommends that electricity shall be installed for lighting, cooking, washboiler and refrigerator.

Isle of Man.—FAILURE OF SUPPLY.—Mr. Bertram Kelly, the borough electrical engineer and manager of Douglas, informs us that the interruption of supply in the country districts of the Isle of Man on May 20th was due to high-voltage transmission line insulator failure following lightning. No generator was affected.

Kent.—FARMERS AND SMALL UNDERTAKINGS.—Praise for small electricity undertakings comes from the Executive Committee of the Kent Farmers' Union which has passed the following resolution: "That this branch appreciates the fact that electricity costs much less in the areas served by the Ashford Urban District Council than in the adjoining areas, and would like to point out to headquarters the danger of small undertakings being swallowed up by the larger ones to the detriment of the consumer." Proposing the motion, Mr. E. H. Richards said that it did not follow that larger concerns could produce cheaper than the smaller ones; the reverse was sometimes the case.

London.—DISCOUNTS TO BE STOPPED.—The Electricity Commissioners have informed the Stoke Newington Borough Council that they raise no objection to the proposal of the Council to abolish electricity discounts.

HACKNEY STREET LIGHTING.—It is reported that the cost of reconverting the street lighting to peacetime standards will be £1,340, and it is estimated that there will be an extra cost due to energy consumption of £12,000.

Northern Ireland.—BALLYLUMFORD STATION.—Replying to a question in the Ulster House of Commons the Prime Minister (Sir Basil Brooke) said that the total capital cost of the Ballylumford generating station when the installation was completed would, it was estimated, amount to £2,240,350. Of that amount £590,000 would be contributed by the Imperial Exchequer as the 50 per cent. grant on the original installation, leaving approximately £1,650,350 to be met from the Northern Ireland Government funds. The total cost would include the necessary transmission lines. It had not been possible, in the time available, to ascertain the present cost of electricity at Ballylumford, and he could therefore only furnish the figure relating to the year ended December 31st last, 0·5602d. per kWh.

LOAN GUARANTEES.—A White Paper just issued by the Ministry of Finance, Northern Ireland, shows that no guarantees were given under the Electricity (Supply) Act during the year ending March 31st last. Of guarantees amounting to £2,400,000 in respect of loans raised by the Electricity Board £1,907,034 was outstanding at March 31st.

Rawtenstall.—NEW FEEDER.—The Corporation Electricity Committee is to provide a new feeder cable to supply Bacup.

Warminster.—STREET LIGHTING CHANGE.—The Urban District Council, following lengthy negotiations with the Warminster Gas and Coke Co. and the Wessex Electricity Co., has agreed to the complete conversion of the street lighting to electricity. Hitherto part of the lighting has been by gas.

West Midlands.—VISIT OF INSPECTION.—The West Midlands Joint Electricity Authority's five-year programme of extensions to cost £10,000,000, of which the first section, involving £2,000,000 is in hand, was mentioned by Mr. C. Heathcock, at Ironbridge generating station last week. Mr. Heathcock, who is chairman of the Authority and general manager of the Midland Electric Corporation for Power Distribution, Ltd., was addressing members of the Wolverhampton Town Council and Corporation officials, who, at his personal invitation, paid an inspection visit to the station. He emphasised the necessity for the four parent undertakings—the Midland Electric Corporation, Wolverhampton, Walsall and West Bromwich—to remain a solid and united core in the concern.

Reviewing the history of the Authority, he said that in 1928, the first year of operation, the maximum load was 73,000 kW, in 1939 it was 229,000 kW, and in 1944 it had reached 280,000 kW. In 1928 the Authority used 241,000 tons of fuel at 12s. 3d. per ton, compared with 748,000 tons at £1 13s. 3d. per ton in 1944. Generating plant had almost reached the limit of efficiency. The J.E.A. had pursued a policy of progressive development and had fulfilled its obligations to give a cheap and an abundant supply of electricity. It was not his idea of good business to alter an arrangement which had proved so progressive in improving domestic comfort and industrial prosperity, and which was now at the peak of its finest endeavour, merely to serve a political idea.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Edmundsons Electricity Corporation, Ltd., has sent to its shareholders the report for the year ended December 31st last, in which the company's progress during the war years is reviewed. A notable feature is the consistency of the net profit, which amounted to £538,065 in 1944 and was actually less than in 1941, when the figure was £556,393. During this period the distribution on the ordinary stock has remained at 6 per cent. General reserve received £30,000 in 1941; since then the allocation has been £20,000, an amount recommended in respect of the past year. The report records the death of Lord Eltisley, Lord Meston and Mr. A. Winterbottom and the appointment of Lord Aldenham, Col. Sir E. Geoffrey Cox, Mr. E. F. Dadson, Mr. D. M. Evans Bevan and Sir George Jessel, Bt., to the board. The retirement of Mr. C. H. Jones from the secretaryship is also referred to (the new secretary is Mr. Eoin C. Mekie).

Consolidated accounts of the group for the past six years show that the gross revenue from the sale of energy has risen from £4,965,436 in 1938 to £11,358,823 in 1944, and the net profit from £656,418 to £758,553. Taxation in the same period has increased from £95,332 to £1,076,612. Statistics for the group give the rise in consumers connected as from 404,781 in 1938 to 504,433, and the sales of energy per consumer from 506 to 1,000 kWh. The price per kWh has declined from 1·27d. to 1·08d. for all consumers and from 2·77d. to 1·94d. for domestic and commercial consumers. The installed capacity in generating stations rose from 269,000 kW in 1938 to 586,000 kW in 1944; the energy generated from 718 million kWh to 2,554 million kWh; and the quantity purchased from 312 to 857 million kWh. Sales to consumers totalled 2,305 million kWh, against 816 million kWh and "exports" to the Central Board 743 million kWh, against 73 millions. The connected load in 1944 was 2,395,000 kW against 1,267,000 kW in 1938.

A list is given of investments in subsidiary companies; the principal ones are the Shropshire, etc., Power Co. (£3,116,162), the Wessex Electricity Co. (£2,983,666), the South Wales Electric Power Co. (£2,011,073), the East Anglian Electric Supply Co. (£1,418,144), the Cornwall Electric Power Co. (£1,320,000), and the Bedfordshire, etc., Electric Co. (£1,150,322).

Simms Motor Units, Ltd.—Subject to Treasury permission, it is proposed to issue the balance of 292,680 5s. ordinary shares to ordinary shareholders in the proportion of two new shares for every five held. Announcing this in a statement issued with the annual report, the chairman, Mr. Tom Thornycroft, says that the floor space in the factory has doubled in the past few years, the output has increased many times and the company is now employing about three times as many people as before the war. There is every hope that most of this increase in turnover will be maintained and that is why it is essential to have sufficient working capital. The net profit for 1944 was £122,839 (£149,910 in 1943) before providing £105,500 (£137,750) for taxation. The ordinary dividend is maintained at 10 per cent. and £21,591 (£18,318) is carried forward.

Calcutta Tramways Co., Ltd.—*Reuter* reports from Calcutta that the Bengal Government proposes to take over the Calcutta tramways undertaking, with effect from January 1st, 1946, according to a Government communication to the Calcutta Corporation. Negotiations between the company and the Calcutta Corporation have been proceeding since June 27th, 1944, when the Corporation, under the terms of its contract with the company, gave formal notice of its intention to take over the undertaking. The scope of the company's contract with the Corporation has been in dispute in respect of tramways outside the jurisdiction of the Corporation. Recently the Chief Minister of Bengal Legislative Assembly put forward a suggestion that a transport board should be formed which should take over the company's property on the same conditions as set out in the original contract of December, 1899.

Richard Johnson & Nephew, Ltd.—The chairman (Mr. M. A. T. Johnson) stated at the annual general meeting on May 18th that it was proposed at the earliest possible moment to send technicians abroad to re-establish contacts and ascertain what technical developments have taken place during the war years. The company was not, however, going to derive much benefit from such visits unless it was permitted to make sufficient profits to provide it with the necessary funds to take advantage of them.

W. T. Henley's Telegraph Works Co., Ltd., reports a net profit for 1944, after providing for taxation, of £347,852 as compared with £354,566 for the preceding year. A sum of £75,000 (£50,000) goes to war contingencies reserve. It is proposed to pay a final dividend of 10 per cent. on the ordinary stock together with a bonus of 5 per cent., the total distribution for the year remaining at 20 per cent. The carry-forward is £399,326 (against £398,974).

The St. Austell & District Electric Lighting & Power Co., Ltd., reports that after providing for depreciation the net working profit amounted to £18,673 for 1944 as compared with £16,411 in 1943. A final dividend of 6 per cent. making 10 per cent. (same) is being paid and £7,892 (£7,701) is carried forward. Sales of electricity increased from 8,117,8212 to 10,563,371 kWh, the average price per kWh sold falling from 1·79d. to 1·67d.

Callender's Trust, Ltd., record a revenue, after taxation, amounting to £34,479 for the year ended March 31st last, as against £40,433 in the previous year. Management expenses, directors' fees and N.D.C. take £2,904 (£3,394), while £8,000 (£7,000) goes to dividend reserve or war contingencies. The dividend is maintained at 5 per cent., and £97,932 (£87,482) is carried forward.

General Electric Co., Ltd.—The Stock Exchange Council last week granted permission

to deal in the company's £2,000,000 of 4½ per cent. "C" stock which was issued in November last.

The Telegraph Condenser Co., Ltd., reports a profit for the year ended December 31st last of £77,396 compared with £74,473 for 1943. To this are added interest on investments and £1,200 (nil) from interest on tax reserve certificates. After providing for depreciation, directors' fees and income tax, £16,200 (£15,000) is allocated to general reserve, A dividend of 7½ per cent. is again paid on the ordinary shares and this year a bonus of 2½ per cent. (nil) is also being distributed. The carry-forward is £38,919 (£38,151).

Meters, Ltd., reports a net profit to March 31st last of £28,126 (£30,623), plus internal reserves not required £43,376 (nil), making £71,502 (£30,623). Of this, general reserve receives £50,000 (tax reserve £10,000) and deferred repairs £5,000 (same). The ordinary dividend is maintained at 10 per cent., and £13,546 (£10,558) is carried forward.

The Harland Engineering Co., Ltd., reports a net profit of £16,678 for 1944 (against £15,593), after provision for taxation and deferred repairs. A sum of £7,000 again goes to reserve. The ordinary dividend is increased from 6 to 7 per cent. and £14,800 (£13,996) is carried forward.

Glenfield & Kennedy, Ltd., record a net profit for the year ended March 31st last of £59,684 (£60,871). A final dividend of 5 per cent. plus a bonus of 10 per cent. bring the total distribution for the year to 20 per cent. (same) and £44,105 (£43,296) is carried forward.

Ozonair, Ltd., reports a net profit for 1944 of £2,460 (£1,822). It is proposed to pay an additional preference dividend of 1½ per cent. and a dividend of 8½ per cent. on the ordinary shares. A sum of £500 will again go to reserve and £2,483 (£1,873) will be carried forward.

The Electrical Finance & Securities Co., Ltd., recommends a final dividend of 6 per cent. and a bonus of 3½ per cent., maintaining the year's distribution at 13½ per cent. The profit and loss balance is £74,027 (£68,184).

The British Thermostat Co., Ltd., is to pay a final dividend of 11 per cent., again making 18½ per cent. The net profit for the year ended January 31st last was £36,486 (£34,799).

The London Electric Wire Co. & Smiths, Ltd., has announced a final dividend of 5½ per cent., making 7½ per cent. for the past year, and also an interim dividend of 2 per cent. in respect of the current year.

The Calcutta Electric Supply Co., Ltd., is to pay a second interim dividend of 3 per cent., making 6 per cent. tax free (same).

Companies' Returns

Statements of Capital

Clarke, Chapman & Co., Ltd.—Capital, £550,000 in 7,000 preference shares of £10 each and 480,000 ordinary shares of £1 each. Return dated March 16th. 6,985 preference and 480,000 ordinary shares taken up. £123,650 paid (being £10 per share on 4,435, £1 per share on 78,800 and 5s. per share on 2,000). £403,250 considered as paid (being £1 per share on 401,750 and 15s. per share on 2,000). Mortgages and charges: Nil.

Artic Fuse & Electrical Manufacturing Co., Ltd.—Capital, £5,000 in 4,700 ordinary and 100 deferred ordinary shares of £1 each and 4,000 founders' shares of 1s. each. Return dated December 31st (filed April 3rd). 3,433 ordinary, 100 deferred ordinary and 2,590 founders' shares taken up. £2,329 13s. paid. £1,332 17s. considered as paid. Mortgages and charges: Nil.

Para Electric Railways & Lighting Co., Ltd. Capital, £780,000 in 390,000 preference and 390,000 ordinary shares of £1. Return dated October 30th, 1944. 325,000 preference and 390,000 ordinary shares taken up. £25,040 paid. £689,960 considered as paid. Mortgages and charges: £524,238.

Mortgages and Charges

C. A. Besley, Bailey & Co., Ltd.—Mortgage on leasehold premises at rear of 248, 249, 250 and 251, Bute Street, Swansea, dated May 7th, to secure £150. Holder: H. J. Hancock, "The Links," Penydre, Rhiwbina, Cardiff.

London Auto Electric, Ltd.—Satisfaction to the extent of £250 on January 5th of debenture registered December 9th, 1933. (Notice filed May 12th, 1945.)

Liquidations

Electrical Utilities, Ltd., Rosedale Works, Rosedale Road, Richmond, Surrey.—First dividend of 4s. in the £ payable June 22nd, at 10-11, Park Place, St. James's Street, London, S.W.1.

Bankruptcies

S. W. Bridges, radio and electrical dealer, lately carrying on business as the "British & American Radio Service Co.," 10 and 11, Field Place, St. John Street, Clerkenwell, E.C.1, and 219, Pentonville Road, N.1.—Application for discharge to be heard on June 7th, at Bankruptcy Buildings, Carey Street, London, W.C.2.

P. S. Kennedy, electrical dealer, trading as "Martin & Co.," 102, High Street, Stoke Newington, London.—Application for discharge to be heard on June 7th, at Bankruptcy Buildings, Carey Street, London, W.C.2.

G. C. Spong and **J. H. Trussell,** electricians, trading as the "C.C.S. Trading Co.," 30, Western Mail Chambers, Cardiff. (Separate application of J. H. Trussell.)—Application for discharge to be heard July 2nd, at the Judge's Court, Law Courts, Cardiff.

J. D. Drury, electrical engineer, lately carrying on business as "Mersey Electrics" and "Drury Brothers," 64, Brasenose Road, Bootle, near Liverpool.—Application for discharge to be heard on June 27th at the Court House, Hunter Street (Friends' Meeting House), Liverpool, 3.

E. G. Kelf and **L. F. Brewer,** radio dealers, lately carrying on business as "E.G.K." 4, High Road, Willesden Green.—Trustee, Mr. H. H. Gaine, Official Receiver, Bankruptcy Buildings, Carey Street, London, W.C.2, released March 25th.

STOCKS AND SHARES

TUESDAY EVENING.

THE prospect of a General Election on July 5th threw the Stock Exchange markets into disorder. Prices gave way in all sections. Those which deal more particularly with the speculative issues, such as, for example, radio shares, were amongst the sufferers. De la Rue and a number of lower-priced shares gave way. In reply to inquiries as to what effect the possible coming into power of the Labour Government would have upon various companies, the answer in every case was that the shares would go down in sympathy with everything else. Last Tuesday saw prices distinctly weak. Buyers were conspicuously absent. On the next day more confidence was shown. Some of the previous falls were recovered. Bargain hunters made their influence felt.

Sentiment and Sellers

Comparison of to-day's prices with those of not more than a month ago shows changes which in some cases are difficult to justify. Sentiment, as is well known, plays a large part in Stock Exchange markets, and to this cause must be attributed the falls which have overtaken shares in many companies which, whatever party is returned to power in July, are not likely to suffer directly any material loss of earning power or profits. One seller, however, makes many other sellers, and when a feeling of nervousness attacks any class of the community, it is nearly always reflected in a general fall in security values. In the ordinary way, the one group that escapes from such an influence is that in which gilt-edged stocks are comprised. But this time the depression has been so general that the best-class securities have given way, though to no great extent, in company with others of lower grade.

Telegraphs and Telephones

The communications market has a rise of £4 in Great Northern Telegraphs, to 32, owing to the liberation of Denmark. Oriental Telephones advanced to 58s. before reacting to 56s., which leaves the price 6d. higher on the month. Globe Telegraphs fell a florin to 43s. in sympathy with the drop in Cable & Wireless. Canadian Marconis at 14s. 9d. are 3s. 3d. to the good, and it is said that most of the buying continues to come from Montreal. Automatic Telephones are 3s. lower at 65s. 6d. Telephone Properties and Telephone Rentals have both gone back.

Cable & Wireless

Reference to this week's table of prices will show a drop to 87 in Cable & Wireless ordinary stock. After touching nearly 100, the price went back to 85 on sales by people of whom some assumed that the stock is hardly likely to receive more than 4 per cent. dividend until conditions throughout the world become settled on a more stable basis. This argument goes on to point out that wireless telegraphy has made strides during the war, and that when trade settles down, the submarine cable will become out of date, supplanted by the more modern system of wireless. Precisely the same argument was put forward when the price of Cable ordinary stock stood about 70. Further consideration suggested that there is plenty of room for both systems, and that the amount of traffic which will be available after the war is likely to prove of such enormous dimensions that both the cable and wireless services will find their capacity taxed to the limit.

Rises and Falls

Amongst the very few prices that stand out prominently against the month's numerous falls, it seems ironical that Tokyo Electric 6 per cents. should score 3 points, rising to 28½. This is due to the impression that "VE-Day" will be shortly followed by victory in the Far East and that Japanese surrender will permit re-establishment of essential services. The home electricity supply group shows a series of falls ranging from 6d. to 3s. London companies' issues are noticeably weaker. In the list of transport stocks, British Electric Traction deferred at 1165 is down by 50 points, 15 of which represent the net amount of the dividend recently deducted from the price. Thomas Tilling shares shed 4s., receding to 57s.

General Electric

Stock Exchange dealings have started in the 4¼ per cent. "C" preference shares of the General Electric Company. It may be remembered that the Treasury gave permission for dealings to take place, but the Stock Exchange Committee in January this year refused to confirm this, and consequently nothing has happened in the way of dealing until a few days ago, when leave was granted by the Stock Exchange Council. Transactions have been taking place on the basis of 21s. 9d. to 22s. At the latter price, the yield on the money comes to £3 17s. 3d. The security is good: the shares are a third preference and rank immediately in front of the ordinary stock.

Hopkinsons

The advance from 17½ per cent. to 20 per cent. in the dividend of Hopkinsons, Ltd., has come about largely by reason of a higher profit standard, resulting from extra capital employed in the business. The price of the shares rose to 82s. 6d. before reverting to £4, at which, on the new rate of distribution, the yield comes to 5 per cent. Hopkinsons have recently received orders from the

(*Continued on page* 812)

ELECTRICAL INVESTMENTS

Past Month's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price May 28	Month's Rise or Fall	Yield p.c. £ s. d.
Home Electricity Ordinary					
Bournemouth and Poole	12½	12½	63/6	−1/6	3 18 7
British Power and Light	7	7	32/6	−1/6	4 6 2
City of London	5½	6	31/–	..	3 17 5
Clyde Valley	8	8	42/6	..	3 15 3
County of London	8	8	42/–	−3/–	3 16 1
Edmundsons	6	6	30/–	−2/–	4 0 0
Elec.Dis.Yorkshire	9	9	46/–	−1/–	3 18 3
Elec. Fin. and Securities	12½	13½	62/–	..	4 7 1
Elec. Supply Corporation	10	10	50/–	−1/6	4 0 0
Lancs. Light and Power	7½	7½	38/–	..	3 19 0
Llanelly Elec.	6	6	30/–	..	4 0 0
Lond.Assoc.Electric	3	4	26/6	−1/6	3 0 6
London Electric	6	6	31/–	..	3 17 5
Metropolitan E.S.	8	8	43/–	−1/6	3 14 5
Midland Counties	8	8	42/3	−2/–	3 15 9
Mid. Elec. Power	9	9	45/–	..	4 0 0
Newcastle Elec.	7	7	32/–	−6d.	4 7 6
North Eastern Elec.	7	7	36/–	..	3 17 9
Northampton	10	10	51/–	−6d.	3 18 6
Northmet Power	7	7	40/–	−3/–	3 10 0
Richmond Elec.	6	6	26/6	..	4 10 7
Scottish Power	8	8	40/–	−1/–	4 0 0
Southern Areas	5	5	23/6	..	4 5 0
South London	7	7	30/–	..	4 13 4
West Devon	5	5	25/–	..	4 0 0
West Glos.	4½	5½	27/6	..	2 11 0
Yorkshire Elec.	8	8	45/–	−1/6	3 11 1
Public Boards					
Central Electricity 1955–75	5	5	115	..	4 7 0
1951–73	4½	4½	107	..	4 4 0
1963–93	3½	3½	104½	−1	3 7 0
1974–94	3½	3½	101	..	3 3 9
London Elec.Trans.	2½	2½	98½	..	2 10 9
London & Home Counties 1955–75	4½	4½	111	..	4 1
Lond.Pass.Trans.Bd. A	4½	4½	123½	..	3 12 9
B	5	5	124½	..	4 0 4
C	3½	3	67½	+2	4 9 0
West Midlands J.E.A. 1948–68	5	5	106½	..	4 14 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	7/3	−3d.	—
Calcutta Elec.	6*	6*	51/–	..	2 7 0
Cawnpore Elec.	10	7	48/–	+2/6	2 18 4
East African Power	7	7	38/6	..	3 16 9
Jerusalem Elec.	7	5	28/–	..	3 11 5
Kalgoorlie (10/–)	5	5	10/–	..	5 0 0
Madras Elec.	Nil	4	35/–	+6d.	2 5 9
Montreal Power	1¼	1¼	25½	+½	—
Nigerian Elec.	8	10	37/6	..	5 6 8
Palestine Elec. "A"	5*	5*	40/–	..	2 10 0
Perak Hydro-elec.	6	7	16/–	+1/6	—
Tokyo Elec. 6%	6	6	28½	+3	—
Victoria Falls Power	15	15	88/9	−¼	3 7 7
Whitehall Inv.Pref.	—	6	26/–	..	4 12 4

Company	Dividend Previous	Dividend Last	Middle Price May 28	Month's Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron. Elec. Ord.	10	15	62/–	..	4 16 9
Assoc. Brit. Eng.	6	7	53/9	..	2 12 0
Assoc. Elec.: Ord.	10	10	55/6	−6d.	3 12 3
Pref.	8	8	41/–	..	3 18 1
Automatic Tel.&El.	12½	12½	65/6	−3/–	3 16 3
Babcock & Wilcox	11	12	53/–	−3/–	4 10 7
British Aluminium	10	10	43/9	−¼	4 11 4
British Insul. Ord.	20	20	6¼	+⅛	3 5 4
British Thermostat (5/–)	16½	18½	20/9	..	4 9 0
British Vac. Cleaner (5/–)	30	30	33/6	+6d.	4 9 7
Brush Ord. (5/–)	8	9	9/6	−1/6	4 14 9
Burco (5/–)	15	15	16/–	..	4 13 9
Callender's	15	20	6¼	..	8 4 0
Chloride Elec.Storage	15	15	90/–	..	3 6 8
Christy Bros.	12½	17½	77/6	..	4 10 2
Cole, E. K. (5/–)	15	20	41/3	..	2 6 0
Consolidated Signal	24	27½	6¼	−¼	4 1 4
Cossor, A. C. (5/–)	7½*	10*	34/–	+1/–	1 9 5
Crabtree (10/–)	17½	17½	42/6	−1/6	4 2 5
Crompton Parkinson Ord. (5/–)	20	22½	34/–	..	3 6 3
De La Rue	35	40	10½	−1	3 18 0
E.M.I. (10/–)	6	8	34/–	−6d.	2 7 1
Elec.Construction	10	12½	62/–	..	4 0 8
Enfield Cable Ord.	12½	12½	64/3	−3d.	3 17 8
English Electric	10	10	51/3	−4/9	3 18 5
Ericsson Tel. (5/–)	22*	20*	55/–	−1/–	1 16 3
Ever Ready (5/–)	40	40	40/9	−4/3	4 18 0
Falk Stadelmann	7½	7½	35/–	−¼	4 5 9
Ferranti Pref.	7	7	34/6	..	4 1 —
G.E.C.: Pref.	6½	6½	34/6	..	3 15 4
Ord.	17½	17½	95/–	−1/6	3 13 8
General Cable (5/–)	15	15	19/–	..	3 19 0
Greenwood&Batley	15	15	48/3	..	6 3 0
H.T.A. (10/–)	12½	12½	30/–	−1/–	4 3 4
Henley's (5/–)	20	20	26/9	−½	3 14 9
4½% Pref.	4½	4½	24/–	..	3 15 0
Hopkinsons	17½	20	80/–	..	5 0 0
India Rubber Pref.	5½	5½	24/–	..	4 11 9
Intl. Combustion	30	32½	7¾	−¼	4 3 9
Johnson & Phillips	15	15	73/9	−1/9	4 1 4
Lancashire Dynamo	22½	22½	105/–	..	4 5 10
Laurence,Scott(5/–)	12½	12½	14/–	..	4 9 3
London Elec. Wire	7½	7½	39/–	..	3 17 0
Mather & Platt	10	10	53/9	−¼	3 14 4
Metal Industries(B)	8	8½	45/9	−6/9	3 14 3
Met.Elec.Cable Pref.	5½	5½	21/3	..	5 3 6
Mid. Elec. Mfg.	25	25	7⅛	+½	3 5 7
Murex	20	20	4¾	−⅜	4 6 7
Newman Ind.(2/–)	20	20	7/3	−9d.	5 10 4
Philco (2/–)	—	—	14/–	−6d.	—
Power Securities	6	6	29/6	..	4 1 4
Pye Deferred (5/–)	25	25	32/6	..	3 17 0
Ransome & Marles	20	20	83/9	−¼	4 15 7
Revo (10/–)	17½	17½	44/–	+6d.	3 19 7
Reyrolle	12½	12½	73/3	+6d.	3 8 4

(Continued on next page)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price May 28	Month's Rise or Fall	Yield £	Yield s.	Yield d.
Equipment and Manufacturing (*Continued*)							
Siemens Ord. ..	7½	7½	34/–	−3/–	4	8	3
Strand Elec. (5/–)	10	12½	10/6	−3d.	5	19	3
Switchgear & Cowans (5/–) ..	20	20	22/–	+1/3	4	11	0
T.C.C. (10/–) ..	5	7½	26/–	..	2	17	9
T.C. & M. ..	10	10	61/3	−1/3	3	5	3
Telephone Mfg.(5/–)	9	9	12/3	+3d.	3	13	6
Thorn Elec. (5/–)	20	20	29/–	..	3	9	0
Tube Investments	20	22½	5 $\frac{8}{16}$	..	3	19	10
Vactric (5/–) ..	Nil	22½	21/6	−3/3	5	4	2
Veritys (5/–) ..	7½	7½	8/6	..	4	8	3
WalsallConduits(4/–)	55	55	53/6	..	1	2	0
Ward & Goldstone (5/–)	20	20	30/6	..	3	5	8
WestinghouseBrake	14	14	79/3	+6d.	3	10	4
West, Allen (5/–)	7½	7½	8/–	−9d.	4	13	9
Traction and Transport							
Anglo-Arg. Trans. :							
First Pref. (£5)	Nil	Nil	2/6	..		—	
4% Inc. ..	Nil	Nil	6	−1		—	
Brit. Elec. Traction :							
Def. Ord. ..	45	45	1165	−50	3	17	6
Pref. Ord. ..	8	8	190	..	4	4	3
Bristol Trams ..	10	10	59/6	+6d.	3	7	4
Brazil Traction ..	1¾	2	26¾	..	7	9	6
Calcutta Trams..	6½	7½	69/6	+8/–	2	3	2
Cape Elec. Trams	5	6	25/–	..	4	16	0
Lancs. Transport	10	10	49/–	..	4	1	0
Southern Rly. :							
5% Prefd. ..	5	5	71	−5½	7	0	10
5% Pref. ..	5	5	118½	−5	4	4	5
T. Tilling ..	10	10	57/–	−4/–	3	10	2
West Riding ..	10	10	49/–	+6d.	4	1	7
Telegraph and Telephone							
Anglo-Am. Tel. :							
Pref.	6	6	124	+1¼	4	16	9
Def.	1½	1½	30¼	—	4	18	4
Anglo-Portuguese	8	8	28/–	..	5	14	4
Cable & Wireless :							
5½% Pref. ..	5½	5½	111	..	4	16	6
Ord.	4	4	87	−12	4	12	0
CanadianMarconi$1	Nil	1 cts.	14/9	+3/3		—	
Globe Tel. & Tel. :							
Ord.	8¼*	5*	43/–	−2/–	2	6	6
Pref.	6	6	31/–	..	3	17	5
Great Northern Tel. (£10)	Nil	Nil	32	+1		—	
Inter. Tel. & Tel.	Nil	Nil	35	+1		—	
Marconi-Marine..	7½	7½	35/–	−6d.	4	5	4
Oriental Tel. Ord.	4	4	56/–	+6d.		—	
Telephone Props.	Nil	6	20/–	−6d.	6	0	0
Tele. Rentals (5/–)	10	10	11/6	−1/–	4	7	0

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 810)

Central Electricity Board, as well as substantial orders from Russia. This work is expected to keep the factories in full employment for several years to come. The company, according to the report, sold some of its investments during the past year at a profit of £5,900, which has been put to an investment reserve. Hopkinsons paid 15 per cent. annually from 1939 to 1942 inclusive; the dividend was raised to 17½ per cent. in the two following years 1943 and 1944, and now, as already noted, it is 20 per cent. The authorised and issued capital in £1 shares is £700,000 divided equally between ordinary and 7 per cent. preference.

Calcutta Tramways Again

After being a stagnant market for two or three weeks, Calcutta Tramways ordinary shares came to life with a sharp rise of 7s. in a single day on a fresh announcement from Bengal. This reported that the Bengal Government intends to take over the company as from January 1st next. No details were vouchsafed. The previous estimates of what the shares would be likely to receive in a transaction of this nature, were revived. As noted here on previous occasions, anything between £3 per share and £6 per share is looked for as the amount which the Calcutta Tramways shareholders might receive in payment for their undertaking. In the slump which occurred last week amongst industrial shares, the price of Calcutta Tramways held its gain, and at 69s. 6d.—after being 72s.—the shares are 8s. higher on the month.

Cheap Money Policy

There may, of course, be some ground for the idea that, if there should be a change of Government there might also be a reversal of the policy of cheap money that has stood the country in good stead during the war, but which has also materially raised share prices. Gilt-edged stocks pay, roughly, 3 per cent. on the money at the present time, but if the Government were to loosen the tightness of its grip upon the money market, this would be followed by a fall in the prices of gilt-edged stocks as a whole. Also, a possible opening of the gates to new issues, should it come into effect, would bring about such competition with existing stocks and shares as might depreciate the value of the latter.

London Passenger Transport

With the European war at an end, speculative interest is revived in the "C" stock of the London Passenger Transport Board. The Government agreement with the railway companies, whereby the railways receive a certain fixed sum in respect of earnings, runs for a year after the termination of war; the definite date has yet to be fixed. The Transport Board is included in the agreement. The "C" stock for last year received 3 per cent. dividend, as against 3⅛ per cent. in the previous year.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

BOOTS PURE DRUG CO., LTD., J. B. M. Coppock and E. L. Grew.—"Production of depolarising materials for use in primary electrical cells." 6876. April 30th, 1943. (569217.)

British Thomson-Houston Co., Ltd.—"Electric control devices." 13981/43. August 28th, 1942. (569204.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—"X-ray apparatus." 11580. July 16th, 1943. (569197.)

English Electric Co., Ltd., and W. E. M. Ayres.—"Dynamo-electric machines and magnetic slip couplings, brakes and dynamometers." 14188. August 31st, 1943. (569206.)

A. D. Ferguson, Metropolitan-Vickers Electrical Co., Ltd., and D. Bridge & Co., Ltd.—"Injection moulding of thermoplastic and like materials which are plastic when hot." Cognate applications 7042/43 and 3654/44. May 4th, 1943. (569155.)

General Electric Co., Ltd., and S. W. Richards.—"Junction boxes for electric cables." 11432. July 14th, 1943. (569165.)

C. Gruenberg.—"Portable electric testing device." 18204. November 3rd, 1943. (569179.)

Induction Heating Corporation.—"Flow controlled electric switch apparatus." 9454/43. May 15th, 1942. (569193.)

H. R. Levy.—"Electric lamps." Cognate applications 12330/43, 12331/43 and 16539/43. July 29th, 1943. (569198.)

Lodge Plugs, Ltd., and B. Hopps.—"Sparking plugs." 18468. November 6th, 1943. (569237.)

Mathieson Alkali Works.—"Cells for the electrolysis of magnesium chloride fusions." 5790/43. March 21st, 1942. (569216.)

Micafil, Ltd., and W. W. Triggs.—"Machine for winding the stators of electric motors." 10629. June 30th, 1943. (Addition to 563932.) (569159.)

M-O Valve Co., Ltd., and J. Bell.—"Thermionic valves." 12710. August 6th, 1943. (569224.)

M-O Valve Co., Ltd., and G. Moggridge.—"Machines for making glass pinches, for example in the foot-tubes of electric-discharge devices and the like." 7115. May 5th, 1943. (569218.)

J. F. O'Brien.—"Feed section unit for electric wiring systems." 9532/43. May 12th, 1942. (569194.)

Revo Electric Co., Ltd., and F. H. Reeves.—"Mounting for an electric hot-plate or like unit relative to its terminal connections, particularly applicable to electric ovens or other cooking apparatus." 18495. November 8th, 1943. (569238.)

E. S. Russell.—"Magnetic time-lag device." 17973. October 30th, 1943. (569211.)

N. G. Schonander.—"X-ray diaphragms for intercepting secondary radiators." 18386. November 5th, 1943. (569231.)

Standard Telephones & Cables, Ltd., and A. B. Atkinson.—"Soldering irons." 14410. September 3rd, 1943. (569208.)

A. H. Stevens (Woodward Governor Co.).—"Speed controls, particularly for synchronising a number of power units." 832. January 16th, 1943. (569213.)

Sulzer Frères Soc. Anon.—"Gas-turbine plants." 10032/43. July 10th, 1942. (569158.)

F. Wolf and F. Sigmund.—"Dynamo-electric machines provided with windings." 9883. June 18th, 1943. (569196.)

Forthcoming Events

Friday, June 1st.—*Manchester.*—Reynolds Hall, College of Technology, 6.30 p.m. Institution of Electronics (N.W. Branch) and Institute of Physics (Manchester and District Branch). Lecture on "Design of Electron Guns of Radial Symmetry," by Dr. H. Moss.

Monday, June 4th.—*London.*—At Royal Society of Arts, Adelphi, 5.30 p.m. Institution of Electronics. "Principles of Triode Design," by Dr. J. H. Fremlin.

Tuesday, June 5th.—*Manchester.*—Engineers' Club, 6 p.m. I.E.E. North-Western Centre. Annual general meeting followed by a paper on "The Place of Radiant, Dielectric and Eddy-Current Heating in the Process Heating Field," by L. J. C. Connell, O. W. Humphreys and J. L. Rycroft.

Birmingham.—James Watt Institute, 6 p.m. Electrodepositors' Technical Society (Midlands Centre). "The Tainton Electro Galvanising Process for Brylanised Wire," by H. Roebuck and A. Brierley.

Glasgow.—Societies' Room, Royal Technical College, George Street, 6.15 p.m. I.E.E. Scottish Centre. Post-war Planning Committee's Report on Part-time Education.

Wednesday, June 6th.—*Edinburgh.*—Heriot Watt College, 6 p.m. I.E.E. Scottish Centre. Post-war Planning Committee's Report on Part-time Education.

Thursday, June 7th.—*Cardiff.*—Control Room, Roath power station. Association of Mining Electrical and Mechanical Engineers (South Wales Branch). Members meet at power station at 2.45 p.m.: annual general meeting, 5 p.m.

Thursday, June 14th.—*London.*—Kingsway Hall, 10 a.m. Incorporated Municipal Electrical Association. Fiftieth annual ordinary general meeting.

Saturday, June 16th.—*Stratford-on-Avon.*—I.E.E. South Midland Students' Section. Summer outing to see "Twelfth Night."

Tuesday, June 19th.—*London.*—Connaught Rooms, 5.30 for 6 p.m. I.E.E. Transmission Section. Informal dinner (tickets, 12s. 6d.).

Friday, July 27th.—*Manchester.*—Reynolds Hall, College of Technology, 6.30 p.m. Institution of Electronics (North-West Branch). Lecture on "Rectifiers and Invertors," by Dr. F. Feinberg.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Amble.—June 14th. Electricity Department. L.v. mains and distributors, feeder pillars and services. (May 18th.)

Australia. — PERTH. — June 21st. Government of Western Australia. Switchgear, motor-generator sets and batteries. (May 4th.)

Dunbar.—June 9th. Town Council. Supply and installation of street lighting equipment, including poles, lanterns, wiring and control gear. Specs. from burgh surveyor.

Gellygaer.—June 30th. U.D.C. Electricity Department. House service units. (See this issue.)

Greenock.—Corporation. Electrical installations at 200 houses. Schedules from the director of housing, Municipal Buildings.

Littleborough.—June 19th. Electricity Department. 11-kV feeder cables. (See this issue.)

Manchester.—June 5th. Electricity Committee. Low-pressure pipework, etc., at the Stuart Street generating station. 10,000-kVA transformer for Denton (West) substation. (May 18th.)

Orders Placed

Aberdeen.—Electricity Committee. Accepted. Boiler plant for Ferryhill power station (£117,000).—Mitchell Engineering (revised contract).

Croydon.—Electricity Committee. Accepted. Exhauster for suction sooting plant (£480).—Sturtevant Engineering Co.

Glasgow.—Transport Committee. Accepted. Asbestos covered wire.—London Electric Wire Co. & Smiths.

Ilford & Barking.—The English Electric Co., Ltd., informs us that the order placed with the company by the Joint Sewerage Committee (*Electrical Review*, May 4th) was for a 660-HP (not 6,000-HP) Diesel engine and the price was £4,823.

Portland.—Electricity Committee. Accepted. L.v. cable (£305).—Pirelli-General. L.v. switchboard (£82) and two l.v. feeder pillars (£120). 350-kVA transformer (£314).—Ferranti. E.h.v. ring main unit (£78).—Crompton Parkinson.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bedworth.—Houses (40), Poplars Farm estate, for U.D.C.; S. J. Oldham, architect, The Hollies, Job's Lane, Coventry.

Bromsgrove.—Houses (98) at Catshill; F. W. Goodman, surveyor, The Council House.

Derbyshire.—Improvement of X-ray department, new school recreation rooms and treatment department at Walton Sanatorium, Chesterfield (£12,500); J. Harrison, county architect, St. Mary's Gate, Derby.

Glasgow.—Seven three-storey tenements at Barrowfield (£44,000) and new mess room at Provan chemical works (£11,075); city architect.

Hebburn-on-Tyne.—Additions to the works of Pyrotenax, Ltd.; Demolition & Construction Co., Ltd., 3, St. James's Square, London, S.W.1.

Hull.—Works additions; E. Martin (Shipriggers), Ltd., Goulton Street.

Lanarkshire.—Additional tube plant and extensions to steel works; Stewarts & Lloyds.

Leicestershire.—Electrical renewals at Carlton Hayes Hospital (£21,850), additions to mental institution (£40,000), school canteens (£10,344) and dining hall, etc., at Loughborough College (£9,000); county architect, Leicester.

London. — ISLINGTON. — Flats, Halton Mansions (£22,300); H. Monson, architect.

STOKE NEWINGTON.—Health centre; borough architect.

Manchester.—Additions to works, Culcheth Lane and Stansfield Street, Newton Heath, for P. Frankenstein & Sons (Manchester), Ltd.; B. Pendleton, 16, Brazennose Street.

Motor showrooms, Cheetham Hill Road; G. Grenfield Baines, architect, 12-24, Guildhall Street, Preston.

Middlesbrough.—Nurses' home, Park Road; borough engineer.

Rochdale.—Additions to works; Turner Bros. Asbestos Co., Ltd., Spotland, Rochdale.

Swanscombe.—Works additions and substation; Plaster Products, Ltd.

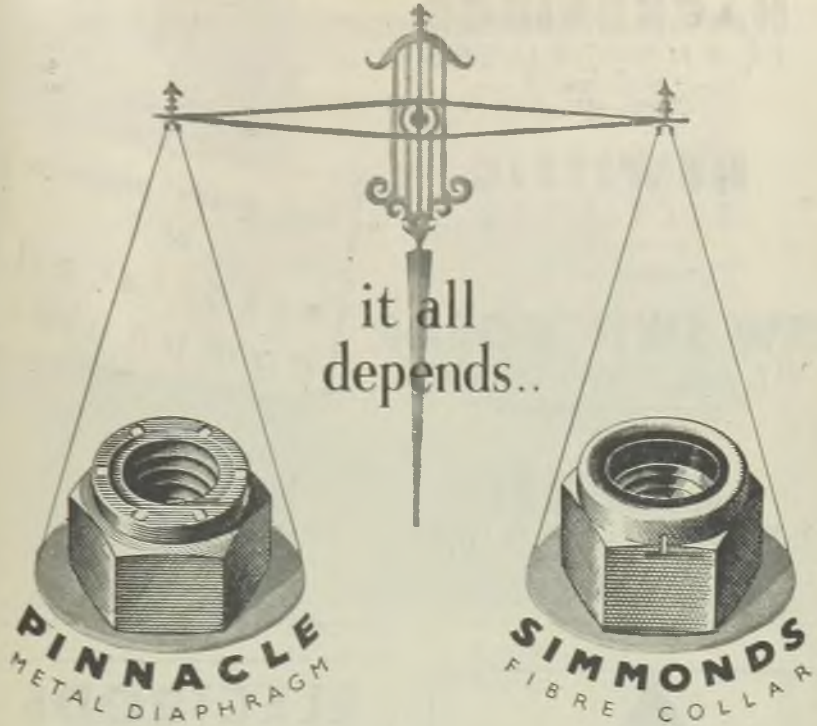
Towcester.—Houses for Rural District Council; Sir John Brown, architect, 83, St. Giles' Street, Northampton.

Wakefield.—Children's ward; superintendent, Clayton Hospital and Wakefield General Dispensary, Northgate, Wakefield.

Wrexham.—Fire station for N.F.S.; J. M. Davies, borough engineer, Guildhall.

Workshop Yearbook

FROM Paul Elek (Publishers), Ltd., Diamond House, 36-38, Hatton Garden, W.C.2, we have received "The Workshop Yearbook and Production Engineering Manual," edited by H. C. Town, M.I.Mech.E. (price 30s.). This succeeds two earlier volumes entitled "Machine Shop Yearbook and Production Engineers' Manual." The information given is stated to be almost entirely new. The yearbook is in three parts, the first consisting of five articles on machine tools, mechanical testing of materials, industrial administration and lubrication. Part II covers all types of machine tools and instruments and also deals with industrial developments and power transmission; and Part III is devoted to practice and processes, machine design and construction, and production control and management.



Which is better — the Simmonds Nut with the fibre collar ; or the Pinnacle — with the metal diaphragm? Both are efficient and proved Stop Nuts. The fibre type has ten years successful use behind it. The metal diaphragm is newer, but we know already that it has certain advantages over the older nut. It is less affected by heat and moisture for example. On the other hand the fibre collar is much more effective as a seal. And so on . . . . Well, which should *you* use? The answer of course is that it depends on the job. If you're in any doubt, why don't you have a word with us? We think we know pretty well how any Stop Nut will behave in any given conditions.

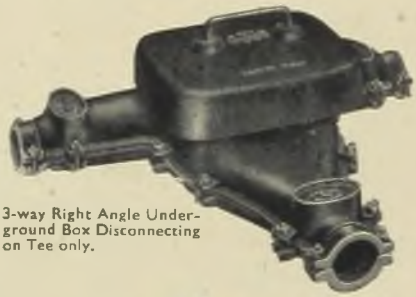
SIMMONDS STOP NUTS

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

3G

Useful Underground Disconnecting Boxes

2-way Underground Disconnecting Box fitted with wedge type links.



3-way Right Angle Underground Box Disconnecting on Tee only.

Parallel 'Narrow' Type Underground Disconnecting Box with Bolt on Wiping Glands. The fuses are provided with Porcelain Carriers which can be fitted instead of the Bakelite Lifting Bars supplied as standard.

Our special study of all problems relating to underground distribution has enabled us to build up a range of Underground Disconnecting Boxes to meet all the usual requirements of the Distribution Engineer and yet maintain a high degree of standardisation, thereby reducing stocks of components and increasing interchangeability.

The boxes illustrated are typical of the very wide range available. Please ask for catalogue WB and supplements.

HENLEY

UNDERGROUND DISCONNECTING BOXES

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.

MILTON COURT · WESTCOTT · DORKING · SURREY

MISERABLE CURVE

All's not well with output in this factory. Operatives, plant and organization are right but some factor is wrong. Something is putting a damper on production.

It could be bad ventilation.

Unless an efficient ventilation system is installed the effects of excessive heat and bad ventilation cannot be avoided. Workers' energy will be sapped, enthusiasm damped and production is bound to suffer.

Not only will an efficient system of ventilation help to increase war-time production but it will add immeasurably to health and output in the post-war years too.

CONSULT THE G.E.C. ON VENTILATION with GENALEX EXHAUST FANS

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS for insertion in the following Friday's issue are accepted up to **First Post on Monday**, at Dorset House, Stamford Street, London, S.E.1.

THE CHARGE for advertisements in this section is 2/- per line (approx. 8 words) per insertion, minimum 2 lines 4/-, or for display advertisements 30/- per inch, with a minimum of one inch. Where the advertisement includes a Box Number there is an additional charge of 6d. for postage of replies.

SITUATIONS WANTED.—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES TO advertisements published under a Box Number if not to be delivered to any particular firm or individual should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Letters of applicants in such cases cannot be returned to them. The name of an advertiser using a Box Number will not be disclosed. All replies to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. Cheques and Postal Orders should be made payable to ELECTRICAL REVIEW LTD. and crossed.

Original testimonials should not be sent with applications for employment.

OFFICIAL NOTICES, TENDERS, ETC.

LITTLEBOROUGH URBAN DISTRICT COUNCIL

Electricity Department

THE above Council invite tenders for the supply and delivery of E.H.T. FEEDER CABLES (11,000 volt). Specification, schedule and forms of tender may be obtained on application to Mr. George Hill, Electrical Engineer and Manager, Council Offices, Littleborough.

No tender will be received except in a plain sealed envelope, bearing the words "Tender for Cables," but which must not bear any name or mark indicating the sender.

Tenders sealed and endorsed as above, must be received by the undersigned not later than TUESDAY, the 19th June, 1945.

The Council do not bind themselves to accept the lowest or any tender.

R. C. CLOUGH,
Clerk of the Council.

Council Offices,
Littleborough, Lancs.
31st May, 1945. 2036

GELLYGAER URBAN DISTRICT COUNCIL

Electricity Department

House Service Units

THE Council invite tenders for the supply and delivery of HOUSE SERVICE UNITS for one meter per consumer. Specification and form of tender may be obtained on application to the Electrical Engineer and Manager, Electricity Offices, Hanbury Road, Bargoed, Glam. Tenders, endorsed "HOUSE SERVICE UNITS," must be addressed to the undersigned in plain sealed envelopes bearing no mark to indicate the sender, and must be delivered not later than first post on Saturday, 30th June, 1945.

BERNARD M. MURPHY,
Clerk of the Council.

Council Offices,
Hengoed, Glam.
25th May, 1945. 2060

SITUATIONS VACANT

None of the vacancies for women advertised in these columns relates to a woman between 18 and 41 unless such woman (a) has living with her a child of hers under the age of 14, or (b) is registered under the Blind Persons Acts, or (c) has a Ministry of Labour permit to allow her to obtain employment by individual effort.

A S.E. London factory has vacancies for experienced Engineers, preferably having pre-war experience of the design of radio and television receivers and the application of radio to vehicles. Excellent post-war prospects. Appointment when present restrictions of employment are withdrawn. Write in confidence to—Box 7188, A.K. Advg., 212a, Shaftesbury Avenue, London, W.C.2. 2035

CHEMIST required for manufacture of and research into fluorescent material. Experience in this field or in inorganic analysis of traces an advantage. Excellent post-war prospects. Salary according to qualifications. Write —Box E L S. 105, Judd Street, London, W.C.1. 1995

CITY OF MANCHESTER EDUCATION COMMITTEE

Newton Heath Technical School

Appointment of Principal

APPLICATIONS are invited for the post of Principal of the Newton Heath Technical School on the retirement of the present Principal (Mr. R. Saunsbury, M.Sc., M.Ed.) in September next.

The School is organised in three sections, viz., the Junior (Secondary) Technical School with Courses preparing for entry to the Engineering and Rubber Industries, Ordinary National Certificate Courses in Mechanical and Electrical Engineering (Day and Evening) and Courses for the Licentiateship and Associateship of the Institution of the Rubber Industry.

Candidates should be graduates of a British University, preferably in Science or Engineering, or possess equivalent qualifications. Suitable teaching experience is essential and industrial experience is desirable.

The Committee's salary scale for Principals of Technical Schools is under revision in accordance with the Burnham Reports, and any adjustment in the present scale (£600 × £25 × £800 plus £52 bonus) will operate as from 1st April, 1945. Previous experience may be taken into account in determining commencing salary.

Application forms and further particulars may be obtained (stamped addressed foolscap envelope) from the Director of Education, Education Offices, Deansgate, Manchester, 3, to whom they should be returned not later than 23rd June, 1945. 2019

COUNTY BOROUGH OF WEST BROMWICH

Education Committee

Kenrick Technical College
(Principal: R. C. Prescott, M.Sc.(Vict.), M.I.Mech.E.)

APPLICATIONS are invited for a full-time post of Lecturer in ELECTRICAL ENGINEERING, commencing in September, 1945. Applicants should possess a good degree or its equivalent, together with sound industrial experience. Salary in accordance with the new Burnham Scale. Further particulars of the post and form of application will be sent on receipt of a stamped addressed foolscap envelope. Applications must be returned to the undersigned not later than Saturday, June 16th, 1945.

L. G. ROSE,
Director of Education.

Education Offices,
Highfields, West Bromwich.
16th May, 1945. 2022

CITY OF PORTSMOUTH ELECTRICITY UNDERTAKING

APPLICATIONS are invited for the position of Junior Engineer for shift work in the Generating Station at a salary in accordance with Grade 10, Class J, of the National Joint Board's Schedule, at present £317 per annum.

Applicants should have completed a course of training in a technical college and have had works experience. Previous experience in an electricity undertaking is not necessary.

Forms of application may be obtained from the undersigned and must be returned by 11th June, 1945.

B. HANDLEY,
Engineer and Manager.

111 High St., Portsmouth.
16th May, 1945. 2016

BOROUGH OF CHESTERFIELD

Electricity Department

APPLICATIONS are invited for the appointment of a Senior Charge Engineer in the Corporation's Generating Station.

Candidates must have had previous experience in a similar position and the successful candidate will be held responsible for the efficient operation and maintenance of turbo-generators and auxiliaries, rotary converting plant, high voltage and medium voltage switchgear, etc., and must also act as relief shift charge engineer.

The salary will be in accordance with Grade 7, Class F (E.P.E.A. Schedule), which is at present £431 per annum.

The appointment will be subject to the provisions of the Local Government and Other Officers' Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications, endorsed "Senior Charge Engineer," stating age, qualifications and experience, together with copies of recent testimonials, to be addressed to and reach the undersigned not later than 14th June, 1945.

RICHARD CLEGG,
Town Clerk.

Town Hall, Chesterfield.
26th May, 1945. 2053

BOROUGH OF ROYAL TUNBRIDGE WELLS

Electricity Department

APPLICATIONS are invited for the position of Control Room Engineer. Applicants must have sound experience in the control of E.H.T. switchboards.

Conditions of service and rate of pay will be in accordance with the National Joint Board Schedule, Class F, Grade 9a (present salary £293 per annum).

The successful candidate will be required to pass a medical examination and to contribute to the Corporation's Superannuation Scheme.

Applications, giving age, details of training and experience, present position regarding service with H.M. Forces, and accompanied by copies of two recent testimonials, must be delivered not later than Friday, 15th June, 1945, to the undersigned.

R. N. TORPY, M.I.E.E.,
Borough Electrical Engineer.

Town Hall,
Tunbridge Wells.
25th May, 1945. 2042

BOROUGH OF CHESTERFIELD

Electricity Department

APPLICATIONS are invited for the position of Assistant Switchboard Attendant in the Corporation's Generating Station.

Applicants should be technically qualified and have had experience with power station switchgear and converting plant.

Salary and conditions in accordance with District Council (No. 2) Section "A" rates of pay, at present 28.35 pence per hour.

Applications, endorsed "Assistant Switchboard Attendant," stating age, present position, details of training and experience, together with copies of testimonials, to be addressed to the undersigned and to be received not later than 14th June, 1945.

RICHARD CLEGG,
Town Clerk.

Town Hall, Chesterfield.
26th May, 1945. 2054

WEST GLOUCESTERSHIRE POWER CO. LTD.

Apparatus Sales Manager

APPLICATIONS are invited from persons capable of the organising and developing of the Apparatus Sales side of the company's business.

Applicants must be experienced in the buying and selling of apparatus and have contact with and access to manufacturers, and be prepared to work in co-operation and collaboration with the Consumers Department staff.

Salary of not less than £700 per annum with appropriate increases after development of the organisation. Earnings will be based upon the development achieved.

Appointment will be subject to the company's usual conditions of service.

Application forms obtainable from 126, London Road, Gloucester, communications to be endorsed on the envelope "Apparatus Sales Manager" and addressed to the General Manager and Chief Engineer. 2027

THE ENGINEER SURVEYORS' ASSOCIATION

ENGINEERS (Mechanical, Electrical and Lift and Crane) seeking to enter the Engineering Insurance Industry should write to the General Secretary of the above Association, which is exclusively concerned with the industry, and is, in fact, the only Association so concerned.

Typical qualifications are: Thorough Power Plant experience, ashore or afloat; First Class or Extra First Class B.O.T.; National and Higher National Certificates; Drawing Office experience; Membership of a Senior Institution an advantage.

The Association's salary scale is in general operation throughout the industry.

JAMES C. FELL,
General Secretary.

19, Atlantic Chambers,
7, Brazennose Street,
Manchester, 2. 1988

ELECTRICAL and Mechanical Engineering Company in London area require Departmental Manager for their electric motor and transformer section. A commencing salary of £500 per annum will be paid to a keen, energetic man with the following qualifications: (1) Good practical experience in winding and assembly of electric motors, A.C. and D.C., all sizes, transformers, coils, etc.; (2) sound technical knowledge; (3) able to control and train mixed labour; (4) some experience of estimating and rate fixing. Apply by letter, stating age and concise particulars of training and subsequent experience. Applicants selected for interview will be paid travelling expenses.—Box 1977, c/o The Electrical Review.

ELECTRICAL Designer for A.C. commutator motors, with thorough knowledge of induction and D.C. machines, required by manufacturing electrical engineers in East Anglia. Successful applicant must possess a technical education up to degree or H.N.C. standard, and have had a thorough electrical training, coupled with some years' experience of design of the type specified. Permanent progressive position, subject to superannuation, for suitable candidate. Salary £400 to £700 p.a. according to qualifications and experience. Write, quoting D.1121XA, to Ministry of Labour and National Service, Central (T. & S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for application form, which must be returned completed by 12th June, 1945. 2038

ELECTRICAL Engineer, Grad.I.E.E., 14 years' experience in manufacture and design of control switchgear having complicated circuits, lifts, ventilation and small generating plant, anxious to hear of permanent executive post in London. Excellent education, initiative, ideas, writing ability, languages.—Box 7114, c/o The Electrical Review.

ELECTRICAL wholesalers require Trade Counter Assistant. Must be conversant with all types of electrical material for installation purposes.—London Electrical Co., 92, Blackfriars Road, S.E.1. 24

EXPERIENCED Armature Winder wanted for India. £40 per month plus 10% of concern's annual profit. Four years' term. Passages paid. Leave on half pay. Desirable features: Sound mechanical sense; possess snaps of own heavy mill or textile jobs rewound; good health; unmarried; age 25-35; had own wiring business; understand quoting. (1944 concern's profits were £7,500.) Write—Box 7108, c/o The Electrical Review.

EXPERIMENTAL Physicist required, preferably with experience in vacuum and gas discharge work. Excellent post-war prospects. Salary according to qualifications. Write—Box E.F.7, 105, Judd St., London, W.C.1. 1996

EXPORT Manager required by well-known fixed electric condenser makers. Managerial export experience of electrical component sales for equipment purposes and personal connection with merchant exporters essential. Age 30 to 35. Salary and possible interest commensurate with capabilities. First-class man wanted. State in full past experience.—Box 2007, c/o The Electrical Review.

LAMP Factory Manager. Required for the North, a Works Manager with technical experience and executive ability. The factory is small, with first quality production. Apply in confidence, with full particulars of qualifications, experience and salary required.—Box 2024, c/o The Electrical Review.

MALE Records and Order Clerk required by manufacturers of electric light fittings in London. One with experience preferred, but not essential; permanent position for suitable man.—Box 2006, c/o The Electrical Review.

MANAGER wanted for electrical and instrument Assembly, with experience in moving coil instrument production.—Box 2028, c/o The Electrical Review.

MANAGER, experienced in radio production, offered permanent post with good prospects.—Box 2029, c/o The Electrical Review.

PRODUCTION Engineer required: shop apprentice trained, with practical experience of planning mass-production processes of intricate small products. Academic qualification would be an advantage, but not essential. Applicants should have experience of handling small staffs and be capable of training juniors along orthodox lines. Appointment after relevant restrictions of employment are withdrawn. Write in confidence to—Box 7197, A. K. Advg., 212a, Shaftesbury Avenue, W.C.2. 2034

REPRESENTATIVES required for some areas to sell non-ring flexibles and cables to contractors, electricians, etc. Sidelines not objected to.—Box 7116, c/o The Electrical Review.

REPRESENTATIVES required, leading wholesale radio-electrical factors, London and coastal districts, wage and comm. Apply—65, Farringdon Road, E.C. 7062

REQUIRED by The Lothians Electric Power Company, 53, Melville Street, Edinburgh, Lady Cookery Demonstrator and Domestic Adviser to advise consumers on the correct use of electric cookers and household appliances and carry out occasional public cookery demonstrations. Salary £3 7s. 4d. per week basic, plus cost of living bonus, at present £1 4s. 6d. per week. Applications, stating age and qualifications, to undersigned. This advertisement is by permission of the Ministry of Labour and National Service under the Employment of Women (Control of Engagement) Orders, 1943.—Chas. Collyns, M.I.E.E., General Manager. 2023

REQUIRED, Operation Foreman for shift duties in modern H.P. boiler house. Must be accustomed to large water-tube units of modern design, and must be good disciplinarian. The position is permanent and pensionable for suitable man. Wage 28.67d. per hour, rising to 29.67d. per hour when fully proficient. Applicants must state age and if married. The housing situation in the district is acute, and if the successful applicant is separated from his family he will be paid 24s. 6d. lodging allowance for a limited period whilst maintaining two homes. Applications should be addressed to—The City Electrical Engineer, Gloucester Corporation Electricity Dept., Commercial Road, Gloucester. 2017

SALES and Contracts Engineer, about 25/30 years of age, with experience in handling E.H.T. and L.T. switchgear work. Fullest details.—Box 2014, c/o The Electrical Review.

SALES Engineer with first-class technical education in electricity required for sales department of progressive manufacturers of small switchgear. Knowledge of heating an advantage. Good opportunity for ambitious man.—Box 2021, c/o The Electrical Review.

SALES Representative required by electrical wholesaler for Cambs. and surrounding area. Salary and liberal commission. Experience, age and commencing salary.—Box 7093, c/o The Electrical Review.

SWITCHGEAR manufacturers require Technical Sales Engineer in London office. Experience in estimating, tendering and correspondence. Write, stating age, experience and salary required, to—J. G. Statter & Co. Ltd., 82, Victoria Street, S.W.1. 2025

TECHNICAL Engineers required, with experience in motors, control gear, instruments or meters. Apply—Box 7109, c/o The Electrical Review.

THE Yorkshire Electric Power Company: Public Lighting Engineer. Applicants must be corporate members of the I.E.E. or hold an equivalent qualification, and must have had technical and practical experience in illuminating engineering and the lighting of public highways. Candidate appointed will be responsible for conducting negotiations with public lighting authorities, the fixing of terms of contract, preparation of plans and schedules for attachment to agreements, etc. An understanding of the legalities of contract is essential. Salary £500 to £600 p.a., plus war allowance, according to qualifications. Write, quoting D.1231XA, to Ministry of Labour and National Service, Central (T. & S.) Register, Room 5/17, Sardinia St., Kingsway, London, W.C.2, for application form, which must be returned completed by 12th June, 1945. 2037

TRANSFORMER Draughtsman, experienced, not over 35 years of age, will be required immediately the present restrictions on employment are relaxed. Applications are invited from men at present employed on this class of work, who will wish to make a change later, and also from those serving with H.M. Forces. Apply to—British Power Transformer Co. Ltd., Ponders End, Middx. 1497

WELL-established, progressive Electrical Wholesalers, London area, require efficient Departmental Manager, fully conversant with all electrical material. Permanent. Write, stating knowledge, experience and age—Box 37, c/o The Electrical Review.

APPOINTMENTS FILLED

Dissatisfaction having been so often expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

ADVERTISER (50) desires change. Many years' administrative exp. sales office organisation. Methodical and efficient controller.—Box 7089, c/o The Electrical Review.

CONTRACTS Manager. Electrical engineer, handling £50,000 turnover, wide experience all classes installations, management, supervision, estimating, etc., seeks change offering scope; West of England preferred.—Box 7110, c/o The Electrical Review.

ELECTRICIAN-Wireman, wiring or maintenance. A.C. and D.C., 20 yrs.' experience, age 41.—Box 7068, c/o The Electrical Review.

EXPERIENCED Plumber Cable Jointer, E.H.T., L.T., sub-station foremanship.—Breach, 67, Longridge Rd., Ribbleton, Preston, Lancs. 7104

FIRST-class practical mechanic, with technical and business ability, is desirous of contacting manufacturers or contractors in view to acting as their Area Installation or Service Representative, preferably speciality equipment. South Wales or West of England preferred; similar position held before hostilities. Aged 32, advertiser has acquired valuable experience with the varied types of electrical installations during the past five years, engaged upon important speciality work, wireless telegraph and Radar, etc., also gained wide experience of modern interior and exterior lighting equipment, domestic appliances and power distribution. Excellent credentials.—Box 7064, c/o The Electrical Review.

FOREMAN Electrician (17 years), experience all branches contracting and maintenance, estimating, requires similar position.—Box 7067, c/o The Electrical Review.

PRODUCTION Engineer, age 34 years, seeks progressive position. Fully experienced, production, planning and methods of time study. Previous 10 years with world-renowned electrical engineers.—Box 7105, c/o The Electrical Review.

RESPONSIBLE position required by Engineer, offering excellent prospects. Practical experience commercial, sales, office administration, etc., or would consider directorship with moderate investment; own car; London area preferred.—Box 7077, c/o The Electrical Review.

SALES. Technical Sales Engineer (50) wishes to represent manufacturer of transformers, heating and cooking equipment or resistances, in London and South. Good connection for approved equipment. Min. rem. £500. Own car.—Box 7113, c/o The Electrical Review.

SENIOR Electrical Draughtsman and Engineer (35), qualified, experienced and with good refs., seeks permanent position of trust, industrial or public works installation design, etc., or maintenance of plant. Good experience in field, office management, correspondence, etc. Release promised.—Box 7073, c/o The Electrical Review.

TECHNICAL Sales Engineer (39), Associate I.E.E., over 15 years' established connection electricity undertakings, electrical trade and large industrial concerns over wide area Midlands—Northampton to Sheffield, Birmingham, etc.; lighting, heating, cables, switchgear and general L.T. distribution specialist, desires similar position where initiative, resourcefulness and responsibility are demanded. Write—BM/KAY11, London, W.C.1. 7074

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YOUNG Electrical Engineer, widely travelled, at present holding responsible position abroad, could be free for re-engagement, inducement offering, in the U.K. or on site early 1946. Good education and technical training, excellent references. Wide experience in executive situations home and abroad on installations, maintenance, repairs to electrical and mechanical equipment, steam and diesel engines, planning, layout. Any employer requiring really keen young engineer, preferably for service overseas, should write for further details to—Box P.368, 19/21, Corporation Street, Birmingham, 2. 2040

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BRITANNIA MANUFACTURING CO. LTD.,
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ONE Crompton Alternator, 400/440 volts, 3-phase, 50 cycles and neutral, 80 kW, 750 r.p.m., revolving field type, three bearings on common base plate with automatic voltage regulator.

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A.C. and D.C. House Service Meters, all sizes, quarterly and prepayment, reconditioned, guaranteed one year. Repairs and recalibrations.—The Victa Electrical Co., 47, Battersea High Street, S.W.11. Tel. Battersea 0780. 19

A.C. and D.C. Motors, all sizes, large stocks, fully guaranteed.—Milo Engineering Works, Milo Road, East Dulwich, S.E.22 (Forest Hill 4422). 6781

A.C.-driven Plating Dynamo, 1,000 amps., 16 volt, 570 r.p.m., direct coupl. on bedplate, reconditioned.—The Electroplant Co., Wembley, Middx. 2057

A.C. Motor, 100 h.p., 400/3/50, 580 r.p.m., Crompton, slip-ring, with liquid starter, reconditioned.—The Electroplant Co., Wembley, Middx. 2058

A.C. Motors, 1/50th h.p. to 10 h.p., from stock. Also D.C.—The Johnson Engineering Co., 86, Great Portland Street, London, W.1. Tel.: Museum 6373. 57

AERIAL Cables, all sizes quoted for: good deliveries against Government contract numbers.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7121

ALTERNATOR, 500 kVA, 3-p., 50 c., 400/440 v., 750 revs., direct coupled exciter, 2 brgs., on bedplate.—Stewart Thomson & Sons, Fort Road, Seaforth, Liverpool, 21. 58

BEST English Cables, 1/.044 up to 127/.103, deliveries against M.O.S. requirements.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7122

CARBONS, large stocks assorted sizes, solid and cored.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7123

DIESEL Generating Set, comprising 35-h.p. Allen vertical engine direct coupled to 21-kW, 110/145-volts, compound interpole dynamo, 200 amps., direct running. Also 110-volt Battery, comprising 585-ampere-hour unit complete with stands. Seen running in Surrey. Sold separately if desired. Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 2051

EXHAUST Fans, new, 14", 1-phase, 200/250 v., 1,900 cu. ft./min., £11 15s.—Southern Ignition Co. Ltd., 190, Thornton Road, Croydon. 75

FERRANTI F.L.P. Prepayment Meters, 1s. slot, A.C., 10 amp., as new, £2 10s.—11a, Highbury Grove, London, N.5. Can. 1766. 7118

FOR sale, new Brass Rods, screwing quality, Brass Tubes, pure Zinc Rods, P.B. Strip, Electric Cable.—Albion Metal Co., Church Walk, Albion Rd., N.16. 7065

FOUR identical 150-kW "Weir Sulzer/E.C.C." Diesel-driven Generating Sets, 220 volt D.C.—Stewart Thomson & Sons, Fort Rd., Seaforth, L'pool, 21. 74

G.E.C. 30-kW Dynamo, 460 v. D.C., or 230/460 v. A.C., 400 r.p.m., splendid cond.; also 5-kW Steam Set, 100 v.—Kimmins, Lyndhurst Road, Worthing. 7063

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INSU-Glass covered Plain or Enamelled Instrument Wires, No. 18 s.w.g., No. 40 s.w.g., stock deliveries.—Saxonia, Roan Works, Greenwich, S.E.10. 29

LEAD-covered and Armoured Cables, P.I. and V.I.R., various special lines at low prices.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7124

LESLIE Dixon & Co. for Dynamos, Motors, Switchgear, Chargers and Telephones.—214, Queenstown Road, Battersea, S.W.8. Telephone, MACaulay 2159. Nearest Rly. Sta.: Queen's Road, Battersea (S.R.). 18

MOTOR Generator Sets and Convertors, all sizes and voltages from ¼ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, City Road, London, N.1. Telephone, Clerkenwell 5512, 5513 & 5514. 28

NAMEPLATES, Engraving, Diesinking, Stencils, Steel Punches.—Stilwell & Sons Ltd., 152, Far Gosford Street, Coventry. 14

ONE B.T.H. indoor type oil-cooled Transformer, 6,600 volts, 3-phase, 50 cycles incoming, 2,200 volts, 3-phase, 50 cycles outgoing, 600-kVA capacity; voltage tappings plus and minus 5% on the incoming side. Two compound interpole 230-volts D.C. Generators, suitable for direct coupling, one by L.D.M., 80/95 kW, 1,000/1,500 r.p.m., size D110; one by B.T.H., 60 kW, 1,200 r.p.m., size BS11W. One Higgs Squirrel Cage, 400 volts, 3-phase, 50 cycles, four-speed, 3 h.p., continuous on each speed, motor with controller.—Oldfield Engineering Co. Ltd., 96, East Ordsall Lane, Salford, 5, Lancs. Bla. 3842. 1915

PHONE 98 Staines. 400-kW Belliss Steam Condensing Set; 34-kW Browett Steam Generating Set, 220 vo. D.C., 75-h.p. National Diesel Engine; Weir Feed Pump, 9" × 7" × 21"; 9-kW Crude Oil Generating Set, 110 vo. D.C.; 250-kW Browett Steam Generator, 220 vo. D.C.—Harry H. Gardam & Co. Ltd., Staines. 60

PORCELAIN Cleats, 2 and 3 groove, various sizes ex stock, price list.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7125

PORCELAIN Insulators, various sizes in stock, galv. spindles.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7126

PORTABLE Engine-driven Welding Sets, output 75/350 amps., brand new, Government licence to purchase, delivery stock.—Gladiator Welder Sets Ltd., 18, Leicester Road, Sale, Manchester. 69

QUANTITY Bakelite Electrical House Fittings, ex surplus stock.—34a, Gaolgate St., Stafford. 2049

ROTARY Converters in stock, all sizes; enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 16

SEVERAL duplicate 20-h.p. and 25-h.p., 440-volt D.C., 3-bearing Motors by Mather & Platt, on baseplates, 650 r.p.m., with Brookhirst panels.—Newman Industries Limited, Yate, Bristol. 2047

SEVERAL Telescopic Tower Ladders ready for essential work. Extensions, Trestles and Steps to order.—Shaftesbury Ladders Ltd., 453, Katherine Road, E.7. Grangewood 3363. 15

SPECIAL line, Bell and Telephone Wires, also screened wires, large quantity, cheap.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7127

STAFF Time Checking and Job Costing Time Recorders (all makes) for quick cash sale. Exceptional condition. Write—Box 528, Smiths, 100, Fleet Street, London, E.C.4. 31

SWITCH and Fuse Units, Conduits and fittings, works requirements stocked.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7128

SWITCHBOARDS suitable for dynamos and alternators, all sizes from 100 amp. up to 1,500 amp.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 25

TRANSFORMER Lead-in Wire, 7/38 and 14/38 s.w.g., Insu-Glass finished, various colours, stock.—Saxonia, Greenwich, S.E.10. 34

TRANSFORMER, 50 kVA, Hackbridge, pole mounting, 6,300/400/230, new 1942. £55 f.o.r.—Electric House, Borth, Cards. 2032

TRANSFORMERS, single and three-phase. All types up to 10 kVA.—Woden Transformer Co. (Phone, Bilston 41959), Moxley Road, Bilston, Staffs. 12

T.R.S. Cables and Flexibles, Welding Cables, supplied to M.O.S. requirements.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 7129

TWO Motors, 250 b.h.p., 425/550 volts, revolutions 640/550, shunt wound, continuous rating. Two Boosters, 85/100 volts, shunt wound, 720/2,100 amps. Both manufactured 1914 by Lancashire Dynamo Co. For details and inspection apply to—Box 2018, c/o The Electrical Review.

TWO 20-kW, 120-v. D.C. Steam Turbo Sets and panels; Kohler Sets (rebuilt), 5 kW, 2 kW, 220 v., 800 w., 110 v.; Petter Diesel Set, 5 h.p., 200/220 v., 1-ph., 50 p., on bed; Steam and Diesel Sets, A.C., D.C., to 1,000 kW.—E. Binns, 156a, Falsgrave Road, Scarborough. 7115

2 200-kW Hewittic Mercury Arc Rectifiers, in first-class condition, output 460/490 volts, 2-wire; each complete with own transformer; input 6,300 volts, 3-phase, 50 cycles. £900 or nearest. Apply—" Glospower," Ref. C.E., 126, London Road, Gloucester. 1992

71-kW Steam-driven Generating Set, Ashworth Parker ½ vertical engine coupled to L.D.M. compound wound 230-volt generator, £120.—Stewart Thomson & Sons, Fort Road, Seaforth, Liverpool, 21. 54

6½-kW Turbo-Generating Set, 110 volt D.C., £40.—Stewart Thomson & Sons, Fort Road, Seaforth, Liverpool, 21. 55

7½-h.p., 400-v., 1,420-r.p.m., S.P., R.I. Century Motor and Resistance Starter, perf. cond., £45.—Colley, 51, Lambs Conduit Street, W.C.1. 7111

80-kW, 220-v., 350-revs., S.I., two ped. brgs., on bed plate.—Greenhalgh Bros., Burton's Field Mill, Atherton, nr. Manchester. 2044

100-h.p., 400/3/50, S.R., 730-revs., Louvre Vent., B.T.H. (ball bearings), with Ellison O.I. gear.—Greenhalgh Bros., Burton's Field Mill, Atherton, M/cr. 2045

110-volts, 1½-h.p., G.E.C., 1,700-r.p.m., shunt wound D.C. Motors, 12 available.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 2050

110-volt Chloride Battery, comprising 56 cells, 15 plate, 583 ampere hour, complete with stands and interconnections. Seen in use.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 2052

160-kW, 500-volts, 700-revs. S.I., two ped. brgs., on bedplate.—Greenhalgh Bros., Burton's Field Mill, Atherton, nr. Manchester. 2046

250-kVA Alternator, 400 volts, 3-phase, 50 cycles, 750 revs., with direct-coupled exciter; also two 250-kW Rotary Converters, with transformers and switchgear, input 6,600 volts, 3-phase, 50 cycles, output 420/210 volts D.C.—Midland Counties Electrical Engineering Co. Ltd., Grice Street, Spon Lane, West Bromwich. 36

400-kW Rotary Convertor, Metropolitan Vickers, 240-volt D.C. output, with 3-phase transformer, complete with pony motor, booster and exciter.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 1856

400-volts, 3-phase, 50-cycles, ball-bearing Motors, slip ring induction type; one 140 h.p., 975 r.p.m.; one 150 h.p., 730 r.p.m.; two 200 h.p., 980 r.p.m.—Oldfield Engineering Company Ltd., 96, East Ordsall Lane, Salford, 5. Blackfriars 3842. 2026

500 ¼-h.p. D.C. Motors, 1,440 r.p.m., 230 v., cont. rating, compound wound, ball bearings, condition as new, G.E.C. Offers to Box 2020, c/o The Electrical Review.

1,000-kW Turbo-Alternator Set, made by Metropolitan-Vickers in 1920, 3-phase, 50 period, 400 volts. Steam pressure 200 lbs., jet condenser. Apply—Patons & Baldwins Ltd., Halifax, Yorkshire. 2000

ARTICLES WANTED

ACETATE and other thermoplastic scrap; polythene and P.V.C. in any form; also scrap cable and insulated wire; urgently wanted.—Elton Levy & Co. Ltd., 18, St. Thomas Street, S.E.1. 30

COIL Winding Machines wanted for essential work.—Box 63, c/o The Electrical Review.

ENAMELLED Copper Wire wanted. Please state quantity, make, gauge and price.—Box 61, c/o The Electrical Review.

ENGINEERING Technical Books (new or secondhand) wanted in any quantity. Attractive cash offers. Call—Third floor, 356, Oxford Street, W.1, or " Stoneleigh," St. George's Avenue, Weybridge. 62

ONE 4-wire, 400-volts, 3-phase, 50-cycles Alternator, with direct coupled exciter, 3-bearing machine, 200 kVA, speed 500-600-750, if possible complete with control switchboard.—Box 67, c/o The Electrical Review.

POWER Station Circulating Water Vertical Pumps required immediately, 10,000 galls./min. and 6,000 galls./min. against 23 ft. head. Full particulars to—Box 2048, c/o The Electrical Review.

TWO 500-kW Rotary Converters, input 11,000 or 6,600 volts, 3-phase, 50 cycles, output 240/250 volts D.C. Full particulars to—Box 1920, c/o The Electrical Review.

WANTED, Rotary Converters, any size.—Universal, 221, City Road, London, E.C.1. 22

WANTED, Westinghouse Static Phase Convertor, 220v. input.—Allen Electric, 67, Loampit Vale, S.E.13. 7120

BUSINESSES FOR SALE AND WANTED

ADVERTISER wishes to purchase Electrical Contracting business in Eastern or Home Counties. Liberal price given for going concern capable of post-war development. Partnership considered. Replies treated in strictest confidence.—Box 7094, c/o The Electrical Review.

WHOLESALE electrical distributors operating Southern England would be prepared to consider buying established Wholesale Business in Manchester, Leeds, Birmingham, Newcastle, Scotland or elsewhere. Local staff could remain, possibly vendor as manager. Details (which will be treated with strictest confidence) to—Box 2030, c/o The Electrical Review.

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Long runs assured.

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Firms having capacity available in the near future for the above type of work are invited to communicate with—Box 2059, c/o The Electrical Review.

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ELECTRICAL Measuring Instruments skilfully repaired and recalibrated. — Electrical Instrument Repair Service, "Stanimede," Forlease Road, Maidenhead. 7117

FACTORY wanted, employing 50 to 100, to undertake manufacture of parts and sub-assemblies for well-known firm already overloaded with post-war work. Plant required must include capstans, bar chucking, drilling and milling machines, etc., able to produce good quality comparatively small parts in 1,000 batches. Factory purchased outright or fully absorbed with sub-contract work. London area preferred.—Box 2033, c/o The Electrical Review.

MACHINING Work, for Centre Lathes up to 6½ in. centres and medium-sized milling (good grade work preferred).—The London Electric Firm, Croydon. Uplands 4871. 56

PLASTIC Moulding concern, specialising in precision and repetition moulding, invite enquiries for immediate or P.W. delivery. Moulds designed and made in our own tool room. Free advice on all moulding matters.—Box 1912, c/o The Electrical Review.

POST-war development. Capacity for all types of Radio and Electrical Winding, including solenoids, chokes, small power transformers, etc.; contractors to large electrical undertakings.—Box 7033, c/o The Electrical Review.

SMALL Armatures, etc., winding or re-winding, in quantity. High-class work, prompt delivery.—Southern Ignition Co. Ltd., 190, Thornton Road, Croydon. 59

AGENCIES

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ELECTRICAL Engineer with good sales organisation in the Union and Rhodesia, representing various British manufacturers of Electrical goods, wants agency for:—

ELECTRIC MOTORS

from ¼ h.p. upwards. Fully conversant with tender business, etc.—Box 2039, c/o The Electrical Review.

A live, well-established company manufacturing small electrical switchgear, with excellent connections and first-class sales organisation at home and abroad, seeks Selling Agencies for products like limit, pressure and float switches, starters, push buttons, signalling lamps, etc. Would buy on own account, sound financial standing.—Box 2043, c/o The Electrical Review.

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WE WISH TO CONTACT BRITISH MANUFACTURERS OF ELECTRICAL AND MECHANICAL MACHINERY AND EQUIPMENT, GENERAL ENGINEERING STORES AND HARDWARE REGARDING REPRESENTATION OF THEIR PRODUCTS AS AGENTS AND DISTRIBUTORS IN INDIA, PARTICULARLY NORTHERN INDIA, SIND AND BOMBAY PRESIDENCY.

(Bankers: National Bank of India Ltd., Lahore.)

GAYTEE & COMPANY,
Engineers, Merchants and Importers.
BERRY COURT, THORNTON ROAD,
LAHORE (INDIA).

2041

A young man desires London Agency from manufacturer. Good connection with electrical and wireless wholesalers and retailers.—Box 7103, c/o The Electrical Review.

AGENCIES (commission or buying) required for Scotland for (1) Domestic Elect. Appliances; (2) Lamp shades, Fittings; (3) Accessories. Advertiser has valuable connection amongst wholesalers, contractors, retailers. Immediate turnover assured. Address—"1753." Wm. Porteous & Co., 9, Exchange Place, Glasgow. 7106

AGENCIES required, South of England, including the London area: (a) Cables; (b) Small Switchgear; (c) Transformers; or any lines suitable for distribution for wholesalers' business.—Box 40, c/o The Electrical Review.

AGENCIES required for London, South of England, for the following: (1) Domestic electrical appliances; (2) Brass electrical accessories, switch plugs, etc.; (3) Conduit. Advertisers have clientele with every wholesaler in the territory mentioned. Immediate turnover can be guaranteed. Either commission or buying basis. Post-war arrangements considered. — Box 64, c/o The Electrical Review.

AGENT, M.I.E.E., wide and influential connections in Midlands, would represent established firms. Any lines considered.—Box 7107, c/o The Electrical Review.

ARGENTINE: Post-war Exports. Well-connected Agent recently returned to this country, with partner competent engineer in the Argentine, wishes to contact British firms manufacturing all classes of electrical equipment, engineering lines, cables, hardware, etc. Excellent opportunity for firms to anticipate early resumption of trading with thoroughly competent representatives in leading South American country. Highest credentials, full particulars.—Box 46, c/o The Electrical Review.

ELECTRICAL Wholesalers (established 28 years) seek sole agencies for electrical specialities. Now operating mainly London and Southern England, but developing. Customers include electrical contractors and many large industrial user concerns.—Box 2031, c/o The Electrical Review.

EXPORT to India: An export house with well-established connections in the Indian market desires to hear from manufacturers of Electrical Accessories, Household Appliances, Refrigerators, etc., who seek to expand their export business. Write, giving full details, to the—Empire Export & Import Company, 2, Broad Street Place, London, E.C.2. 70

IRISH concern, having vast connections in wholesale electrical trade, wish to represent manufacturers of accessories, apparatus, etc. Interview in England.—Box 7112, c/o The Electrical Review.

MANUFACTURERS of Electro-Magnetic Relays require an agent for each of the following areas: Home Counties, South Coast, West of England, South Wales, Northern Ireland, Eire. Must be technically qualified and have connections in the industrial and supply companies field. Give full details, stating territory covered and agencies held.—Box 1967, c/o The Electrical Review.

WANTED, Agencies for British India for electrical A.C. and D.C. motors, generators, transformers, convertors, engines, arc welding plants, pumps, switchgears, meters, fans (table, exhaust and ceiling), heating and cooking appliances, cable, lamps, fittings and general accessories, also sound equipments for cinema and radio studios, and parts, by a well-organised firm who can sweep India's business for you through Calcutta, Bombay, Madras, Delhi and Lahore offices, and over 100 sub-agents in small towns throughout India. Apply, with catalogues, prices and trade terms—Havell's Electrical Sales Corpn., 59, Forbes Street, Fort, Bombay, 1. 1980

MANUFACTURERS' Agents, covering the whole of Great Britain and Colonies, are desirous of contacting manufacturers with a view to sole selling rights (either commission or buying), post-war arrangements considered.—Box 23, c/o The Electrical Review.

PROGRESSIVE company with sales organisation and good connections in the Building, Furniture and Allied Trades desire good agencies. Bankers' references. Enquiries to be addressed to—Stokes Bros. & Pim, Chartered Accountants, 36, College Green, Dublin. 2015

BUSINESS OPPORTUNITIES

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