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ELECTRICAL REVIEW

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May 19, 1944



# \* Cosmology

Number Twelve

#### COMETS AND SHOOTING STARS

The Science of the Universe as a whole.

THE remainder of the sun's family are quite small objects. Foremost in size and importance come the comets. These resemble the planets in travelling round and round the sun, but differ from them in mostly having very elongated paths, so that at one time a comet may be far out in the cold depths of space, and at another quite close to the sun. Comets are usually invisible until they get well into the light and heat of the sun. Then they are apt to become conspicuous, and even sensational, out of

all proportion to their true importance. They too are broken up when they enter the danger-zone surrounding a big body such as the sun or Jupiter : the broken fragments then form showers of stones which we call meteors, Occasionally the earth happens to pass right through one of these showers, so that some of the meteors get entangled in the earth's atmosphere. These are raised to a white heat by the friction of the air. and we have what is known as a meteoric display-a shower of shooting stars. In a few cases the paths of these



After a photograph by Lowell Observatory.

meteor showers coincide exactly with the former paths of vanished comets, giving a very convincing proof that the comets have been broken up into a swarm of smaller bodies. And, indeed, the whole history of the solar system is in large part one long story of big bodies being broken into smaller ones, not so much by direct collision as by gravitational forces, such as raise tides on our earth, tearing them to pieces.

+

Most meteors are no bigger than a walnut or a pea, if as big. Generally they are small enough to be completely vaporised before they strike the earth, leaving only a bright trail of luminous dust. The end of this trail marks the spot at which they became completely dissolved into vapour, and it is usually many miles above the ground. Occasionally, however, a meteor is too large to be entirely vaporised in its rapid flight through the air, and what is left of it strikes the earth as a meteoric stone. All parts of the earth are of course liable to bombardment by these stones, which appear to fall out of the skies. The Book of Joshua tells how, " The Lord cast down great stones from heaven." Many other falls of stones are mentioned by early writers, and great numbers of fallen meteorites have been preserved, some of them of considerable size and weight

> From "The Stars in their Courses" by Sir James Jeans. By permission of the Cambridge University Press

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May 19, 1944

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Baked Jam Sponge

Ingredients

12 Tablespoonsful margarine.

3 Tablespoonsful grated raw carrot. 6 Tablespoonsful self-raising flour.

3-4 Tablespoonsful of jam or stewed fruit.

Method

Cream the fat and sugar, beat in the carrot, then lightly add the flour. Moisten to a creamy consistency with milk or milk and water.

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May 19, 1944

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THE OLDEST ELECTRICAL PAPER - ESTABLISHED 1872

Vol. CXXXIV. No. 3469.

MAY 19, 1944

9d. WEEKLY

POLITECHNIKI SEASME

# **Registration of Contractors**

Mandatory Rules Would be Sufficient?

ARLY this year an I.E.E. Sub-Committee's report dealing with the future of electricity supply, distribution and installation was published and in it the view was expressed that compulsory registration of electrical contractors was not justified by the available evidence. This has been followed by the publication of a complete scheme for the examination, licensing and registration of contractors and operatives engaged in electrical installation work drawn up by a committee, under the chairmanship of Mr.S.B. Donkin, formed for the purpose before the war.

This scheme is based upon a "statement of evidence" which purported to show that the existing uncontrolled installation methods were a danger to the life and property of the public. It was pointed out that compulsory registration and wiring codes had been successfully introduced in a number of Empire and other countries.

#### **Desirability and Cost**

In any consideration of the merits of a move of this kind two questions must be answered: Is it desirable? Is it practicable? It will be generally agreed that good installation work is desirable and if good work can be ensured only by registration and rules then it may be assumed that they are desirable too.

The question of practicability is bound up with that of cost. It is conceivable that a scheme might be devised by which all installation work could be supervised and inspected to ensure adherence to the rules and conditions of registration, but would the cost involved be justified by the results?

The advocates of registration will reply that they realise the impossibility of securing an absolutely infallible scheme. Trust would have to be placed in those who were, by test, found to be qualified and reliable; this would be reinforced by the fear of punitive measures should they fail to observe the rules.

It was thought by the I.E.E. Sub-Committee that good installation work might be ensured by the formulation of a code to which all concerned would have to conform. Mr. L. C. Penwill (E.C.A.), for the pro-registration party, suggests that this would certainly entail a vast army of electrical inspectors. A code is necessary but it should be secondary to registration.

#### **Government Will Decide**

But whatever the electrical industry thinks of the matter the public, as represented by the Government, will have the decision. Advocates of registration and rules will have to convince them that the present position is so grave that the electrical installation trade should be treated on a somewhat similar basis to certain professions, such as the legal and medical, and made a "closed shop" to the illequipped and incompetent practitioner. In view of the lack of enthusiasm which has greeted attempts to secure the registration of engineers in the past there seems to be little hope of success at present, however desirable control may be. For the time being, it seems, we shall have to rely upon the education of the public to employ only reliable contractors—a slow and maybe painful process.

Register

MR. PENWILL, presum-The National ably reflecting the views of his Association, spoke out

thoughts which have been in the minds of many during the past few years when he said that the National Register of Electrical Installation Contractors had achieved nothing in its twenty years' life. He attributed this entirely to its lack of all authority and power. It is better to talk of the limited success of the Register rather than its failure; it has had some small influence where it has been backed by the supply authorities, but not enough to justify two decades of work. Mr. Penwill's reasons for this are no doubt sound, but there is another to which we have frequently called attention. It is simply that the public does not know about the Register; it has been almost a secret society. Only steady, sustained publicity could have remedied this, but there have never been the necessary funds. If the industry had been really serious in the matter and had thought voluntary registration worth while it might have found the money somehow.

> Aid to Russia

Too much secrecy has been observed about the nature and extent of the assistance which this coun-

try has afforded to Russia since she was attacked by the Germans in 1941. This has led both the Russians and our own people to wonder whether that assistance has been commensurate with the needs and deserts of our Ally. So far as the electrical aspect is concerned, we have persistently pressed the authorities until at last we have been permitted, in the series of articles which started in the Electrical Review of May 5th, to publish some details of the plant and equipment which British manufacturers have supplied and are supplying.

In the foregoing we More to have used the words supplying " be-" are Come cause last week's statement by the Prime Minister on the subject of aid to Russia was not the end of the story. Mr. Churchill gave among his figures a total of £7,564,000 as the value of power plant and electrical equipment dispatched during the last two-and-a-half years. There is a great deal more yet to go. For instance, the equipment for about a dozen power stations, ranging up to

60,000 kW, is in hand for putting into The service as far as two years ahead. transportable generating plants which we described last week are intended for affording temporary supplies until the permanent plant is ready.

IN this issue we present further views upon the Selected Stations question of changes in the present ownership

of selected generating stations. The references of Mr. J. F. Field to supplies to consumers in less densely populated areas are strictly relevant in their wider implications, since an important aspect of the question is whether the lower costs of production at the most favourable sites should be handed on to undertakings throughout the country with a view to facilitating price equalisation.

LARGE industrial com-**Ethics of** Suppression

bines are frequently accused of buying up and suppressing inventions

which, although improvements on existing methods, are likely to upset their established business. It is not denied that this practice is sometimes pursued, but it may not necessarily be pernicious-it may possibly work to the public advantage. The subject was referred to by Dr. P. Dunsheath in the first Llewelyn Atkinson Memorial Lecture delivered at the Royal Society of Arts in February last year. Dr. Dunsheath then pointed out that a too-rapid change-over to new ideas might be wasteful, but it was not for the wealthy industrial corporation to make the decision. In his Hobhouse Memorial Trust Lecture, delivered by Dr. D. R. Pye last week at Cambridge in the author's absence, Mr. H. Morrison expressed similar views and said (an unusual view for one of his political associations) that the blocking of patents was not necessarily "stupid or lazy."

National Interest

IT was suggested by Dunsheath Dr. that machinery was needed to adjust on a national basis

the competing claims of new and established designs that might have reached the mass production stage. Where the new idea ought to be developed the superseded industry might be compensated out of the consequent profits. Mr. Morrison agreed that every large change in the social and economic sphere had its cost as well as its

possible advantages. It was important to ensure that public policy was effectively operative when such great and vital decisions affecting our industrial progress were being taken.

Four years have elapsed since the Glasgow Corpor-Glasgow and E.D.A. ation ceased to be a member of the British Electrical Development Association, a break which we deplored at the time. The reason for the withdrawal was said to be the Corporation's inability to obtain details of the Association's expenditure in Glasgow and the West of Scotland, although particulars for Scotland as a Now, were available. howwhole ever, the Electricity Committee by ten votes to two has adopted a recommendation by Mr. G. Morgan, the general manager, that membership of E.D.A. should be resumed and that the subscription for the current year (£1,449) should be paid. It is to be hoped that the Corporation will confirm this welcome decision.

### Patent Extensions

HARDSHIP and expense are incurred by owners of patents which the war has

rendered it difficult or impossible to work when they seek an extension by way of compensation. The Chartered Institute of Patent Agents states that the cost of an application to the High Court is generally of the order of £200 and in the case of a patent which expires during the war a second application becomes necessary at a later date. This undoubtedly deters many patentees from putting forward justifiable applications for extension and the Institute repeats a suggestion which it made two years ago that these applications should be dealt with by the Comptroller-General of Patents who is well qualified to handle them.

### EACH year the Report of Milestones the Council of the I.E.E.

records a progress in professional activities that is surely, if slowly, raising the status of electrical engineers to the position intrinsically merited by their calling, having regard to the benefits it bestows upon the community. Perusal of the Report for the past twelve months (leading particulars of which were given in our last issue) will bring home to the membership of 25,000 the extent of the debt they owe to some of the busiest men in the profession, whether in London or in the local Centres, who ungrudgingly sacrifice their leisure time to advance the technical interests of their fellows. Their reward is the certain knowledge that so much of what has been accomplished is destined to be of permanent value.

> Central can be Control tricity.

Two kinds of service can be rendered by electricity. One is merely done better or more eco-

nomically than by alternative means; the other is practicable only because of inherent characteristics of electricity. Representative of the latter are many methods of remote control, the complexity of which has not prevented trouble-free operation. One of the most important of these is remote switching by superimposed currents, the present state of development of which at audio frequencies was surveyed in the paper presented by Mr. J. L. Carr before the I.E.E. Transmission Section last week.

Ripple Currents PRIMARILY intended for the control of street lighting, provision has been made for further develop-

ment and numerous uses suggest themselves, especially in regard to peak control. The single-equipment parallel-injection system adopted in Manchester seems particularly suited to the large area covered by the city undertaking, though questions have been raised as to the possibility of interference with relays on other distribution systems. Regulations will no doubt be introduced by the Electricity Commissioners to guard against eventualities of this nature. Unwanted tripping has proved to be an insubstantial bogy.

IN his presidential Trans-Oceanic address to the I.E.E. last Telephony year Sir Stanley Angwin showed that there is increasing scope for cables as well as radio

increasing scope for cables as well as radio for inter-continental communications. Indeed, one of the most pressing needs is to increase the number of speech channels available, and reference was made to promising developments in the use of submerged repeaters as an integral part of a cable. What is believed to be the first repeater of this type was described by Mr. R. J. Halsey last week. It was laid by the G.P.O. in the relatively shallow water of the Irish Sea just on a year ago, but its installation at appreciably greater depths would appear to present little difficulty.

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# **Electric Welding**

# Securing Immunity from Shocks

NONE of the precautions adopted in most branches of electrical engineering

to prevent operators making contact with live metalwork is possible with arc welding. In fact, practice goes to the other extreme of giving the welder a bare live conductor to handle, although at a voltage that seldom exceeds 100 AC as compared with at least 200 to 250 V found in most industrial applications.

In renewing electrodes the welder handles live equipment hundreds of times a day, and the potential risk By H. G. Taylor, D.Sc.(Eng.), A.M.I.E.E.

of shock is high, particularly when he is in contact—as on shipboard or in boiler welding —with the actual metal on which he is working. The welder's safeguard is threefold: That he invariably wears gloves which act as insulation, that the non-metallic coating of the electrode is itself at least a semi-insulator, and that he is continuously aware of the risks attached to exposure to both shock and burning and therefore automatically takes care.

In 1930 there were only fourteen accidents due to welding, which represented about 4 per cent. of the total electrical accidents.



Fig. 1.—Circult for reduction of open-circuit voltage

By 1942 the figure had steadily increased to 228 accidents, or 22 per cent. of the total. Of this number no doubt a large proportion was due to "eye-flash" and, indeed, no fatal accident resulting from welding has been "reported" to the Home Office over the period during which official statistics have been published.

In view of the great increase of welding during the war this is a good measure of the limited nature of the danger. It is desired not to stress the risks unduly, but only to engender a true appreciation of the situation and an adequate sense of responsibility on the part of those in charge. One must also bear in mind that there are many women operators who are more apprehensive than men when slight shocks are received.

A careless welder can expose other employees to similar risks, as when a welding holder is laid down on metalwork which is insulated from the return path or, alternatively, if he commences to weld without having first attached his earth connection. All the affected metalwork

All the affected metalwork is raised in potential with respect to true earth, and unsuspecting persons in an earthed situation touching

the live metalwork may receive a shock.

An effective method of avoiding shock is to ensure that the open-circuit voltage, that is, the voltage at the electrode when the equipment is switched on but no welding is taking place, is reduced to a safe value. A practicable means of carrying out this operation is shown in Fig. 1. The supply from the welding transformer or welder's distribution board passes via the variable reactor R and the contactor C on the one hand and the earth lead on the other hand to the electrode and work respectively. A small auto-transformer, T, is connected across this supply through the auxiliary contact (2) of the contactor. The low-voltage supply from the transformer is required to operate the contactor coil at 10 to 15 V. The transformer is connected across the line and, therefore, by means of the contactor coil and auxiliary contact (1) the electrode is connected to a point on the transformer which is at 10 to 15 V with respect to the work. So long as the electrode does not touch the work no higher voltage can exist and the holder and rod are safe to handle.

When the electrode is brought into contact with the work the secondary circuit of the auto-transformer is completed, current flows through the contactor coil, the contactor closes and welding commences. Auxiliary contact No. 1 changes the operating coil connection from the electrode to the end of the transformer winding, and auxiliary contact No. 2 transfers the supply to the transformer from the earth lead to the live supply lead to the reactor, so that the transformer is now operated by the voltage drop across the reactor instead of by the 100 v supply. When the arc is broken there is no voltage drop across the reactor to operate the transformer, and the contactor opens ready for a fresh cycle of operations.

The reactor is made variable to obtain different welding currents, but under operating conditions the voltage drop in the reactor is practically independent of the current for which it is adjusted, and is only a function of the main transformer voltage and the arc voltage (see Fig. 2). As a general rule the maximum arc voltage used does not



Fig. 2.--Vector diagram showing small effect of arc voltage on reactor voltage

exceed 40 per cent. of that of the main transformer. This implies that the voltage drop across the reactor varies only between the full transformer voltage (when the electrode touches the work piece) and 92 per

cent, of this voltage (when the arc voltage attains 40 per cent. transformer of the voltage). Thus the operating-coil design is very simple; it must hold on at, say, 90 per cent. of the voltage at which it is called upon to operate and must not overheat when on a heavy-duty cycle at, say, its full operating voltage. The operation of the reactor is almost instantaneous, and the operator is not aware of any delay.

The chief disadvantages of this arrangement are the need for a contactor capable of carrying though not breaking the full welding current and the provision of a connection from the contactor to the earthed side of the

supply. Fig. 3 (a) shows the normal basic method of connection, R being the reactor connected between the welding transformer and the electrode. Obviously the best place to fix the contactor is to the reactor casing and Fig. 3 (b) shows one arrangement of connections. By this method reactors would have to be fitted with plug-and-socket connections for two heavy-current leads instead of one. Fig. 3 (c) is an alternative arrangement in which a twin cable is used between the transformer and reactor, but one of the wires is a relatively light one required only for the small transformer. Such a lead could be provided by the armouring of the main cable, but effective connections would have to be made at each end—in fact the armouring would need to be bonded in the usual way.

Fig. 3 (d) represents the normal arrangement on shipboard where the welding transformer is generally located on the dock side. A multicore cable is connected on the power-voltage side of the transformer to a distribution board on deck. Near this board a solid connection is made to the metalwork of the ship for the neutral conductor, though B.S.S. 1071/1943 suggests that such a connection should be made as near to the work as possible. Where this arrangement exists a somewhat simpler solution is availablethe lead from the No. 2 auxiliary relay lower contact should be joined to the metalwork of the reactor, when earth continuity will be provided through the base of the reactor. Such an arrangement is not fool-proof, since the reactor may not stand on a metal deck and, in fact, may be transferred from the ship to



Fig. 3-Alternative methods of wiring for safety device

welding shops where it is most unlikely to be earthed. The best arrangement in the long run would appear to be that in Fig. 3 (b).

The author is indebted to Philips Industrial (Philips Lamps, Ltd.) for permission to publish this article, and to Mr. W. O. Julius, joint patentee of the device with Philips.

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### British Plant for Russia-III

# **Commercial-Type Boilers**

# Arrangements for a Wide Variety of Fuels

MONG a large number of boilers included in the contracts being undertaken by British manufacturers for power station work in Russia are the following, which we have selected mainly because of their interest in respect of the wide variety of fuels to be used. A contract in the hands of Clarke, Chapman & Co., Ltd., covers several watertube boilers of fairly average commercial size, but while all are of the same evaporative three entirely capacity,

different fuels are to be burnt in them. Each boiler is designed to evaporate 44,000 lb. of water per hour under normal working conditions from feed water entering the economiser at 212 deg. F. into steam at 300 lb. per sq. in. and 707 deg. F., and to carry an overload of 55,000 lb. per hour. The fuels

specified are brown and bituminous coal and anthracite.

All the boilers are of the makers' tridrum water-tube type, consisting essentially of two upper steam and water drums and one lower water drum, all of riveted construction, interconnected by the main gene-

rating tubes which are arranged in three separate banks, baffles being provided to control the flow of the gases over the banks. The superheaters, situated behind the front bank of tubes, are of the "Melesco" multi-loop type incorporating the Superheater Company's ball ioint attachment to facilitate removal and replacement of the elements.

While it has been found possible to utilise firing equipment of the same size for the boilers dealing with the brown and bituminous coals, anthracite necessitates a considerably wider stoker to ensure sufficient coal being burnt efficiently to meet the load requirements. There are, however, differences in the general contour of the combustion chambers and arch settings to meet the varied combustion conditions in the boilers using brown and bituminous coals. Further, the application of secondary air varies with each form of fuel.

The combustion chamber for anthracite firing is of plain refractory construction, but panels of water cooling tubes are arranged in the side walls only on all the other units. These panels are of the Clarke,

Leading British manufacturers are providing bollers for use in Russian power stations designed to operate on anthracite or brown and bituminous coal. The special features of these are described in this article

Chapman plain-tube type, the tubes being connected at their upper and lower extremities into solid-drawn mild-steel water boxes from which a system of carefully designed feeder and upriser tubes is led to the boiler drum, thus making the

water-cooling system an integral part of each boiler unit. The stokers are of the Class "L" type by International Combustion, Ltd., while the arches are of the suspended type by M. H. Detrick, Ltd.

To give the best combustion conditions the temperature of the air entering the furnace is varied according to the type of fuel, and the air heaters, which are of the "Usco" plate type, are designed to give



There are differences in the general contours of the combustion chambers and arch settings to meet the varied combustion conditions

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maximum temperatures of about 350 deg. F. for brown and anthracite coal firing, and 300 deg. F. for

type economisers by Senior Economisers, Ltd. Both forced- and induced-draught fans are



perature, thus minimising the possibility of corrosion and chokage. Between the boiler gas exit and the air heaters there are Heenan twin-tube



..... the three examples shown are for anthracite, brown and bituminous coals

installed at the rear of each boiler at firingfloor level, whilst the secondary-air fan is mounted in the basement. All the fans are by James Howden & Co. (Land), Ltd., the forced- and induced-draught fans incorporating vane control with remote operation from the firing aisle on the Lockheed hydraulic system. Each boiler is self-contained with its own draught equipment. All the fan driving motors are Metropolitan-Vickers totally enclosed dustproof fan-cooled squirrel-cage machines.

These boilers are to be utilised for providing steam to either existing turbines or new machines being manufactured in Russia and they are being installed in spaces of limited dimensions. With this in view, feed-water dimensions. With this in view, feed-water conditioning equipments by the Neckar Water Softener Co., Ltd., have been incorporated, the chemical being charged into the feed suction ranges at points adjacent to the Mather & Platt feed-water pumps.

For the brown-coal and bituminous-coal boilers there are three pumps in all, two electrically driven, each having a maximum capacity of 69,300 lb. of water per hour, and one steam turbo-driven pump having a capacity equal to both the electrically driven pumps. For the single anthracite unit there are two pumps only, each to deal with 69,300 lb. per hour; one of these pumps is electrically driven and the other steam driven.

A multi-draught indicator, multi-point temperature indicator and a steam-flow meter, all by Bailey Meters & Controls, Ltd., are mounted on a specially designed instrument panel which also carries the pressure gauges, a Gordon's "Simplex Mono" CO<sub>2</sub> recorder and the fan-motor control switches. Each unit incorporates Hopkinsons mountings and soot blowers, a Copes feed-water regulator, Igema remote

level indicators, Babcock & Wilcox traversing chutes and Brookhirst switchgear.

The complete boiler plant supplied by Yarrow & Co., Ltd., for each of a number of 3,165-kW generating stations, includes two boilers for firing with bituminous coal, in which the gases traverse the rear bank of tubes twice after passing the superheater. Each boiler is designed for a m.c.r. evaporation of 37,500 lb. per hour, a working pressure of 310 lb. per sq. in., a steam temperature of 750/770 deg. F. and a feed temperature to the economiser of 120 deg. F.

The general layout of the plant is in keeping with modern practice for power stations of moderate size and ample spaces around all parts of the plant ensure ease of access. The sloping front of the Yarrow boiler leaves a clear space between it and the bunkers, thus permitting good light for the firing aisle.

Each boiler has one saturated steam drum and three water drums, the tubes facing the furnace being arranged in inverted "V" formation, giving a maximum surface exposed to direct radiation from the furnace. Access to the drums for cleaning and inspection

is obtained by the removal of the drum manhole doors. The weight of the water drums and tubes is carried from the saturated steam drum, leaving each tube element to expand independently.

A special feature of the design is the straight tubes, most of which enter the drums at an angle somewhere between the radial and the tangential. The thickness of the drum tube plate is arranged so that there is always an adequate parallel band in the tube plate, enabling the tubes to be expanded in such a way as to make a perfectly tight joint. The front bank, which is subject to radiation, has the tubes specially pitched, the front row being spaced to minimise the loss of heat by radiation from the furnace. The casing outside this front bank of tubes in normal conditions is quite cool. The drums are constructed with longitudinal and, for securing the ends, circumferential riveted seams. The heating surface of each boiler is 5,620 sq. ft., the tubes being of 2-in. diameter.

Water boxes are arranged at the stoker



The furnaces of the largest boilers for bituminous coal have front arch settings only; each of the mixed-fuel combustion chambers ...

sliding level, with riser tubes in the furnace and external downcomers. Above the water boxes there are fifteen rows of carborundum tiles. The large combustion chamber has a volume of 2,200 cu. ft. and is fitted with secondary air nozzles in the front arch, and the heat insulated portions are completely steel cased.

The water drums are connected to the steam drum by a circulating pipe and an injector which provides a useful means of drawing cold water from the water drums when raising steam and bringing the boiler

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to a high temperature before lighting fires. The superheater is of the self-draining type with "U" tubes expanded direct into a 23-in. diameter drum, the steam making six passes through the tubes. The superheater heating surface is 1,900 sq. ft. Hopkinsons mountings include main steam and automatic isolating, feed, blow-off and "Hylif" spring safety valves, and other fittings are Copes feed-water regulators, Gordon's Igema water level indicators, and Clyde

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UPUP V

... has recirculating chutes by which a proportion of the "carry-over" from the anthracite is brought back to the grates

soot blowers. Each boiler has a Green's "Premier Diamond" economiser with a heating surface of 6,720 sq. ft. Forced-draught stokers by International Com-bustion, Ltd., each have 144 sq. ft. of grate area and are fitted with Detrick front and rear suspended arches. Each boiler is provided with Davidson forced- and induceddraught and secondary-air fans, each induceddraught fan discharging to a self-supporting 5-ft. diameter cement-lined steel chimney. All the fans are driven by Metrovick motors. Three Weir feed pumps, two electrically

and one steam-turbo driven, each of 45,000 lb. per hour capacity, serve each station, and an instrument panel for each boiler is equipped with the usual modern instruments. The coal-handling plant, by John Thompson, Ltd., has a capacity of 30 tons per hour, and comprises a 12-ton receiving hopper below the rail siding, a coal crusher, a chain and bucket elevator and a belt conveyor over the coal bunkers which have a capacity of 100 tons per boiler.

A number of units supplied by John Thompson Water Tube Boilers, Ltd., include examples of 49,100 lb. per hour, m.c.r.capacity at 275 lb. per sq. in. and 750 deg. F., for a 4,500-kW station; 16,635 lb. per hour, m.c.r., capacity at 275 lb. per sq. in. and 675 deg. F., for a 1,350-kW station; and 13,105 lb. per hour, m.c.r., capacity at 290 lb. per sq in. and 725 deg. F., for a 1,000-kW station. All of these are fired by carrier-bar stokers with balanced draught. The two largest boilers are designed to burn a bituminous coal and all the others are designed to deal with a mixture of bituminous and Russian anthracite coals.

All the boilers are of the fourdrum type, each with two steam and two mud drums, having vertical circulating tubes and an integral superheater. Each boiler has a "Premier Diamond" economiser and is equipped with Copes feed-water regulators, Igema distance water-level indicators and Hopkinsons mountings and soot blowers. Each of the station boiler houses has a full basement equipped with ash-removal plant in the form of a light-gauge truck railway. The f.d. stoker fan is also situated in the basement, while the i.d. fan, the feed-water pumps and the feed tank, etc., are at the firingfloor level. A simple instrument panel fitted to each boiler is equipped to line up with modern ideas of combustion control. Modern coal-handling plant by the boiler makers transports the fuel

to the boiler house bunkers in each case, and the outlet chutes from the bunkers are of the B. & W. traversing type.

The heating surfaces for each of the largest units are: boiler 8,050 sq. ft., superheater 1,945 sq. ft., and economiser 5,037 sq. ft. The grate area in each of these cases is 203 sq. ft. and each furnace has a front arch setting only. The combustion chamber is designed for the release of 24,000 B.Th.U. per cu. ft. from straight bituminous coal. The heating surfaces for each of the medium and smallest boilers are: boiler 3,375 and

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3,230 sq. ft.; superheater, 562 and 528 sq. ft.; and economiser, 1,425 and 1,425 sq. ft., all respectively. The corresponding grate areas are 98 and 77 sq. ft., respectively, and each of the furnaces has an ignition arch with a long and large-area rear section to burn off the low-volatile fuels. The combustion chamber for each of the medium-size boilers is designed for the release of 18,700 B.Th.U. per cu. ft. when handling the mixed fuels. and under similar firing conditions

Features consequent on the burning of wood are the depth over the grate and the large capacity of the fuel hopper

the combustion chamber release for each of the smallest boilers is 15,500 B.Th.U. per cu. ft.

The relatively high combustion-chamber settings for the smaller boilers permit the satisfactory combustion of the anthracite fuels, while another feature of each of these combustion chambers is the recirculating chutes by which a proportion of the "carryover" from the anthracite, in the form of dust carried up with the flue gases, can be brought back on to the grate.

Babcock & Wilcox, Ltd., are supplying brick-set cross-type marine boilers, each for a maximum continuous evaporation of 55,000 lb. per hour, with steam at a pressure of 298 lb. per sq. in. and a temperature of 707 deg. F. Each boiler consists of 26 nine-tube sections with a 54-in. diameter steam and water drum, giving a heating surface of 5,158 sq. ft. A superheater, a Green's economiser and a tubular air heater are also provided, the heating surfaces being 2,922 sq. ft. for the superheater, 2,924 sq. ft. for the economiser, and 12,000 sq. ft. for the air heater.

These boilers are provided with B. & W. "Style 28" forced-draught compartmenttype stokers, each with a grate area of 320 sq. ft. and designed for burning wood chips.

The combustion chambers are provided with "Liptak" suspended front walls and arches and suspended rear arches. arrangements being made for secondary air to be admitted through the front wall and the nose of the rear arch. The proportions can be varied according to combustion conditions. The stoker, in view of the wood firing, has a large fuel hopper which is fitted with a motoroperated guillotine fire door for easy and speedy operation.

The boiler baffles are arranged to give three passes for the gases which, after leaving the boiler, pass down through the economiser and then through a flue to the air heaters. An induced - draught fan finally discharges the gases to a chimney supplied by the Russian authorities. The tubular air

tubular air heater is arranged in two banks, each dealing with half the gases, and the air circulates through the air heater in three passes, entering at the bottom and leaving at the top. The main hot air is taken in ducts beneath the firing floor to the under-side of the stoker. Secondary air is provided by a tapping from the main hot-air ducts and is delivered by a secondary-air fan to the combustion chamber. The fans are being supplied by James Howden & Co. (Land) Ltd. The forced- and induced-draught fans are located in the basement, and the secondary-air fan is on a platform between the boilers.

It is intended that the boilers shall be erected in one boiler house, and they are served by electrically driven and steamdriven standby feed pumps.



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# **Power Station Owners**

## Relationship to the Central Electricity Board

THE following is an outline of the present relationship between the Central Electricity Board and the selected-station owners as I see it, after some years of experience, both of the C.E.B. administrative machine and of the supply industry.

Generation can be considered under perhaps four heads, viz., location, design and construction, operation and accounts. The location of generating stations and extensions thereto is to-day almost entirely a matter for the Board, having regard to the strategy of grid development. The Board is advised, however, by its District Consultative Committees. Design may be in the hands of the larger power companies and municipal authorities, when the technical staff is

adequate to the purpose, or it may, by the advice of the Board, be placed in the hands of one of the well-known firms of consulting engineers.

consulting engineers. In all cases, however, there is very close liaison between the parties and the chief engineer of the Central Board through his power-station development engineer. The degree of control is practically the same as the Board exercises over the construction of its main grid system, but the control is not and need not be absolute. The advantage of the present arrangement is that the local authority or power company puts up the money for construction and is usually qualified to have, through its engineers, a big say in the general layout and design, having regard to local conditions-a form of advice and co-operation which in my view would quickly disappear in favour of other methods if the Board became the sole owner of the power stations. Unfortunately there is no centralised fund and facilities for development of improved generating technique, all the recent experimental plant having been sponsored by power companies with, however, the close technical liaison of the C.E.B. This appears to me to be one of the few good points in the I.M.E.A. Brown Memorandum.

The general strategy of power-station operation is settled by the Board, but the tactical day-to-day operation is also jointly in the hands of the power companies or local authorities. It is a form of partnership giving very full scope to both parties, and both have a vital interest in the results. It is difficult to imagine how centralised ownership could improve the present high standard of operation, with base loading on a national order of plant-merit basis. In my personal view it might tend to lower the standard. Under accounting, one must include finance. One of the first steps in extending any power station or building a new one is for the Central Board to settle the financial details with the prospective owner, including the precise manner in which the money should be raised. Regarding the remainder of the accounting between the two parties as provided for in the 1926 Act, it is quite impossible for the owners to "get away with anything" under Section 7 (4) (a), by unburdening some of their independentoperation fixed costs on the Board, for the Board has the simple remedy of instructing them to take a suitable import, at a suitable time, at the grid tariff to offset the saving.

With a few exceptions the owners have had no wish to make a fortuitous gain on this account.

In the settlement of accounts generally, there

appear to be three main commercial situations (with numerous additional special conditions) as follows:-(1) The owner may have the same amount of plant installed in his station as he would have had under independent operation-a very common case where in effect exported energy is paid for by the Board at about running coal cost. The same principle applies if on balance there is an import to the station owner. (2) The station owner may have less plant than he would have had under independent operation, in which case he pays to the Board overhead charges in respect of the extra plant he would have needed and he is deemed to have the benefit of the probably lower cost of energy from this hypothetical plant. (3) The owner may have more plant installed than he would otherwise have had. There are possibly several cases of this kind, in which the Board pays the overhead charges on all the plant over and above that required by the owner under independent operation and credits itself with the whole of the output of energy from that plant. In all these cases, the owner may alternatively be charged for his energy at the tariff if that gives him a lower total cost for his bulk supply.

The important point is that in the majority of cases the Board, in effect, gets the exported energy at about running coal cost and has the use of the spare-plant kilowatts, in effect, for nothing. These spare-plant kilowatts, whether they actually exist or not, are paid for by the selected-station owner under independent operation and in the circumstances one would perhaps wonder why it

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By J. F. Field, B.Sc., M.I.E.E., A.M.Inst.C.E. (Engineer and Manager, Edinburgh Electricity Department) should be necessary for the Board to sell this energy elsewhere at the tariff, which includes a fairly substantial demand charge. By the construction of the grid the Board saved expenditure on a substantial amount of spare figure at some £22,000,000 worth, but every selected-station owner who would have owned some of that plant has been charged up with it, and in addition the Board buys in the aggregate a large block of kWh at about running coal cost to sell to undertakings which have for one reason or another to import. Obviously, under the present highlydeveloped system the independent operation spare-plant kW may be insufficient for the Board's grid-tariff consumers elsewhere, which has apparently encouraged the building of one or two stations considerably in excess of local requirements. There is no question that the Board is able to buy a very large proportion of its energy at little more than running coal cost and that its kW charge for grid-tariff consumers is not so high as it would have to be if there had not been a substantial block of kilowatts in selected stations to call upon, virtually free of overhead charges.

#### Cost of the Grid

One may ask why the tariff is as high as it is. Certainly it is not because of the high prices paid for the energy to the selectedstation owners, except where the station is much bigger than it need have been under independent operation. Rather is it because the grid cost a substantial sum of money to construct and must cost a substantial sum to maintain and operate. Of these two items of cost, it is the capital cost of the grid which.

Nevertheless, taking the electricity supply industry as a whole, the grid has justified its existence (quite apart from its special usefulness under war conditions) in the saving of both total capital cost and fuel consumption, having regard to the much larger number of isolated small stations which would otherwise have been necessary. The whole of this benefit has been passed on to the smaller undertakings in the form of a grid tariff much lower in total cost than the price for which they could have hoped to generate the like amount of electricity locally. The low tariff has partly been made possible by the Board's refusal to let any of the larger station owners obtain a fortuitous benefit under Section 7 (4) (a), but the small undertakings are apparently not content with this and would like the selected-station owners to subsidise transmission to their supply points. In this connection it should be appreciated once and for all that the larger groups cannot, and mostly have not sought to, benefit financially from the existence of the grid.

In his article in the Electrical Review of

May 5th. Mr. J. A. Sumner mentioned the prospect of co-ordinated coal buying. What is the good of co-ordinated coal buying when there is co-ordinated coal selling? The Board has been protesting vigorously against the increase in the price charged to the electricity supply industry ever since the original 1s. a ton for the miners was placed on coal costs in 1935. (See page 23 of the Board's Annual Report for 1936 and pages 20 and 21 of the Report for 1937). These protests were backed up by bitter complaints from every large electric power station operating group in the country. These complaints greatly strengthened the Board in its case to the appropriate Government Department, but without avail, for the Government had apparently already settled policy regarding coal prices and in particular the revenue to be obtained from electricity undertakings. The origin of coal for particular stations had already been settled by the economic pressure of transportation charges.

The Board's 1938 Report (pages 16-19) shows that it had still not given up the struggle for more equitable treatment. I cannot imagine how the Board's case could have been any stronger if it had owned the stations. My personal view is that it would have been even less effective, for the Board would have been responsible only to a Government Department and would have been told by its virtual masters that the extra cost was a matter of high policy to which it would have to conform.

#### Inadequate Reasons

The real import of Mr. Sumner's article and the Brown Memorandum is apparently to tell the selected-station owners that they should not be content with, in effect, selling their surplus energy to the C.E.B. at running coal cost and throwing in the use of their plant and machinery free of charge, but that they should actually subsidise the tariff consumers still further via the C.E.B. I personally believe that the idea of handing over the stations contained in the Brown Memorandum is merely a rhetorical device to obtain the national standard bulk-supply tariff and with the same shot to eliminate the power companies. The reasons adduced for handing over the stations under paragraph 16 are naïve in view of the existing relationship between the C.E.B. and the selected-station owners as outlined above. Either the draftsmen of the Brown Memorandum were owners ignorant of the fact that the suggestions in paragraph 16 are already an almost complete reality, or else they were put into the Memor-andum to bolster up a bad argument which might, however, satisfy the very large number of non-generating undertakings which having little knowledge of C.E.B. relations, hope to benefit by an increase in the bulk supply 13/19.114

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charges to the larger undertakings, that their case rests on a broader basis than self-interest.

Why should large urban communities, bearing the industrial production burden of this country and herded together in large cities for that very purpose, be asked to subsidise bulk supplies of electricity to communities more fortunately situated in other respects, with lower rates, cheaper services and superior amenities? The real cause of high cost of electricity in such communities is high distribution charges, which overwhelm the extra cost of the bulk supply, and these can only be reduced by cheaper and more efficient technical methods of distribution.

Possibly, if the smaller communities get the subsidy from the large undertakings envisaged in the Brown Memorandum, the next suggestion will be to pool the cost of distribution to the consumer's door in city and country districts alike, so that the city dweller can contribute a little more to the comfort of the rural and small town dweller. This aspect was put very well by Mr. Herbert Spencer in a letter published in the *Daily Telegraph* recently. He says, ... the man in the street seems unable to grasp that to supply a small quantity of electricity to an isolated village is for sound technical reasons a costly operation. . . . It has been proposed that the poor inhabitant of our grimy towns shall pay a concealed, and so dishonest, tax on one of the few things for which he pays less than the former in order to pay for the inevitable loss on these isolated units.' The same remarks apply in a lesser degree to the small towns without generating stations.

#### **Combined Management**

If the Central Board did acquire the stations a substantial administrative staff with regional divisions would be required to run them, whereas under the present arrangement the industry gets the management of these stations largely combined with distribution. As the Board exists for the benefit of this industry, I cannot imagine it wishing to do so unless substantial economies to the industry as a whole would result. I can imagine the Board not being sorry if Section 13 were dispensed with, but that Section is an extremely valuable check on the absolute authority of the Board and it has a good effect on the selected-station owner, for the price of his energy depends on the design and operation of his station. The present arrangement, including the vital Section 13, ensures that all sections of the industry have a say in the running of it, whereas the elimination of Section 13 would gradually cause the control of the industry to fall into the hands of a comparatively small body of men.

If selected-station owners hand over the stations and still retain their rights under Section 13, the final result will be the same, for within a few years the various distribution authority managers will have lost their close contact with generation technique, upon which an equitable Section 13 claim largely depends.

Regarding Mr. Sumner's point about "relief for managers" and the advantages accruing from centralisation of functions, the majority of engineers with first-class technical ability and imagination under whom I have served have also had first-class administrative ability. A vital industry such as ours needs engineers who are also administrators to run it most efficiently. There have been attempts to dispense with engineers on the administrative side of the industry, with results which I need not dwell upon. The commercial efficiency of power stations is largely settled by the design, and I cannot see how their running could be materially improved by the removal of their control from competent existing officials.

#### Seeking Technical Improvements

Real progress in cheapening electricity supply to the masses in town and country alike must depend in the limit on technical improvements, and the scope there is very great. Far more money should be spent on research, and undoubtedly the industry would be glad to furnish that money if the returns could be shown to be commensurate with it. Such research is of an industrial nature and should be made to pay its way. The most successful German and American research, for example, in chemicals and electrical contrivances alike, has been on this realistic basis, and similar activities extremely profitable to British industry could be stimulated. There is no need, however, to upset the industry from top to bottom in order to obtain this advantage.

Finally, Mr. Sumner claimed that the matter should "receive careful attention completely free from motives of emotion or self-interest." What is wrong with "self-interest" to the healthy mind? The authors of the Brown Memorandum have, indeed, displayed a degree of self-interest which almost takes one's breath away. Perhaps the most extraordinary point Mr. Sumner makes is that we should agree to this Memorandum because it is "a twentieth-century tendency of business organisation," i.e., to make the industry huge and unwieldy at the top without reference to the needs of the case. He quotes the successes achieved by the West Midlands J.E.A., the London Power Co., etc. Why not then leave them and the larger selected-station owners with similar organisations alone in their admittedly high state of efficiency? The point made in the excellent and statesmanlike White Memorandum was that there should be no change merely for the sake of change, and I cannot see any reason why the industry should depart from that point of view.

# **PERSONAL** and SOCIAL News of Men and Women of the Industry

NUMBER of changes have been announced by the Metropolitan-Vickers Electrical Co., Ltd. Mr. H. C. Pierson becomes general sales manager, and is succeeded as manager, home sales, by Mr. D. Mac-Arthur. The position of

manager of the London office is taken over by Mr. J. I. Law-Brooks; Mr. H. Butterworth is to be sales manager of the motor department as well as of the control department; and Mr. H. Clayton is appointed manager of the welding sales department. On the works side Mr. E. W. Steele, who has been appointed to the board, becomes director and general manager of works, being succeeded by Mr. W. Symes as works manager of the main Trafford Park works. Dr. C. Dannatt has been appointed assistant to the chief electrical engineer and Mr. T. Fraser has been elected a director.

Lord Simonds has relinquished the chairmanship of the National Arbitration Tribunal upon appointment as a Lord of Appeal. He is succeeded by Sir John Forster who has been a

member of the Tribunal since its establishment. The Minister of Labour and National Service has appointed Lord Terrington and Mr. W. Gorman, K.C., to be additional members of the appointed members panel of the Tribunal.

Major Sir Ralph Glyn, Bt., chairman of the Skefko Ball Bearing Co., Ltd., recently presented long-service certificates to 120 people who had been with the company for twenty-five years or more, including the two managing directors of the company. Each of the certificates was accompanied by twenty-five Savings Certificates.

Mr. V. Horman has resigned from the position of shift charge engineer at the Valley power station of Bradford Corporation on account of ill-health. At a gathering on May 11th Mr. T. H. Carr, the electrical

engineer and manager, presented him with a wallet containing notes on behalf of the staff and employees of the Electricity Department.

The Central Electricity Board announces that Mr. Richard H. Fox, who has held the dual office of secretary and solicitor to the Board since March, 1929, has, for personal reasons, tendered his resignation, which has been accepted with great regret. The Board has appointed the deputy secretary, Mr. O. A. Sherrard, to be secretary, and the deputy solicitor, Mr. C. L. Poyser, to be solicitor. These changes will take effect on July 1st next.

Mr. W. J. Jefferson, A.M.I.E.E., of Carlisle, has been appointed to the position of distribution assistant at Chesterfield, advertised by the Ministry of Labour and National Service (Technical and Scientific) Register.

Dr. C. Dannatt

Mr. D. MacArthur

The Council of the Institution of Electrical Engineers has made the following award of premiums for papers read during the 1943-44 session or accepted for publication -

session or accepted for publication — GROUP A. —John Hopkinson: Messrs. J. R. Rylands, M.Sc., and J. R. Jenkinson, B.Met. GOUP B. —Non-Section premiums: Messrs. J. A. H. H. M.S. and R. W. Wild (Ayrton). Mr. A. E. W. Austen, Ph.D., and Miss W. Hackett, Ph.D. (*Llewelyn B. Atkinson*). Messrs. H. E. Cox and T. W. Wilcox (extra). Installations. Section. premiums: Mr. J. F.

Installations Section premiums: Mr. J. F.



Personalities at the E.L.M.A. lunch reported in our last issue : Lord Portal (Minister of Works), Sir Harry Ralling (G.E.C.), Sir Cyril Hurcomb (Chairman, Electricity Commission), Sir Robert Renwick, Mr. L. C. Gamage (G.E.C.), Sir George Nelson (President, F.B.I.)



Mr. H. C. Pierson



Mr. E. W. Steele

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Shipley (Crompton). Messrs. H. Barron, Ph.D., B.Sc., J. N. Dean, B.Sc., and T. R. Scott, D.F.C., B.Sc. (Swan). Messrs. W. Fordham Cooper, B.Sc. (Eng.), and F. H. Mann (extra).

 Cooper, B.Sc. (Eng.), and F. H. Mann (extra). Measurements Section premiums: Messrs.
L. B. S. Golds and C. L. Lipman (*Mather*).
Mr. A. Hobson, B.Sc. Tech. (extra). Mr. R. Dell (extra).

Transmission Section premiums: Messrs. E. C. Neate, B.Sc. (Eng.), and W. F. Bowling (Sebastian de Ferranti). Messrs. C. O. Boyse and N. G. Simpson (John Snell). Mr. B. L. Metcalf, B.Sc. (extra).

Wireless Section premiums: Mr. D. Gabor, Dr. Ing. (Duddell), Prof. Willis Jackson, D.Sc., D.Phil., and Mr. L. G. H. Huxley, D.Phil. (Ambrose Fleming). Mr. J. Kemp (extra). GROUP C.—Paris Ex-

GROUP C.—Paris Exhibition, 1881: Mr. C. A. Cameron Brown, B.Sc. Webber: Mr. C. P. Edwards, M.Sc.Tech. Overseas premium for senior members: Mr. K. I. Brown, M.B.E. The awards for papers

The awards for papers read before the Students' Sections will be announced later.

Mr. S. F. Steward has been appointed to the board of E. R. & F. Turner, Ltd. (incorporating Bull Motors), of Ipswich. Mr. Steward, associated



Mr. S. F. Steward

who has been associated with Bull Motors for twenty-three years, at present holds the position of Director of Industrial Electrical Equipment in the Ministry of Supply.

Mr. W. A. Wilkins has been appointed chairman of the Bristol Corporation Electricity Committee to fill the vacancy caused by the death of Alderman Senington.

Mr. A. W. Williams, who has been elected to the Arnold Urban District Council, is a pastpresident of the Association of Mining Electrical and Mechanical Engineers.

Mr. W. Barham, M.I. Struct. E., A.M.I. Mech. E., has retired from the position of constructional engineer in the Hackney Borough Council Electricity Department after thirty-five years' service. At a recent meeting of the staff, presided over by Mr. E. A. Mills, the borough electrical engineer, a presentation was made from his colleagues and friends in the Department. Mr. Barham, in suitably acknowledging the gifts, gave some of his reminiscences of the Hackney undertaking dating back to the time, in 1899, when he was engaged on the survey of the site of the station at Millfields with the late Robert Hammond the consultant. He joined the Hackney staff in 1909 when generation was by means of the destructor plant with Willans engines, and had thus seen the undertaking grow to its present position of importance.

### **Obituary**

Mr. Patrick Hamilton.—We regret to record the death on May 12th of Mr. Patrick Hamilton, one of the joint managing directors of Everett, Edgcumbe & Co., Ltd. After graduating in science at Glasgow University, Mr. Hamilton acted as personal assistant to Lord Kelvin. He subsequently joined Kelvin & James White, first as works manager and later as their London representative, leaving the company in 1908 to become joint managing director of Everett, Edgcumbe & Co., Ltd. Mr. Hamilton was a member of the Institutions of Civil Engineers and Electrical Engineers, as well as of other technical societies, but he will probably be best remembered for his work in connection with the British Electrical & Allied Manufacturers' Association, the British Standards Institution, the Commercial Instruments Conference, and other bodies aiming at improving the products and general organisation of the industry, and more especially of the electrical measuring instruments branches.

Mr. I. R. G. Jones, staff solicitor to the County of London Electric Supply Co., Ltd., and associated companies for fourteen years, died on May 5th. He was an acknowledged authority on the Electricity Supply Acts. During the last war he saw service with the Welch Regiment and later with the Royal Flying Corps in Italy.

Mr. J. B. Morgan.—We regret to report the death on May 13th of Mr. John B. Morgan, A.M.I.E.E., M.I.Mech.E., electrical engineer and manager to the East Grinstead Urban District Council for the past twelve years. Mr. Morgan served as assistant engineer in the electricity undertakings at Aberdeen, Worcester and Cheltenham. In 1903 he was appointed resident and consulting electrical engineer to the Horsham U.D.C., leaving this position in 1916 to take up the post of manager to H. & E. Lintott, Horsham. From 1923 to the early part of 1932 he was chief engineer and buyer to the Sussex Brick Co., Ltd. For the four years prior to his taking up the appointment as electrical engineer at East Grinstead he acted as supervisory engineer to the Council.



Mr. Frank Parkinson (Crompton Parkinson), Major G. Lloyd George (Minister of Fuel and Power), Sir Henry Dale (President of the Royal Society), Dr. C. C. Paterson (G.E.C.), Mr. Percy Thomas (President R.I.B.A.), Mr. S. S. Eriks (Philips Lamps)

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# CORRESPONDENCE

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

#### **Fixing Centres**

UCH has been said about standardisation and lack of standardisation of late and especially in regard to fixing centres of motors. After Mr. H. Marryatt read his paper, a few months ago, before the I.E.E. and there appeared no prospect of manufacturers altering their designs to a set



standard I designed an adaptable revolving fixing piece capable of giving a wide range of fixing centres, not only for motors but every-thing where machines or parts of machines have to be bolted together.

Fig. 1 is a plan view of an adjustable centre piece, and Fig. 2 is a section on the line A, B of Fig. 1. Fig. 3 is a plan view of an adjustable centre piece mounted in the fixing hole of a machine or part thereof and Fig. 4 is a section on the line C, D of Fig. 3.

Bradford. HARRY MOSS.

#### Welding Machines

AVING read in your April 7th issue the precis of Mr. L. B. Wilson's paper to the Association of Supervising Electrical Engineers, I can only assume that it was inaccurate or that Mr. Wilson's original arguments were not clearly expressed, particularly so with regard to pedal-operated spot welders.

" Аррге-Taking the paragraph beginning, ciable time is needed ... it is incorrect to say that automatic timers are only required, apparently, for distorted metal. So far as spot welding is concerned it is always necessary to control the time as accurately as possible whether metal is distorted or not. The statement made in the following sentence that pressures must be increased if the timer has no arrangement for dealing with distorted metal is most surprising. It can only be

assumed that it is proposed that the current shall flow through the two distorted sheets to some point of contact remote from the tips for a sufficient time and in sufficient quantity to soften the whole sheet when quite a light pressure will bring the sheets together. The use of a sufficient pressure to bring the sheets together is apparently highly undesirable because a larger current is necessary in order to compensate for a lower contact resistance.

Assume, therefore, two cases using 1-in, wide strips of distorted metal which touch 14 in.: 1. Pressure is such that the sheets do not meet. It is therefore necessary to heat the metal until it collapses. 2. Pressure is applied sufficient to bring the sheets together. It can easily be proved that the heat required to make the weld in the first case is twenty times that in the second case and therefore the watts input at the electrodes varies in the same ratio. The machine in the second case must be very short of copper if the necessary current increase more than compensates in losses for the 19 20ths of the watts saved at the tips. The reduction of power consumption would appear then to follow the heavier pressures.

The penultimate sentence of the same paragraph conveys a conclusion quite contrary to the facts and certainly it does not follow from the previous arguments. A light or heavier pressure can be used on an air-operated machine just as it can on a pedal-operated one, but the former can be set by a skilled man and the performance be independent of the operator whereas the latter depends largely on the operator unless special automatic locking devices are added. Yockleton, Shrewsbury. E. W. HARDING.

### American Irrigation Scheme

American Irrigation Scheme Seven States—Montana, Wyoming, North Dakota, South Dakota, Colorado, Nebraska and Kansas—will benefit if an irriga-tion scheme put forward by the U.S. Bureau of Reclamation is put into effect. Fully developed, this £250 million plan would provide for the irrigation of 4,750,400 additional acres of land in the Missouri Basin, provide water for 500,000 acres in five States and yield for sale nearly 7,000 million kWh annually from 17 hydro-electric plants. Mr. Harold Ickes, Secretary of the Interior, said that the plan contemplated a further use of the waters of the Missouri River in stabilising the agriculture and economy of a vast basin, which included the Missouri River in stabilising the agriculture and economy of a vast basin, which included the Northern Great Plains where drought peri-odically brought devastation. Construction would be complementary to that recently suggested by the Secretary of War for flood control and navigation of the Missouri.—Reuter.

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ELECTRICAL REVIEW

# **Post-War Houses**

## Experimental All-Electric Prefabricated Buildings at Coventry

Two recently completed experimental prefabricated houses planned by the Coventry Electricity Department in conjunction with the British Electrical Development Association afford an interesting example of how it is possible to meet the

possible to meet the widespread demand for an adequate number of lighting and plug points to cater for the anticipated greater use of electrical appliances after the war.

The houses are an

carried out largely with pre-war material and appliances, it illustrates as far as possible the latest electrical ideas for the low-cost postwar home. The wiring, carried out on behalf of the Coventry E.C.A. Circle by Lee, Beasley & Co., consists of v.i.r. cable in screwed conduit tubing cut to length in advance to reduce site work. Special boxes were made for mounting the flush fitting plug sockets in the prefabricated type of wall construction. A compact service unit (Bill Switchgear) fitted in the broom cupboard in the utility room encloses the supply authority's cable gland and cut-out and the consumer's main switch and fuses in a single case,

with the meter on the top. Lighting points are installed in the most suitable positions, special care being taken to provide effective illumination in the kitchen (where a second light is fixed over the sink) and over mirrors in the bathroom and bedrooms. The lighting fittings (G.E.C.) are mainly of the totally enclosed type with direct-indirect fittings in dining and living rooms. Two-way switches are provided for the landing light

Above : Service unit in broom cupboard

Centre: Cooker and refrigerator

Right: Sink and washing machine

example of the application of "GBS Unibuilt" construction units (developed by Gyproc Products, Ltd., J. Brockhouse & Co., Ltd., and J. Sankey & Sons, Ltd.; engineer, Mr. G. C. Wright; consultant architects, Mr. G. Grey Wornum and Mr. R. Sheppard). The principal components are light steel frames, fabricated from cold rolled sections in standard sizes for walls, ceiling and roof members, the walls being faced with asbestos cement pans, filled with wood-wool slabs and lined with plaster board. The houses are semi-detached, one having two bedrooms and living-room with dining recess, the other having three bedrooms and separate dining-room. A notable feature is the high standard of thermal insulation.

Although the installation has had to be

and in downstairs rooms with more than one entrance.

To permit the convenient use of table lamps, vacuum cleaner, radio and other portable appliances, a minimum of three plug sockets is provided in every room. They are



all of standard 15-A type giving complete interchangeability for all purposes. The sockets are fixed just above the skirting, except in the kitchen where two sockets are fixed at counter height. There are small plug sockets in the principal rooms for electric clocks.

The plug sockets enable portable electric fires (Heatrae) to be used in any part of the house, or to supplement or replace the solid fuel fire fitted in the living-room in accordance with the requirements of the Coventry Corporation Housing Committee. In addition. an inset electric fire (Berry's) is fitted in the best bedroom, and electrically heated panels are provided in the dining-room and kitchen. In the latter, the electric panel (British Insulated Cables) is built into the ceiling, so as to provide well-distributed warmth over the working area. In the dining-room the electric panels (Reinforced Plastics, Ltd.) are the first of a new type in which heating wires are embedded in a sheet of plastic material. The bathroom is heated by a reflector fire (Ferranti), fitted out of reach over the door.

An immersion heater with thermostat (Heatrae) is installed in the hot water cylinder, which is also heated by a boiler fitted at the back of the solid-fuel fire. A Revo cooker is fitted adjacent to the preparation table, under which is a 3-cu. ft. Kelvinator refrigerator.

Full electrical facilities for washing clothes are arranged in a utility room to avoid interference with the preparation of meals in the kitchen. A cabinet type washing machine (Hotpoint) is fitted alongside the sink so that the power-driven wringer may be used to transfer the clothes from the machine to the sink, thus avoiding heavy lifting. A drying cupboard is fitted with an electric heater.

In a new design of electrically heated owel rail the heat is furnished by wott ordinary electric lamps. An electric bell installation is operated by a transformer.

At an inspection of the houses on Monday last, Mr. F. W. Godden, city electrical engineer and manager, emphasised that, unlike the Ministry of Works prefabricated all-steel unit, which we described last week, the houses are intended to be permanent, The complete erection and equipment of a house takes about a week.

#### House Service Unit

A MODEL of a combined house service unit produced by Siemens Electric Lamps & Supplies, Ltd., for post-war houses, is designed to accommodate equipment of any make. Constructed of all-insulated moulded material (or sheet steel if preferred), the unit is in the form of a cabinet, 34 in. high by 13½ in. wide by 1 in. deep, divided into three separate compartments. The middle one contains the meter and measures 14 in. deep, while the top and bottom compartments accommodating the main switch and fuses and the supply authority's equipment are 10 in. deep. These dimensions are maximum to allow for the largest types of prepayment meter and service cut-out. A smaller cabinet could be utilised with certain makes of equipment.

In the model shown to us the supply authority's compartment's equipped with a 60-A singlepole, h.r.c. English Electric "R" type fuse and there is a neutral block and sealing chamber, with knock-outs for cable entry at the left, right and bottom. The door has a sealable screw fastener. The meter compartment is fitted with



#### Siemens combined house service unit

a spider base with fixing holes for any make of meter and a sealed cover plate. The main switch is a 60-A single-pole unit and the consumer's fuses comprise six 15-A h.r.c. units and one 30-A h.r.c. cooker fuse. A sealed cover plate encloses all connections and there are knockouts at left right and top. Single-pole fusing and switching with neutral bar are provided in this case Within limits interior arrangements could be modified to suit individual requirements. Having a flat exterior the unit is suitable for flush mounting in walls.

# **Brazil Railway Electrification**

According to a statement made by the chief engineer of the National Railway Department, negotiations have started between this department and the Sao Paulo Railway Co with a view to the electrification of the company's railway line from Sao Paulo to Jundiahy.

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# High-Speed Radio Recording Overcoming Distortional Effects

THE high-speed recording of radiotelegraph signals is described in a paper by MESSRS. R. B. ARMSTRONG (Marconi's Wireless Telegraph Co., Ltd.) and J. A. SMALE (Cable & Wireless, Ltd.), submitted at an extra meeting of the Wireless Section of the I.E.E. on May 17th.

'At first sight it may appear to be extraordinary that the simple process of rectifying a signal and passing the resulting DC through an ordinary telegraph relay can become so complex as the paper suggests. That it does so is almost wholly due to the combined effects of different kinds of distortion, while the solutions described are made complicated by the necessity of continuing high-speed working during abnormal conditions.

The effects of distortional interference are aggravated by the absence of radiated energy during the spacing periods of high-speed morse transmission. Future development may therefore tend towards frequency change, employing different valves for spacing and marking, separation of the two being within the 200 to 1,200 c/s range.

#### Securing Stability

Considered from the viewpoint of frequency modulation the frequency deviation is within the range of 100-600 c/s, and the rate of shift, or speed of signalling, may be as high as 160 c/s. Owing to the small degree of frequency deviation employed for space and mark intelligence, it is possible to use a very narrow band on the receiver, but these factors in turn demand a high degree of constancy in the first oscillator in the receiver. Such stability can be obtained by using a crystal, the output of which is modulated by a stable lower- but variable-frequency oscillator to provide a vernier adjustment on the effective crystal frequency which is used as the first oscillator in the receiver.

An alternative method is automatic frequency control, by either the mark or space signals. This system has obvious advantages in a large receiving station, because the correction is operative in cases of deviation at the transmitter as well as at the receiver and it follows that less manual attention is needed for satisfactory operation.

There are two methods of treating the received signals when transmission is made by frequency modulation. The first deals effectively with the intelligence on two separate channels, each of which is passed through a narrow filter and recording unit, after which the channels are combined so that either signal will operate the recorder independently. It follows that some measure of frequency diversity is obtained by this system since, with sufficient deviation between mark and space frequency, propagation effects will be dissimilar. This method, however, does not give freedom from distortion due to multi-path signals, because the whole of both mark and space signals are contributing to the output operating the recorder. Maximum benefit from frequency diversity will, of course, be dependent upon the widest separation of frequencies which is consistent with the desirable band-width in the receiver. Unfortunately, the further the separation between marking and spacing frequencies, the greater will be the tendency to unequal distortion in each, giving an increased tendency to varying bias between mark and space.

#### **Greater Protection from Distortion**

The second method of frequency-modulation reception offers a large measure of protection from distortion due to multi-path and other factors, since the intelligence is derived from flick-impulses provided by the initial part of the mark and space signals. Alternatively, the whole of each signal may be used, but all amplitude variations are removed by a limiter the output of which is passed to a demodulating device which may consist of a phase discriminator or demodulating filters. The outputs of these units are rectified, and the mark and space signals are combined directly into a push-pull recording unit, thereby giving true polar signalling.

The choice of separation between mark and space frequencies in this case is influenced chiefly by the desire to attain similar propagation conditions, and the deviation should therefore be as small as possible consistent with the practical limits of receiver design. Such choice will, in addition, provide an improved signal/noise ratio owing to the narrow frequency band employed.

The use of radio frequencies with small separation clearly calls for great stability of frequencies, both those transmitted and those used in the receiver. The results now obtained by such operation foreshadow a wider application of this system on radio circuits as a means of distortion correction.

#### I.E.E. North-Western Centre

THE past year's report of the Committee of the I.E.E. North-Western Centre records a further increase in membership—from 1,693 to 1,885. Members of the Wireless Group numbered 165. During the session the average attendance at ordinary meetings was 112 and at wireless meetings 58. A questionnaire is being circulated among members to ascertain the support which would be given to the formation of Measurements, Transmission and Installation Groups within the Centre.

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# **COMMERCE and INDUSTRY** Power Companies' Statement. Industrial Research.

#### **Engineering Wages Increase**

**FAST** week the National Arbitration Tribunal issued its award in the claim by the engineering trade unions for an increase of 10s. ner week in base rates. In this the Tribunal concedes an increase in the national bonus of 4s. a week for adult male workers and proportionate increases in the rates for non-adult males.

#### **Contract Price Adjustment Formulæ**

The National Arbitration Tribunal's award of 4s. on the base rates in the engineering industry affects the B.E.A.M.A. contract price adjustment formulæ. The rate of pay for adult male labour at May 11th is deemed to be 90s. 6d. As regards costs of material, the index figure for intermediate products published by the Board of Trade on May 13th is 174.7 (against 173.0) and is the figure for April.

#### Supplies for Russia

Last week, in reply to a Parliamentary question, the Prime Minister circulated a state-ment giving an outline of the military, naval, air and other equipment of many kinds which has been sent to Russia from this country during the past two and a half years. This showed that since the entry of Russia into the war, machine tools valued at £8,218,000 have been dispatched, together with power plant to the value of  $\pounds 4,250,000$ , electrical equipment ( $\pounds 3,314,000$ ), miscellaneous industrial equipment (£1,980,000), various types of machinery, *e.g.* telephone apparatus, food processing plant, textile (£3,019,000), giving a total value for plant and machinery of £20,781,000.

#### **Reply to Labour Party's Proposals**

Electricity charges would increase and service to the consumer would suffer if the Labour Party's proposals for the nationalisation of the fuel industries came into effect. This contention was emphasised at a Press meeting held last week by the Incorporated Association of Electric Power Companies to elaborate its reply (summarised in our last week's issue) to the pro-posals. While agreeing that an improvement could and should be made in the present organisation of the electricity supply industry, the Association expressed the belief that this could best be brought about on the lines of its memorandum published in November last, namely, by following the proposals of the McGowan Report suitably brought up to date.

It was stated that when the work done during the period since the beginning of the war could be made fully known it would be found that the electricity supply industry had played its part very well. It might be said that it had done double the work with half the staff. One under-taking had increased its output 140 per cent. with an expenditure of only 50 per cent, more, with an expenditure of only 50 per cent, more, With regard to the profit motive it was true to say that some companies received no return on capital invested for ten years or more and that in some contemplated rural development

schemes a return of not more than 2 per cent.

schemes a feturn of not more than 2 per cent was looked for. But for the war all but the more remote premises in the areas covered by one large group of companies would now have been supplied with electricity and it was expected that they would be within three years after the war. Out of the 731 townships and parishes in the area comprising Derbyshire, Nottinghamshire, Leicestershire and Warwickshire 676 (92 per cent.) already had supplies, and the lighting flat rate of 4d. in Nottinghamshire and Derbyshire was the same as that of Birmingham (except for a discount for prompt payment).

In some ways, it was stated, the recently pub-lished White Paper on Water Supplies pointed the way for dealing with the somewhat similar problem of electricity supply. If the supply industry were nationalised a sum of about £800,000,000 would have to be found for compensation.

#### Glasgow Recommended to Rejoin E.D.A.

The general manager of the Glasgow undertaking (Mr. G. Morgan) in a recent report to the Electricity Committee recommended that the Corporation should renew its membership of the British Electrical Development Associa-tion from which it resigned in 1939. At a meeting of the Committee Councillor Roberts, seconded by Councillor John Young, moved the adoption of the recommendation and proposed that the annual contribution for the current year, amounting to £1,449, should be paid. Councillor John Stewart, seconded by Councillor Thomas S. Park, moved as an amendment that the Corporation should adhere to its previous decision and not resume membership of the Association. On a vote ten members voted for the motion and two for the amendment. The motion was declared carried.

#### **Post-war Gas Installations**

No. 6 of the Ministry of Works Post-war Building Studies (H.M. Stationery Office, price 6d.) concerns "Gas Installations," and has been 6d.) concerns "Gas Installations," and has been prepared by a committee convened by the prepared by a committee convened by the Institution of Gas Engineers. The recommen-dation is made that the Standards Committee of the Ministry of Works, in consultation with the gas, electrical and solid fuel industries, should give careful consideration to the question of determining suitable locations and dimensions for domestic fuel appliances which would result in the harmonious fitting therein of appliances of any fuel service at the choice of the occupier. If dimensions were standardised the number of If differsions were stated as the or other solid sizes of gas, electric, coal, coke or other solid fuel appliances could be limited, and one type of appliance could be easily changed for another without upsetting design details. It is also emphasised that it would be of great assistance to all concerned if the architect and/or consulting engineer were to prepare, prior to the com-mencement of the works, the necessary scale plans, sections and elevations showing the allotted areas and agreed disposition and runs of the various pipes, conduits and cables.

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#### The Supply of Craftsmen

Better social status for the skilled worker is advocated in a special article in *The Times* of May 15th by Mr. George Wansbrough (a director of the North Wales Power Co., A. Reyrolle & Co., Ltd., and other electrical concerns). Mr. Wansbrough deprecates the treatment of craftsmen as inferior to office employees and he also considers that there should be a greater margin between the rates paid to skilled and unskilled (or less skilled) workers. Foremen should enjoy a better status and their earlier promotion to responsibility in the works should be made possible.

The training of young men should be given in up-to-date shops staffed by "eager, competent and honoured teachers." Mr. Wansbrough suggests that the present Ordinary National Certificates should be scrapped and the courses leading up to them remodelled. A more thorough grounding in engineering and economic fundamentals should be aimed at. Instead of the three years' course for the Ordinary National Certificate in electrical or mechanical engineering or some other specialised field, there should be a standard three years' course leading to a single Ordinary National Certificate in engineering.

#### **Conference** on Grain Harvesting

Norwich Corporation Electricity Department which has been pursuing an active agricultural policy, has this week had the opportunity of bringing home the advantages of electricity to farmers from many parts. Starting yesterday at the Department's Duke Street premises, a threeday conference is being held by the Norfolk War Agricultural Executive Committee in conjunction with the Farm Crop Driers' Association, Ltd. During the conference an exhibition of grain harvesting, drying and hurdling equipment is being held in the electricity building. The conference programme includes a "Brains Trust," with Mr. Donald McCulloch as question master, at the Stuart Hall, Norwich, at 7.30 p.m. to-night (Friday).

#### F.B.I. and Industrial Research

The Federation of British Industries has decided to strengthen its organisation on the research side by making its Industrial Research Committee a permanent Standing Committee of the Federation with its own fully-qualified secretariat. The Federation, while not itself engaging in research, will, through the work of its Standing Committee, do all in its power, in collaboration with existing organisations in this field, to promote the interests of industry in relation to research and its application. At the same time it will make every possible effort to secure the success of any wider or more comprehensive organisation which may result from the present widespread interest in the problem of research.

Included among the terms of reference of the Industrial Research Committee are: encouraging industrialists to devote a more adequate part of their resources to research; providing money for the creation and maintenance of adequate facilities for post-graduate research; encouraging the education of the necessary research and development staff; facilitating co-operative research within British industry, with special reference to the needs of small-scale industries;

and providing information on research questions by creating a liaison with appropriate reference libraries and technical and scientific institutions.

#### **Export** Trade

In the House of Commons on May 9th, Mr. Ellis Stoke asked the President of the Board of Trade if his attention had been directed to the action taken by the U.S.A. economic administration which liberated their export trade from certain restrictions and allowed permits to be applied for to cover the export of electrical and other machinery, tools, cutlery, etc., and that metals, industrial processes, etc., were now being released in preparation for post-war development. What action was he taking to safeguard British post-war exports ?

Mr. Dalton said he was aware that the United States Foreign Economic Administration had recently made some simplifications in its export control machinery, but this did not necessarily mean that more materials or finished goods were being released for export. Arrangements had been made through the Combined Boards in Washington for the exchange of information between the United Kingdom and United States Governments regarding changes in their wartime production controls. Every effort would be made to increase British exports as soon as circumstances permitted.

#### **Radio Imports**

On May 10th Sir Leonard Lyle asked the President of the Board of Trade whether he could make a statement on the importation of radio sets from the United States.

radio sets from the United States. Captain Waterhouse, who replied, said that about 36,000 radio sets had now been imported, and a further 7,000 were expected shortly. It was unlikely that additional supplies would be got from America. About 12,000 had already been distributed and arrangements had been made to distribute a further 12,000. The romainder were being tested, and repaired where necessary, and would be released to the trade within a few weeks. Spare parts other than valves for these sets should be obtainable from British manufacturers. Most of the types of valves required were imported from America, and should be obtainable through the normal trade channels. The supply of spares for a few types was still uncertain and was being investigated.

#### Drawing Office Organisation

This new booklet in the series "Office Aid to the Factory" provides information and suggestions which should be helpful to all engineering firms, especially small ones, in enabling them to improve the organisation of their drawing offices. The booklet is illustrated with typical lay-outs and various charts and forms. Copies of this booklet (B S. 1100, Part 9, 1944) can be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. post free.

#### **Fatalities**

Shock from Table Lamp.—A verdict of "Death by electrocution accidentally received" was returned at an inquest at Newcastle on Mrs. Mary Ann Secker (50), who was found dead at her home holding an electric table lamp. The lamp was used for an indoor shelter and Mrs. Secker took it with her when she went into the boxroom, which was blacked out.

A police constable said he found a fault in the switch inside the base of the lamp where some of the wire strands had broken away and come in contact with the base.

Excavator Touches Overhead Line.—Through the jib of a drag-line excavator coming in contact with an overhead electric line John Bernard Shrive, aged sixteen, received a fatal electric shock. At the inquest held at Peterborough evidence was given by Mr. R. W. Leech, the driver of the excavator, that the youth, who was acting as driver's mate, stood on the left side of the jib with his hand on the metal girder. The jib got out of control for a matter of seconds when witness put the excavator out of gear and swung round, the top striking the overhead wires and rebounding. A verdict of "Accidental death" was recorded.

#### **Commodity Insurance Scheme**

The Board of Trade has decided that in respect of the period beginning June 3rd, 1944, and ending September 2nd, 1944, the rate of premium payable under any policy under the Commodity Insurance Scheme shall continue to be at the rate of 5s. per cent. for three months (or 1s. 8d. per cent, per month).

#### Aid in Marketing

In the course of a statement issued with the company's annual report the chairman of Selfridges, Ltd., said that after the war the urge to "Buy British" would be greater than ever. This would provide a vast field of opportunities for new endeavours and Selfridges would be anxious to offer their services for displays, publicity and support in connection with any new productions of promise and to render, if possible, aid in the production and marketing of such merchandise.

#### "Salute the Soldier" Week

An interesting programme was arranged for the "Salute the Soldier" week at the Chelmsford works of Crompton Parkinson, Ltd., which closes to-morrow (Saturday) and for which an ambitious target has been set—a Churchill tank costing £15,000. Apart from dancing and concerts there were boxing and wrestling contests, a works talent competition and a demonstration of military equipment. Tomorrow the chief event will be a gala on the sports ground, including a dog show.

#### Wartime Regulations

A seventh supplement has been issued to the "Summary of Emergency Statutes, Regulations and Orders Affecting the Electricity Supply Industry." This covers new and amending regulations, etc., up to March 31st, 1944, and together with Supplement IV supersedes all previous issues. Thus the new index includes only Supplements IV and VII, which, the editors say, constitutes a complete guide to current emergency regulations and orders. Matter received too late for the main body of the publication is dealt with in an addendum. It is observed that the reduced size of the latest supplement will no doubt be welcomed as evidence of a substantial reduction, during recent months, in the issue of further emergency legislation. The supplement, which has been compiled by Messrs. Leslie Gordon and J. W. Simpson, assisted by Mr. F. Newey, may be obtained from Mr. Simpson at the I.M.E.A. headquarters, Wellington House, 125-130, Strand, W.C.2, price 2s. 6d.

#### Trade Announcements

Owing to their London office at Bush House, Aldwych, being required for other purposes, Thorpe & Thorpe, Ltd., have moved temporarily to Stratford Road, Kensington, London, W.8 (telephone: Western 2616). The administration and accounts offices remain at Hartney Wintney.

The publicity department of Cox & Danks, Ltd., is now at Faggs Road, Feltham, Middlesex (telephone: Feltham 3471).

# TRADE MARK APPLICATIONS

THE following applications have been received for British trade marks. Objections may be entered within a month from May 10th.

AG (design). No. 624,507, Class 9. Scientific laboratory instruments and apparatus. A. Gallenkamp & Co., Ltd., Technico House, 17-29, Sun Street, London, E.C.2. BATRYMAX. No. B625,683, Class 9. Electric Co. (Ct. Paring). Ltd.

BATRYMAX. No. B625,683, Class 9. Electric batteries.—Ever Ready Co. (Gt. Britain), Ltd., Hercules Place, Holloway, London, N.7. TRIUMPH (design). No. 626,937, Class 9. Radio-telephonic, radio-telegraphic and tele-

TRIUMPH (design). No. 626,937, Class 9. Radio-telephonic, radio-telegraphic and television apparatus, and parts thereof not included in other classes.—Currys, Ltd., Great West Road, Brentford.

TENAPLAX. No. 627,250, Class 9. Highfrequency electric cables. Also TENATHERM. No. 627,251, Class 11. Electric heating devices in the form of cable.—TENAPLAS, Ltd., 7, Park Lane, London, W.1. ALKL. No. 627,621

ALKI. No. 627,621, Class 9. Scientific apparatus and instruments, electrical instruments or apparatus (not included in other classes), and electrodes for use therewith.— Cambridge Instrument Co., Ltd., 13, Grosvenor Place, London, S.W.1.

Place, London, S.W.I. Dawco. No. 627,054, Class 11. Electric heaters and reflectors therefor; reflectors for electric lamps and electric toasters.—E. Dawson, (Lamp Factors), Ltd., 10, Gray's Inn Road, London, W.C.I.

# **INFORMATION DEPARTMENT**

G ENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

COUNTY vacuum cleaner.

BLACK KNIGHT vacuum cleaner.

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# Compulsory Registration A Preliminary to Statutory Wiring Rules

AT a meeting of the Association of Supervising Electrical Engineers on Tuesday last MR. L. C. PENWILL, director and secretary of the Electrical Contractors' Association, read a paper upon "Statutory Wiring Regulations and Compulsory Registration," for both of which, he said, there was a pressing need. After the war the house without an adequate supply of electrical energy from the public mains would be no home at all. Men and women would not be content to do without this essential domestic amenity. The entry of an electrical service into every house in the country lying within reasonable distance of the public mains was essential and something would have to be done to bring electricity

within reasonable reach of rural communities.

In the tremendous work which would have to be done a vital role would be played by the British installation trade. It was no use providing the best

generating plant and transmission systems if the point of public use was left to look after itself. Millions had been spent in securing technical precision of main generating, transmission and distribution systems, but no sort of electrical precision whatever was to be found in the homes of the public. Hence the need for wiring regulations and compulsory registration.

Although these were linked together very intimately Mr. Penwill was inclined to believe that the compulsory registration of contractors and operatives should come first and that a mandatory wiring code should follow as an essential feature. It was wholly impracticable to suggest that there should be a vast army of electrical inspectors sufficient in number to pay regular visits to every building in the country in which electricity was installed to see that the code of wiring rules had been followed. Such regulations should be a "yardstick" by which the competence of the contractor and operative should be judged. Therefore he claimed that the best way to secure safe wiring was to ensure that those responsible for its installation should be properly qualified, and penalised by having their licences withdrawn if they failed to carry out their responsibilities.

About twenty years ago the Electrical Contractors' Association placed its views on this subject before the Institution of Electrical Engineers. The Institution did not see its way to sponsor compulsory registration, but expressed its willingness to convene a conference of interested parties with a view to establishing a voluntary scheme of registration. As a result, the National Register of Electrical Installation Contractors was brought into existence.

How far had the Register's objects been achieved ? Ignoring the war years, in a matter of sixteen years rather more than 3,600 applications for registration were received; of these more than 1,850 had been rejected or withdrawn or the applicants had been subsequently struck off the Register for various reasons. But these 1,850 were still at liberty to carry on as before. In rejecting them or striking them off, the National Register had achieved precisely nothing; the better part of the

British installation trade, and the public at large, had received no benefit whatever. But this was only half the story. Before the present war it was estimated that in the United Kingdom there were about 10,000 traders

of sorts who called themselves "electrical contractors." This meant that apart from those on the Register there were 8,300 "outsiders" free to carry out installation work. Thus, through no fault of the Register but due to its total lack of authority and power its work had been little more than a farce.

The last annual report of the Register showed a total of 1,399 registered contractors. These were very largely members of the E.C.A. who supported the Register principally as a consequence of their loyalty to their own Association. They considered that a voluntary register was better than nothing and a reasonable first step towards compulsion, but after twenty years it was not too much to say that E.C.A. members were becoming very restive and inclined to bring the Register to an end. Without their support the Register would cease to exist.

Mr. Penwill then referred to the scheme for the examination, licensing and registration of electrical contractors and operatives produced by the National Committee set up for the purpose under the chairmanship of Mr. S. B. Donkin. This followed a "statement of evidence" which the Committee had produced to show the need for compulsory registration. Time and time again the A.S.E.E., the two Electrical Contractors' Associations and the Electrical Trades Union, the bodies chiefly concerned with electrical installations in this country, had expressed complete unanimity upon the need for effective control, and the

A recent I.E.E. report did not favour compulsory registration in the electrical contracting industry. It was considered that statutory wiring rules would be sufficient. Mr. L. C. Penwill (E.C.A.) does not agree. Incorporated Municipal Electrical Association was in agreement with them.

It had been argued on more than one occasion, and moreover support had been given to the argument in a recent I.E.E. publication, that the elimination of shoddy and unsafe electrical work should rest with the supply authorities, who already were able to refuse to connect an installation unless it was safe. But this did not take into consideration the large volume of extensions carried out after the completion of the installation and its connection to the mains. The I.E.E. Report bearing the title "Electricity Supply, Distribu-tion and Installation" contended that the relevant statistics from the technical point of view did not in themselves provide sufficiently serious evidence to justify compulsory registration and that a reduction of the already small electrical accident and fire rate could be sought in other directions. Two of the latter were the inspection by supply undertakings of installations for compliance with No. 27 of the Electricity Supply Regulations, 1937 and the encouragement by all undertakings of the observance of the I.E.E. Wiring Regulations and of the use of the voluntary system of registration.

In complete disagreement with the Council of the I.E.E. practical men in daily contact with installation affairs recognised that compulsory registration represented the only effective remedy for the existing deplorable and dangerous situation. As regards inspection, Mr. Penwill said that there were about 600 electricity supply authorities and it was unthinkable that there should be an opportunity for 600 differing opinions as to installation practice. There was no evidence to suggest that the encouragement of the observance of the I.E.E. Regulations would have any greater effect in the future than it had had in the past.

At the annual meeting of the N.R.E.I.C. the chairman, Mr. P. V. Hunter, had said that the I.E.E. report was a negative document as it was stated specifically that it was not the Institution's business to say that compulsory registration was necessary. He did not want attached to the report greater authority than was due to it. Mr. Hunter had also said that the Register would be a much more effective body if it had mandatory powers and if registration was compulsory rather than voluntary.

In conclusion, Mr. Penwill said that his object in submitting the paper was to invite the electrical industry as a whole to give a clear mandate to their representative organisations to take all steps within their power to secure the immediate compulsory registration of electrical contractors and operatives.

# **Telephone Repeaters**

### Thermionic Valve Type for Submarine Cables

G ROWTH of inter-continental telephony, since radio-telephony is unlikely to satisfy all post-war service needs, will probably become a major problem. An account of the present state of multi-channel carrier working through submarine cables is given in a paper by Mr. R. J. HALSEY (Post Office Research Station) submitted to the Institution of Electrical Engineers with the object of examining ways and means of increasing the utilisation of under-sea cables.

While it will be possible to secure some small betterment of utilisation by increasing the transmitted power, reduction of the permissible receiving level below the present limit of about minus 110 db appears to be impracticable. Therefore the employment of submerged repeaters seems to be essential to further substantial progress.

Details of such a repeater, of the thermionic valve type to which reference has already been made in the I.E.E. presidential address as well as the Kelvin Lecture of 1943, are given in the paper. It is believed to be the first ever to be incorporated in a working cable system. Mr. W. T. Duerdoth has been responsible for its detailed design, while Siemens Brothers & Co., Ltd., designed, manufactured and tested the repeater case. This repeater was laid by the British Post Office in the Irish Sea on June 24th, 1943, and by its use the number of circuits operable over the single cable has been increased from 24 to 48. In its present form it is suitable for comparatively shallow waters only, down to about 200 fathoms, although it is actually laid at a depth of only 35 fathoms. The laying was carried out by H.M.T.S. *Iris*, with half a gale blowing during the final lowering, which took only ten minutes; nevertheless the whole operation was successfully accomplished. The sea bed is probably rocky and is swept by a strong tide, so that the conditions are by no means ideal. The temperature on the sea bed varies seasonally between 6 and 14 deg. C., the pressure corresponding to 93 lb. per sq. in.

The cable in which the underwater repeater has been inserted is 43.9 nauts long between shore stations and is a link in a more complex scheme. The maximum frequency which could previously be transmitted was 250 kc/s, whereas the bands now used are 36 to 228 kc/s in one direction without amplification in the repeater and 312 to 504 kc/s (gains of 57 and 70 db respectively) in the other direction.

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of the repeater are described together with its valves and means of supplying power to them, switching and fault-alarm system, performance records being included. A proposed arrangement is outlined whereby the present design could be adapted for tandem operation in a single cable so that the amplifier would function in both directions. Fresh designs for deep water transoceanic routes subject to extreme pressure are being studied in the Bell Telephone Laboratories in America.

#### Discussion

In opening the discussion, MR. A. J. GILL (G.P.O.) spoke of the advantages of polythene over paragutta and said he believed that cables so insulated were now in course of manufacture. As to the point that radio circuits were unlikely to meet the requirements mentioned in the paper he suggested that the author should consider radio before he became too dogmatic. He did not like the idea of changing valves automatically at the bottom of the ocean because that involved dry contacts, which were always a weakness. In spite of the great care taken, there had been a failure on this repeater on the last thing one would have expected, but this had provided valuable information. It had been found possible to pick up and replace the repeater, but it cost something like £1.000.

repeater, but it cost something like £1,000. MR. T. R. SCOTT (Standard Telephones & Cables, Ltd.) said that the deep sea type of repeater was not touched upon in the paper; there would be many serious difficulties to be overcome before this became practical. He gathered from what Mr. Gill had said that a new model had been introduced between the writing of the paper and the present time; what was important was the experience gained with the original model.

experience gained with the original model. DR. W. G. RADLEY (Post Office Research Station) said that frequencies up to at least 100 kc/s must be transmitted to obtain a reasonable number of circuits, which raised the problem of working the cable with several repeaters in tandem. It would seem that some ten or twelve repeaters was the maximum number that could be inserted in a cable some thousands of miles long. If a two-cable scheme were adopted, the number of repeaters could be reduced to six with the same number of circuits. But there was the possibility of multiplying the available circuits by five or more times with the "Vocoder" device. Although the cost of the apparatus was high, it was inconsiderable in comparison with the capital cost of the cable.

 $D_R$ . A. ROSEN (Siemens Bros. & Co., Ltd.), said that his company had started investigations into this particular problem independently of the Post Office and had proceeded a long way when the work had to be interrupted on account of the war. However, they had at least solved the question of the mechanical design of the casings which introduced some difficult problems and when the Post Office asked for such a case they were able to offer that particular part of the design.

MR. R. W. CHAMNEY (G.P.O.) said that he could not help feeling that the repeater should be worked by AC, and that each repeater should be entirely self-contained. In other words, there might be three or four valves in the repeater and if a valve failed it would automatically switch in the second valve and so on without the need for any complicated operations from the land.

The author, in a brief reply to the discussion, emphasised, as regards the number of valves in the repeater, that the use of these particular valves was no more than a temporary expedient. He did not pretend that this was the best solution, but it was the only one that could be applied at the moment. It was essential to have high performance and longlived valves for this job. There was no evidence there would be any failure of the DC supply and was confident that for the moment they were right in having the switching arrangement that had been adopted.

### Lift and Crane Inspection

**R** EGULATIONS embodied in the Factories Act, 1937, for the inspection and maintenance of lifting machines and tackle used in premises to which that Act applies are reviewed by MR. W. DUCKWORTH (Vulcan Boiler & General Insurance Co., Ltd.) in a paper submitted to the Manchester Association of Engineers.

The author next defines such terms as "thorough examination" and "competent person," incidentally explaining why the usual yearly inspections in some cases necessitate examination at least twice per annum. He stresses the desirability for some permanent system of marking every lifting appliance for purposes of identification. Although nearly six years have elapsed since the passing of the Factory Act it is a fact that in many cases no real effort has been made to organise and put into effect any such system, which the author considers to be essential.

Specimen forms for making reports, certifying examinations and keeping records are reproduced in the paper, which strongly recommends that this aspect of the subject should be put on a properly organised basis to permit the systematic keeping of records of work done and repairs or renewals needing attention.

The second half of the paper is mainly concerned with the causes and prevention of accidents, including illustrations of crane failures and tackle fractures. The author has little doubt that more serious lift injuries are due to falls down shafts than to any other cause, too frequently resulting from gate locks being allowed to get out of order. Crane accidents happen mainly through failure of the human element, since their safety depends so much on the manner in which they are used. The author recommends as excellent the set of rules for crane drivers given in the June, 1941, issue of the "Industrial Accident Prevention Bulletin."

# **ELECTRICITY SUPPLY**

Bournemouth.—COMPANY CHAIRMAN CRITI-CISED.—At a meeting of the Town Council Alderman A. Langton, chairman of the Transport Committee, described some of the remarks a speech by the chairman of the Bournemouth & Poole Electricity Supply Co., Ltd., as "ill-conceived, bearing in mind that negotiations are proceeding on behalf of the Corporation, to-gether with Poole and Christchurch, for taking over the company." The borough's policy for improving the supply of electricity, he said, was held up to ridicule in the speech. Alderman F. B. Summerbee contended that the speech contained a considerable amount of mis-statement and implied that the company could supply the whole of the power more efficiently and cheaply than the local authority. There were occasions, he claimed, when the trolley-bus service in Bournemouth would not have been able to operate on the electricity supplied by the company if the Corporation had not replaced part of the equipment at its own generating plant.

[At the company's annual meeting Sir Robert Renwick said that ratepayers should watch the operation of the Bournemouth Corporation's traction generating station. Recently it had been decided to replace generating plant in this station although its thermal efficiency was below modern standards and in spite of the fact that electricity was available from the Central Board at low cost.]

Bromley,-PRICE INCREASE NOT ALLOWED.-Towards the end of last year the Town Council approved a 6 per cent. increase in electricity charges, to take effect from April 1st. At a recent meeting of the Council, Councillor A. Collins, chairman of the Electricity Committee, reported that the Electricity Commissioners had decided against any increase at the present time. The reason given, he said, was that the under-taking had a reserve fund of £37,500 and that the purpose of such a fund was, among other things, to meet unexpected contingencies. The chairman added that consumers in the borough had helped the undertaking by cutting down the demand at the peak period and by using their electricity with discretion, so that during the nine months ended December 31st the financial position showed a considerable improvement compared with the previous year.

Glasgow.—APPLICATION FOR BETTER LIGHT-ING.—At a meeting of the Lighting Committee reference was made to newspaper reports of improved street lighting which, it was stated, had been authorised by the Ministry of Home Security for the central area of Liverpool. The town clerk was instructed to take the matter up with the Ministry with a view to a similar concession being granted to Glasgow.

Ilford.—LOANS.—The Electricity Committee has obtained sanction to borrow £1,395 for mains ano £2,005 for substation and equipment.

Leicestershire.—ELECTRICITY FOR SMALL-HOLDINGS.—The Agricultural Committee has approved in principle the installation of electric light in the houses and power in the buildings on its smallholdings where electricity is reasonably available, and in particular where the installation

### Bournemouth Traction Supply. Teignmouth Public Lighting.

of electricity would enable improvements to be made in water supplies by the installation of electric pumps.

London.-WATERWORKS PLANT.-The Metropolitan Water Board is to install electric motors in substitution for two water turbines at a station in the Thames Valley at an estimated cost of £2,400.

Newport.—OPPOSITION TO BARRAGE.—When the Newport Harbour Commissioners last week discussed the Severn Barrage scheme it was stated that the Parliamentary Committee of the Newport Corporation was opposing the project.

Southport.--RENEWAL OF INSTALLATION.-On a report of the borough electrical engineer the Estates Committee has decided upon the complete renewal of the electrical installation at the Cambridge Hall at an estimated cost of £475.

Sunderland.-FIXED CHARGE CONCESSION.-The Town Council has revised its electric home tariff to exclude a boxroom from the fixed charge of 2s. 6d. a quarter if such a room does not exceed 50 sq. ft. in floor area.

Teignmouth.-PUBLIC LIGHTING POLICY.-Should a local authority owning a gas undertaking use its own service in preference to elec-tricity for street lighting? Two points of view were expressed at a meeting of the Urban District Council when the Highways Committee submitted a recommendation that the gas engineer should arrange for immediate post-war public lighting at Shaldon and as much as possible at Teignmouth. On the one hand Mr. A. J. Hockin considered it a retrograde step to go back to gas, saying that they wanted to be modern in lighting as in everything else. Mr. Morgan Edwards, however, likened the Council to a man growing his own vegetables, then leaving them in the ground and buying potatoes from a shop. They should, he considered, put their own industry in order. The gas engineer denied that gas was retrograde, pointing to the fact that several London boroughs were lighted by this means. The Council, however, approved Mr. Hockin's amendment for the reference back of the Highways Committee's recommendation with an instruction that estimates should be obtained from both the gas undertaking and the electricity company.

Tynemouth.—SUPPLY TO TRADING ESTATE.-The Electricity Committee is to provide a supply in connection with the development of the Chirton Trading Estate and is seeking sanction to borrow £4,000 for mains and services, £2,000 for substation equipment and £1,500 for substation buildings for the purpose.

Wallasey.-STREET LIGHTING CHARGES .- The Electricity Committee recommends that the street lighting charge shall be increased from 0.75d. to 0.95d. per kWh.

Whitehaven -Post-WAR PROGRAMME.-The Town Council has embodied in replies sent to the Electricity Commissioners' questionnaire lists of works, estimated to cost £59,990, which the borough electrical engineer suggests should be included in the Council's post-war programme

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# **Ripple Control**

### **Problem of Allocating Frequencies**

THE discussion of the paper on "Remote Switching by Superimposed Currents," which was read by MR. J. L. CARR on May 1st, before the I.E.E. Transmission

Section (and reported by us last week), was opened by MR. H. NIMMO (Electricity Commission). Comparing the Manchester system employing parallel injection with the French system, series injection, he doubted whether the former was preferable especially in regard to interference with other systems. After consultation with the British Standards Institution a clause had been drafted just before the war for inclusion in the Commissioners' Safety Regulations. This draft would prohibit an undertaking from installing or operating a ripple-control system unless the method of signal injection and the lay-out of its network precluded the possibility of interference with relays in any adjacent network, even if fed from the same busbars. In a written contribution, MR. J. R. BEARD (Merz & McLellan), asked whether it would be advisable to set up a body for the allocation of injection frequencies and whether standards could be laid down at the present stage, without cramping development, which might prevent trouble later.

#### **Governing Factors**

MR. T. W. Ross (Metrovick) referred to three governing factors: Limitations imposed by the undertaking's transmission network and switching and transforming arrangements; the flow of ripple current into surrounding networks; adequacy of signal strength at any relevant point on the lower-voltage distribution network. The first was due largely to reactors, power transformers and powerfactor correcting condensers. The Regulation proposed would, he believed, greatly impede the development of ripple control, as it would entail the provision of an unreasonably large number of injection equipments to keep the signal strength down to that required at one time for a small portion only of a large network. If, however, the relays on each network responded only to a particular code, errant signal currents would do no harm. A relay which would respond to a minimum of 0.5 per cent. of the distribution voltage but not to a frequency more than 5 per cent. away from that being used would probably be immune from interference, if the known harmonics were avoided.

In a written contribution, MR. E. E. JOLLY (Bethnal Green) stated that the DC bias system installed on one section of his undertaking in 1938 had proved so satisfactory that, but for the war, it would have been

extended throughout the area. Of 1,300 lamp columns, 950 had been converted, but the system would also be suitable for controlling off-peak loads. Maintenance of the substation panels cost  $\pounds 2$  10s. per annum. Batteries required replating every four or five years, but in his view this cost could be reduced by using nickel-cadmium batteries.

MR. E. M. S. MCWHIRTER (Standard Telephones) emphasised the advantages of DC injection at each substation which prevented risk of failure over a whole area, permitted gradual loading of a network and obviated the interference difficulty. He submitted figures covering twenty-eight installations operating a total of 8,500 street lamps from 166 substations, each with its DC-bias panel. The yearly cost per relay receiving point, including capital charges and rent of Post Office pilot lines for the central control to the substations, he gave as 11s. 10d. plus a maintenance charge of less than 1s. Substation charges included complete replacement of the batteries within a ten-year period.

MR. R. M. A. SMITH (Metrovick) pointed out that ripple installations were working now with direct-connected condensers up to 33 kV on networks up to 50,000 kW, the biggest covering 1,000 sq. miles with simultaneous signals, to which localised control systems, such as the DC bias, would be inapplicable. MR. W. SAVILLE (Automatic Telephone Co.) expressed the view that interference would be eliminated by allocating to each undertaking susceptible to the transfer of signal current a gate frequency or code. Load control might require as many as a hundred frequencies.

#### **Sixty Operating Channels**

MR. E. HALLOWELL (Yorks E.P. Co.) had come to the conclusion as a result of experience with parallel injection on the 11-kV system of the Yorks E.P. Co. that satisfactory multi-service could be achieved only by superimposing a very low-frequency impulse on the carrier frequency, by which means the number of carrier frequencies was minimised and interference due to parasitic frequencies eliminated. Any standardisation of ripple control should call for at least sixty operating channels so as to allow for future developments. MR. J. F. MACKENZIE (Automatic Telephone Co.) said that, with operation within a frequency range advantage could not be taken of the possession by each network of a certain frequency for most efficient propagation, so that a system utilising a single frequency possessed advantages.

In a brief reply, MR. CARR said that during

of other undertakings receiving bulk supplies and others connected to the 33-kV busbars. This had resulted in great economies. With both the parallel and series injection methods some ripple current would go over to the high-voltage system unless a wave trap tuned to the particular frequency were used. He agreed that careful selection of frequencies and perhaps coding would be necessary, but he questioned the desirability of introducing regulations that required the connection of considerable rejector-circuit equipment that would have to withstand the full shortcircuit duty.

Direct-current bias was effective, but the cost of hiring lines from the Post Office might be heavy. There was no best system. Final selection must depend upon consideration of all the local conditions and of the duty required. The installation described was capable of extension to twenty-four switching channels.

### **Telephony in Eire**

OME aspects of telephony and their econo- $\begin{array}{l} S_{MR}^{OME} \text{ aspects of telephony and their economics were dealt with in a recent lecture by } \\ M_{R}, J. W. O'NEIL, B.A., at the Irish Centre in Dublin of the Institution of Electrical \\ \end{array}$ Engineers.

It was pointed out that as regards quality (grade of transmission, speed of connection, availability of service and reliability) a compromise solution was usually most economical. Generally, the more money spent on construc-tion and maintenance, the fewer would be the faults; the economic problem was to compare the loss of revenue and subscriber good-will due to faults with the increased cost of reducing the fault liability.

When requirements had been determined, the question of how best to meet them was almost entirely an engineering economic one.

For example, in an automatic area would it be more economical to have one large exchange with long lines or, say, four smaller exchanges with shorter subscribers' lines? In 1927 it would have been more economical to provide four exchanges to serve the Dunlaoghaire area, but when the work was being undertaken in 1936 a fall in cable prices and technical improvements in exchange transmission made a single exchange to serve the whole area the better proposition. Automatic plant was much more costly and required more maintenance, but there was a very considerable saving in operating costs as compared to manual operation. Automatic working had proved economical in so many cases that the manufacture of large manual exchanges had now practically ceased.

The lecture was accompanied by graphs prepared from the published commercial accounts, showing the salient points of the financial results of the operation of the system under Irish administration. At the start the plant was inadequate and in bad condition and in the earlier years much money had to be spent on repairs, renewals and the provision of new

plant. The receipts were not able to meet all charges until 1931, but the surplus since then had much exceeded the previous deficit.

# **Diffraction** Radiology

HE manner in which X-ray crystal analysis (differentiation method) is employed in engineering is described by MR. F. BRECH in a paper submitted to the Manchester Association of Engineers.

It indicates how matter in the solid state is the repetition in three dimensions of charac-teristic arrangements of atoms, to which crystal structure most of the physical and chemical properties of materials are related. Diffraction of X-rays by powdered specimens reveals the composition of elements; the author explains the significance in identification of departure from optimum values, grain size, lattice distortion produced by such cold work as machining and the manner in which the last mentioned factor can be used for stress measurement.

The author thus indicates the types of X-ray diffraction patterns that may yield information about the chemical composition, texture and stress content of all metals or alloys, pointing out how it may be done without preparation of the sample other than for local acid etching, for progress is being made with the design of a camera which will enable block specimens as well as powders to be examined.

The method is applicable to most metals and alloys, its scope being summarised as checking quality and control of fabrication, heat treatment, finishing processes as well as the identifica-tion of corrosion products. The X-ray photographs of typical diffraction patterns which illustrate the paper were taken with the "Dextræ " apparatus manufactured by Adam Hilger, Ltd.

## **Forthcoming Events**

Saturday, May 20th .-- Bath .-- Royal Bath Lounge, 3 p.m. I.E.E. Bristol Students' Section. Annual general meeting and repeat of address "An I.E.E. Student Sees the U.S.A.," by Mr. R. W. Adams.

Mr. R. W. Adams. Leeds.—At Hotel Metropole, 3 p.m. Associa-tion of Mining Electrical and Mechanical Engineers (Yorkshire North-West Branch). "Mercury Arc Rectifiers," by Mr. P. Butler.

Monday, May 22nd.—Birmingham.—Birming-ham Electric Club. "Modern Applications of Mercury Rectifiers," by Mr. J. C. Milne. Nottingham.—Corporation Gas Showrooms, Class Exect anticates (G. D. Michaeland)

Clare Street entrance, 6 p.m. Nottingham Society of Engineers. Films of engineering interest (ladies invited).

Wednesday, May 24th.—London.—At Royal Society of Arts, John Adam Street, W.C.2, 6.30 p.m. Institution of the Rubber Industry. Annual general meeting and paper. "Synthetic Rubber Processing," by Dr. R. J. Tudor (to be read by Mr. M. M. Heywood).

Thursday, May 25th.—Birmingham.—At James Watt Institute, 6.30 p.m. I.E.E. South Midland Students' Section. Annual general meeting and paper, "The High Voltage Laboratory" (with special reference to impulse testing), by Mr. O. D. Penzig.

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ELECTRICAL REVIEW

**Diesel-Electric Shunters** 

### Likely Improvements in Design

In this country Diesel-electric shunting locomotives have been chiefly developed and used in regular service in the marshalling of the L M.S. Railway. There has theredesign to be adopted as a general standard. The initial requirements of a three-axle locomotive weighing approximately 50 tons capable of a maximum tractive effort of 30,000 lb. and equipped with an engine of nominal rating of 330 HP running at relatively low speed appear still to meet the general need.

Most of the variations in design have been concerned with the form of drive. Originally two

types were tested. In the first, two single-reduction axle-hung motors located on the outer of the three axles provided the driving force which was transmitted to all axles by coupling rods. Since the motors required the maximum space axially on the axles,

Pre-war type of Diesel-electric shunting locomotive supplied to the Bombay, Baroda & Central Indian Railway

the frames were arranged outside the wheels, and accordingly cranks were necessary outside the axle boxes for the coupling rods. The other initial design tried had

the three axles coupled and driven from a jack-shaft which was in turn driven from a single motor, frame mounted,

through double-reduction gearing. The principal reasons why the latter design was preferred were the better location of the motor for inspection, ventilation and free-dom from, for example, track flooding, together with a reduced weight and, therefore, lower cost of motor due to the better utilisation of the electrical material. The motors, too, could be provided with forced ventilation, ensuring dissipation of the maximum heat at low vehicle speeds and high tractive efforts, and the air input to the motors could, if desired, be readily filtered.

The shunter's mechanical design probably in-volved some increase in the cost of the mechanical parts, while the side-rod drive occasioned an increased maintenance cost, but in general the design has a fine record of service operation on the L.M.S. Railway as well as overseas.

The side-rod drive was used originally on the Armstrong Whitworth shunters with Crompton-West equipments, and this type has in general been followed both for subsequent L.M.S. locomotives and also for the Armstrong Whit-worth Crompton-West type of locomotive now operating on the Bombay, Baroda and Central Indian Pailway Indian Railway.

There is evidence, however, that renewed attention is now being given to further developments in the design of this type of shunter, in one case using two axle-hung motors but of the double reduction geared type with coupling rods. Disclosure of the new designs will be awaited with interest, but in general it would seem that the following are the principal features at which they will aim :--(a) To sim-plify, lighten and reduce the cost of the electrical equipment; (b) to cheapen the costs of the mechanical parts and to make the mechanical design suitable, with the minimum of alteration, for application on the various export market railways, *i.e.*, with changes of track gauge, axle load, and loading gauge; (c) to co-ordinate the manufacture of a complete unit which in general involves, about equally, three separate in-dustries, *i.e.*, the locomotive industry, the engine industry, and the electrical industry; (d) to take



advantage of the developments in Diesel engines which have come to the fore as a result of wartime experience; (e) to carry still further the development of simple and foolproof automatic schemes of control.

It is believed that during approximately ten years of operation the position of electric transmission has strengthened in competition with mechanical transmission for applications such as shunting locomotives, where it is required to handle very high tractive efforts and to have simple, foolproof means of infinite and gradual speed control.

We are indebted to Crompton Parkinson, Ltd., for the above information.

#### Survey of Columbia River

R. MACKENZIE KING announced in the M Canadian House of Commons recently that a broad survey of the water power and other resources of the Columbia River and its tributaries would be undertaken by the International Joint Commission at the request of the Canadian and United States Governments. He said that the task was the largest the Commission had yet undertaken and would probably of many Canadian and American engineers and economic experts. The waterways to be covered by the survey drain a large part of Southern British Columbia and four American States, Washington, Idaho, Montana and Oregon.

# FINANCIAL SECTION

# Company News. Stock Exchange Activities.

### **Reports and Dividends**

Johnson & Phillips, Ltd., propose to repay their  $4\frac{1}{2}$  per cent. debenture stock at 102 per cent. on January 1st mext, the earliest date permissible. This was announced at the annual general meeting on May 10th by Mr. G. Leslie Wates, the chairman, who said that it was felt that for a company of its standing and total assets it was hardly appropriate to have any capital raised on debentures, and furthermore that the rate of interest of  $4\frac{1}{2}$  per cent. was higher than ought to be paid having regard to money rates at present.

Speaking of trade associations and cartels, Mr. Wates said that in some quarters these had a bad name and undoubtedly in some parts of the world they had sometimes been used against the public interest. But the answer to that was not to prohibit them but to ensure by appropriate means that they were properly used in the interests of all persons concerned, including the customer, instead of in the sole interests of the shareholding side of the partnership. Personally he would be happy to see on a trade association some representation of the customer and would like the principle recognised by Parliament.

Laurence, Scott & Electromotors, Ltd., as previously announced, show a net profit of £109,504 for 1943, as against £108,202 for 1942. Of this, preference dividends absorb £4,256 net (£4,360), income tax £54,000 (£53,000), pension fund £5,000 (same), staff annuity fund £5,000 (£2,500), general and other reserves £10,608 (£11,154) and dividends on "A" and "B" ordinary capital, 12½ per cent. (same), £25,062, leaving £6,871 (£5,483) to be carried forward.

**Permutit, Ltd.,** reports a net profit for 1943 of  $\pounds 17,789$  ( $\pounds 14,639$ ). After paying an ordinary dividend of 10 per cent. (8 per cent.) and writing off patents,  $\pounds 25,629$  ( $\pounds 15,450$ ) is carried forward. The holding in an associated company was realised at a profit of  $\pounds 25,000$ , which was transferred to capital reserve.

Imperial Chemical Industries, Ltd., report an income for 1943 amounting to £6,685,345, as compared with £6,499,859 for 1942, which with £965,499 brought in gives a total of £7,650,844 available. A sum of £774,210 is allocated to war contingencies reserve and £100,000 to the war personnel reserve, and a final dividend of 5 per cent. is to be paid making 8 per cent. The carry-forward is £1,062,018.

British Oxygen Co., Ltd.—At the annual general meeting on May 10th Mr. S. J. L. Hardie (chairman) stated that the company had had a record trading year at home and in all the overseas associated companies. There was still a large programme of expansion and development to complete.

The Sphere Investment Trust, Ltd., reports gross dividends received, before deducting income tax, amounting to £114,610 for the year ended March 31st last, an increase of £6,538 on the previous year. After providing for interest on debentures, administration and other expenses, the revenue account shows a credit balance of £40,975, to which is added £74,851 brought in, making £115,827. Reserve account receives £10,000 and the ordinary dividend is maintained at 5 per cent., £72,827 being carried forward. A sum of £10,000 has also been transferred from reserve for taxation to the reserve account, increasing the latter to £100,000.

The Marconi International Marine Communication Co., Ltd., had a revenue of £668,988 in 1943, as compared with £612,569 in 1942. The profit was £93,392 (against £94,477). The final dividend is 5 per cent., again making  $7\frac{1}{2}$  per cent. for the year. The balance carried forward is £34,371 (against £30,433). The report states that it is the company's desire, in conjunction with Marconi's Wireless Telegraph Co., Ltd., to establish aircraft radio service depots wherever required and to continue the present good relations with shipowner clients who are contemplating entry into the sphere of civil aviation.

The British Electric Traction Co., Ltd., reports that revenue for the year ended March 31st amounted to  $\pounds767,962$ , compared with  $\pounds760,293$ for the previous year. After deducting general expenses, etc., and debenture stock interest, and providing £312,677 for income tax (against £311,032), there remained for appropriation (subject to audit) the sum of £316,441 (£309,915). The directors recommend the payment of the following final dividends: 5 per cent. on the participating preference stock (making 8 per cent. for the year); 4 per cent. on the preferred ordinary stock (making 8 per cent. for the year); and 30 per cent. on the deferred ordinary stock (making 45 per cent. for the year). This leaves £56,961 to be transferred to undivided profits account.

The Ever Ready Co. (Great Britain), Ltd., reports an increase in profit and investment income from £680,248 for 1942-43 to £820,376 last year and in net profit from £584,887 to £621,813. The allocations include £178,247 (against £140,000) to reserve and the final ordinary dividend is 25 per cent., making 40 per cent. for the year (against 35 per cent.). £103,518 (against £100,148) is carried forward.

Ever Ready (Ireland), Ltd., is again paying an ordinary dividend of 10 per ceut. The net profit was £14,339 (against £12,005).

The Anglo-American Telegraph Co., Ltd., utilised the whole of the rent, after deduction of income tax, received from the Western Union Telegraph Co. under lease, amounting to £131,250, for payment of dividends on the company's three classes of stock. The credit balance of £65,625 from the previous account is carried forward.

Pinchin, Johnson & Co., Ltd.—Mr. Edward Robson (chairman) stated at the annual general meeting on May 10th that despite difficulties of extended control of essential materials and labour the company's turnover expanded satisfactorily. The board had not been unmindful of the increasing importance of plastics.

Tube Investments, Ltd., announces the payment of an interim dividend of 10 per cent. on the ordinary stock and one at the same rate relatively on the liaison ordinary shares.

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The Rheostatic Co., Ltd., by paying a final dividend of 8 per cent., maintains the total dividend for the year at 12 per cent.

Stream-Line Filters, Ltd., are paying a final dividend of 7 per cent. (same), again making 10 per cent. for the year.

The Calcutta Electric Supply Corporation, Ltd., is maintaining its final dividend at 3 per cent. tax free, making 6 per cent. (same) tax free.

Enfield Rolling Mills, Ltd., is to pay a dividend of 5 per cent.,  $2\frac{1}{2}$  per cent. more than last year.

International Combustion, Ltd., is again to pay an interim dividend of 5 per cent.

John I. Thornycroft & Co., Ltd., are maintaining the interim dividend at 5 per cent.

British Mechanical Productions, Ltd., is paying an interim dividend of 3 per cent.

### **New Companies**

Simmons Electrical & Winding Co., Ltd.— Private company. Registered May 4th. Capital, £1,000. Objects: To carry on the business of electrical, mechanical, radio, motor, marine, and general engineers, etc. Subscribers: F. S. C. Simmons and R. A. Davis, both Commonwealth House, New Oxford Street, W.C.I. Secretary: T. J. Dickens. Registered office: Commonwealth House, New Oxford Street, London, W.C.I.

Electrical Service (Edgware), Ltd.—Private company. Registered May 2nd. Capital, £1,500. Objects: To carry on the business of electrical contractors, manufacturers of, and dealers in, electrical, radio and television apparatus and accessories, etc. Directors: A. H. Auterac and Doris I. Auterac, both of 5a, North Parade, Mollison Way, Edgware; F. G. Merkl, I, Rembrandt Road, Edgware; and Rita Durrant, 47a, South Parade, Mollison Way, Edgware. Registered office: 39, South Parade, Mollison Way, Edgware, Midlesex.

Southern Power, Ltd.—Private company. Registered April 25th. Capital, £10,000. Objects: To carry on the business of mechanical, electrical, radio and general engineers, etc. Subscribers: R. B. Stoney, Holmlea, Durrington, Wilts; and Elfrida E. Weaver, 1, Queen's Park Gardens, Bournemouth. Registered office: Upper Hinton Chambers, Bournemouth.

Blackson & Kerridge, Ltd.—Private company. Registered May 2nd. Capital, £500. Objects: To carry on the business of manufacturers of, and dealers in, electrical and mechanical apparatus, cinematograph machines, television and wireless sets and accessories, etc. L. H. Blackwell, 133, Empire Road, Perivale, is the first director. Secretary: H. Greene.

Claytelec, Ltd.—Private company. Registered May 2nd. Capital, £1,000. Objects: To acquire the business of an electrical contractor carried on by B. Clayton at 26, Aberdeen Park, Highbury. Directors: B. Clayton and Mrs. G. E. Clayton, both of 6, Highbury Grove, N.5. Registered office: 6, Highbury Grove, N.5.

J. E. Fenton, Ltd.—Private company. Registered in Edinburgh, May 4th. Capital, £10,000. Objects: To acquire the business of electrical radio, refrigeration and mechanical engineers, etc., now owned and administered by the trustees of the late John E. Fenton. Directors: J. Stobo, 75, Craiglea Drive, Edinburgh, and seven others. Secretary: J. C. Leslie. Registered office: 26, Canmore Street, Dunfermline.

Scientific Radio & Instruments, Ltd.—Private company. Registered April 28th. Capital, £2,000. Objects: To carry on the business of manufacturers of, and dealers in, radio sets and accessories, etc. Directors: D. C. Wenk, 111, Woodhall Lane, Welwyn Garden City, electrical engineer; J. McCluney, 21, Guessens Road, Welwyn Garden City; and L. F. Rouvray, 33, Granville Road, St. Albans. Registered office: 111, Woodhall Lane, Welwyn Garden City.

### Companies' Returns Statements of Capital

Park Bros., Ltd.—Capital, £11,000 in 4,000 ordinary, 3,000 71 per cent. preference, and 4,000 6 per cent. preference shares of £1 each. Return dated January 13th. 3,040 ordinary, 3,000 71 per cent. preference and 3,445 6 per cent. preference shares taken up. £9,219 10s. paid (£1 on 2,686 ordinary, 3,000 71 per cent. preference and 3,445 6 per cent. preference, and 5s. on 354 ordinary shares). Mortgages and charges: £650.

Vulco Dry Battery Company, Ltd.—Capital, £8,000 in £1 shares (1,500 preference and 6,500 ordinary). Return dated December 31st (filed January 28th). All shares taken up. £3,667 paid. £4,333 considered as paid. Mortgages and charges: Nil.

Ever Ready Radio Valve Co., Ltd.—Capital, £1,000 in £1 shares. Return dated September 15th (filed November 5th). 970 shares taken up. £970 paid. Mortgages and charges: Nil.

Gamble & Sons, Ltd.—Capital, £4,000 in £1 shares. Return dated December 31st. 350 shares taken up. £350 paid. Mortgages and charges: Nil.

#### **Receiver** Released

Gainsborough Radio, Ltd.—A. G. Hill, 12, Woodcote Road, Wallington, Surrey, ceased to act as receiver and manager on April 21st.

#### Mortgages and Charges

Roncar, Ltd.—Assignment registered May 4th, to secure all moneys due or to become due from the company to Barclays Bank, Ltd., charged on contract moneys.

Kent Bros. Electric Wire Co., Ltd.—Satisfaction in full on March 10th, of debentures dated August 13th, 1926, and registered August 30th, 1926, securing all moneys due or to become due from the company to Barclays Bank, Ltd.

F. C. Hill & Co., Ltd.—Satisfaction in full on May 3rd, 1944, of debenture dated February 9th, 1935, and registered February 20th, 1935, securing £1,000.

# Bankruptcies

E. Cookson, automobilc, electrical and mechanical engineer, 190, Warwick Road, Carlisle, trading as W. Turnbull & Co., Express Magneto Works, Elizabeth Street, and Charles Street, Blackpool.—Application for discharge to be heard on June 21st at the Court House, South King Street, Blackpool.

## **STOCKS AND SHARES**

#### TUESDAY EVENING.

THE creeping paralysis which was expected to come over Stock Exchange markets as zero hour approached has failed to materialise. In its place a con-siderable volume of business, mostly on the buying side, took members of the House by surprise. Prices are firm in nearly every department. Brisk rises, followed by a reactionary tendency, in the rubber share market were amongst the features. The spirited attack upon nationalisation, and upon its supporters, by the Incorporated Association of Electric Power Companies aroused hearty commendation. Investment continues to accumulate the good-class ordinary shares. Speculation is concerned with what are deemed to be the favourable post-war prospects of companies connected in any way with television.

#### The Hand of the Buyer

Lancashire Dynamo are 1s. 9d. to the good at 93s. 9d., and the yield at that price is a little more than 4 per cent. on the money. A florin rise lifted Automatic Telephones to 66s. There is consistent demand for Ericsson Telephones on the basis definite to the basis of the basis of 55s. 6d. Hall Telephones lost 6d., at 28s. 6d. At  $6\frac{1}{16}$  Consolidated Signals show a gain of the fraction. In sympathy with the rise in "Signals," Westinghouse Brakes moved up to 75s. Further buying of Telephones and the sympathy basis of the basi graph Constructions caused an advance in the price to 53s. Associated Electrical Industries, at 52s. 6d., have again risen 6d. Johnson & Phillips are quoted ex dividend at 74s. The chairman at last week's meeting notified the company's intention to pay off at 102 its £357,800  $4\frac{1}{2}$  per cent. debenture stock on January 1st next. The company will replace this stock by some other form of financing, at a lower cost to itself. Repetition of the 11 per cent. dividend on Babcock & Wilcox served to strengthen the price by a few pence. Ever Ready, at 41s. ex dividend, recovered the amount deducted. Crompton Parkinsons are 1s. up at 30s. 6d. General Electric ordinary, at 93s., have retained their improvement of last week, and British Insulated, at 108s. 1<sup>1</sup>/<sub>2</sub>d., also held their previous rise. Laurence, Scott, at 13s., regained the dividend nominally taken off the price.

#### **Rises in Prices**

Communication stocks remain in request and what changes have occurred in this section are upward. Anglo-American Telegraph preferred, which had been keeping in step with the deferred, gained a point and so is literally 1 up on the junior stock. Anglo-Portuguese Telephones hardened to 26s. and Oriental Telephones, at 45s. 6d., are 1s. 6d. higher on the week. Electricity supply shares are better where changes have taken place, the only exception being Bournemouth & Poole, which are 6d. easier at 60s. 6d. There are a few small rises, five of them in the group of Home companies' shares. Calcutta Electric Supply are 6d. better at 38s. The company is again paying a final dividend of 3 per cent. net, making 6 per cent. net for the year. Brazilian Tractions are  $\frac{1}{8}$  better. Amongst domestic stocks, British Electric Traction deferred gained 10 points, advancing to 1165.

#### **Government and Railways**

Re-investment of final amounts payable in redemption of conversion 5 per cent. stock has given a good deal of work to the market for Home railway prior-charge stocks. The advances in this market have been fairly numerous and business, until the last few days, was on a substantial scale. Southern Railway preference has been a favourite purchase. Continued support for London Passenger Transport senior stocks served to fortify their prices.

The prospects of the Government consenting to vary its agreement with the railways—in connection with the rent paid during the war—are fading into the background. In reply to the argument that the railways have played an essential part in the war effort, the Parliamentary Secretary, Ministry of War Transport, maintained that this could not have been done without complete control by the Ministry of the whole transport system. He said that the Government was now engaged on the study of many of the problems which will inevitably arise when the war ends. London Passenger Transport "C" stock, at 72, is unchanged on the week. Southern preferred is 1 higher at 79.

#### London Electric Transport

The London Electric Transport Finance Corporation has published its accounts for 1943. These show that loans amounting to \$37,000,000 have been made to the L.P.T.B., the Great Western Railway and the London & North Eastern Railway, under the agreement with the Corporation concluded some nine years ago. The agreement provides for the loan of amounts up to £40,000,000 in the proportion of 70 per cent. to the London Transport Board, 5 per cent. to the London & North Eastern Railway, all of which pay interest, of course, at what is termed an effective rate. The Corporation's 2½ per cent. guaranteed debenture stock, of which there is issued and outstanding £41½ million, is quoted at 97½, and the yield, as our tables show, is £2 11s. 3d. per cent. The last issue

(Continued on page 722)

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# **ELECTRICAL INVESTMENTS**

## Prices, Dividends and Yields

Dividend		dend	Middle					Dividend Middle					
Company	Pre-		Price	Rise		Yiel	d	Company Pre- May or I	ield LC				
Company	vious	Last	16	Fall		p.c		vious Last 16 Fall					
Hame Electricity Companies							Public Boards						
					£	s.	d.	£	s. d.				
Bournemouth and								Central Electricity:					
Poole	$12\frac{1}{2}$	121	60/6	-6d.	4	2	8	1955-60 (Civil					
British Power and								Defence) 3 3 100 3	0 0				
Light	7	7	33/-	10.00	4	4	10	1955-75 5 5 114 4	7 9				
City of London	7	55	28/-	+6d.	3	18	7		4 1				
Clyde Valley	3	8	41/6	1.1	3	17	0		7 8				
County of London	8	8	40/6	11	3	19	0	1974-94 33 33 100 3	5 0				
Edmundsons :	-		0.1.10			-		London Elec. Trans.					
7% Prei.	6	6	54/U		4	1	4	Lutu,, $2\frac{1}{2}$ $2\frac{1}{2}$ $97$ $2$	11 9				
Die Die Vorkshim	0	0	29/-	L CA	4	2	9	Countier 1955 75 41 41 112 2 1	0 8				
Elec. Dis. 1 orkshile	9	9	#0/0	+ ou.	5	19	0	Lond Pass Trans +	.3 0				
envition	191	191	551		А	11	0		8 6				
Elec Supply Cor	122	145	00j-		9	11	U	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1 0				
noration	10	10	4616	5.0.1	1	6	0		0 3				
Tele of Thanet	Nil	Nil	18/-	Tou.	x		0	WestMidlandsJ.E.A.	.0 0				
Lancs, Light and			10,-					1948-68 5 5 108+ 4 1	2 4				
Power	71	71	36/-		4	3	4						
Lianelly Elec.	6	6	26/-		4	12	4	Telegraph and Telephone					
Lond.Assoc.Electric	2 3	4	23/6	+6d.	3	8	1	Anglo-Am, Tel.:					
London Electric	6	6	28/-		4	5	9	Pref. 6 6 121 +1 4 1	19 2				
LondonPowerRed.			'					Def $1\frac{1}{2}$ $1\frac{1}{2}$ 30 5	0 0				
Deb	5	5	103 <del>1</del>		4	14	7	Anglo-Portuguese 8 8 $26/-+6d.$ 6	3 1				
Metropolitan E.S.	8	8	40/-		4	0	0	Cable & Wireless:					
Midland Counties	8	8	40/6		3	19	0	$5\frac{1}{2}$ Pref. $5\frac{1}{2}$ $5\frac{1}{2}$ $113\frac{1}{2}$ 4 1	7 0				
Mid. Elec. Power	9	9	44/6		4	0	9	$0 \text{ ord.} 4 4 82 \pm 14$	17 7				
Newcastle Elec	7	7	30/6		4	12	0	Clobe Tel & Tel .	_				
North Eastern Elec									0 0				
Ordinary	7 .	7	33/6	• 12	4	3	7	Prof 6 6 30/- 4	0 0				
7% Pref.	7	7	35/-	• 8	4	0	0	GreetNorthernTel	0 0				
Northampton	10	10	48/-	1.0	4	3	4	(£10) Nil Nil 204	_				
Notting Hill 6%	~							Inter. Tel. & Tel. Nil Nil 16					
Pret. (£10)	6	IN 11	11			_		Marconi-Marine. 71 71 34/- 4	8 3				
Northmet Power :		7	0.010		0	10	0	Oriental Tel. Ord. 16 10 45/6 +1/6	<u> </u>				
Crainary 60/ Brof	e l	6	30/0 20/6	1.00	2	12	2	Telephone Props. 6 Nil 17/-	_				
Dichmond Floo	6	6	95/6		- P1 - A	14	1	Tele. Rentals (5/-) 10 10 11/9 +3d. 4	5 0				
Santtich Power	Q	8	401-		4	14	0						
Southern Areas	5	5	23/-		Ā	7	õ	Traction and Transport					
South London	7	7	28/-	+64.	5	0	ñ	Anglo-Arg.Trans.:					
West Devon	5	5	24/	,	4	3	4	First Pref. (£5) Nil Nil 2/6	-				
West Glos.	41	31	24/6		2	17	4	4% Inc. Nil Nil 6					
Yorkshire Elec	8	8	43/-		3	14	5	Brit. Elec. Traction:	7 7				
								Def. Urd. $45 - 45 - 1105 + 10 - 3$	1 6				
Over	seas Ele	ctricity	Compan	ies				Pret. 0rd. a o 110 . 4 .	0 10				
Atlas Elec.	Nil	Nil	6/-	**			0	Dristof frantion \$1 \$12 262 61	9 1				
Calcutta Elec.	6*	62	38/-	+60.	J P	3	0	Coloutto Trome 51 61 $37/6$ 3	9 6				
Cawnpore Elec	10	10	30/-	• •	G A	14	10	Cane Elec. Trams 5 6 26/ 41	2 4				
Last Airican Power	7	5	28/6		1	10	20	Lancs, Transport 10 10 45/6	8 0				
Kalgoorka (10/)	5	5	10/-	• •	5	10	0	Mexican Light :					
Madroa Files	0 4#	Nil	23/-		0	_	0	1st Bonds 5 5 1023 4 1	17 7				
Montreal Power	11	12	231	+1+	6	7	8	Rio 5% Bonds 5 5 1051 4	4 9				
Palestine Elec "A"	±2 4¢	1 2 5 #	41/-	1 -2	2	8	9	Southern Rly. :					
Perak Hydro-elec	6	7	10/-			_		5% Prefd. 5 5 79 +1 6	6 7				
ShawiniganPower	83cts.	90cts.	151					5% Pref 5 5 120 + 1 4	3 4				
Tokyo Elec. 6%	6	6	15			-		T. Tilling 10 10 59/- 3	8 0				
VictoriaFallsPower	15	15	41		3	12	7	West Riding 10 10 44/6 4	10 0				
WhitehallInv.Pref.		6	23/6		5	2	2	(Continued on next page)					

\* Dividends are paid free of Income Tax.

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	Divio	lend	Middle	Rise	Y	iel	d		Divio	iend	Middle	Rise	1	Yiel	ld
Company	Pre- vious	Last	<u>Мау</u> 16	or Fall	1	p.c.		Company	Pre- vious	Last	<u>Мау</u> 16	or Fall		p.c	-
Equipment and Manufacturing													£	٤.	d.
					£	8.	d.	General Cable (5/-)	15	15	15/-		9	0	0
Aron.Elec.Ord	10	15	60/-		5	0	0	Greenwood&Batley	15	15	42/6	+ 18	4	1	2
Assoc. Elec. :					_			HallTelephone(10/-)	121	121	28/6	-6a.	4	1	9
Ord	10	10	52/6	+6d.	3	16	3	Henley's (5/-)	20	20	26/9	* *	3	14	9
Pref	8	8	39/6		4	1	0	41% Prei	-11	42	24/-	**	6	19	0
AutomaticTel&Tel.	124	121	66/-	+2/-	3	Iā	9	Hopkinsons	15	174	66/3	* 5	9	G	3
Babcock & Wilcox	11	11	51/-	+3d.	4	G	3	India Rubber Pref.	52	52	23/6	4.14	4	13	9
British Aluminium	10	10	47/6		4	4	1	Intl. Combustion	30	30	0#		4	14	U
British Insul.Ord.	20	20	513		3	14	0	Johnson & Phillips	15	10	74/-30	+1/-	4	1	1
British Thermostat								LancashireDynamo	22	221	93/9	+1/9	1	15	10
(5/)	181	181	19/6	1.0	1	14	10	Laurence, Scott(5/-)	122	12±	13/- <b>x</b> d	+4d.	4	16	2
British Vac. Cleaner								London Elec. Wire	71	71	39/-		3	17	0
(5/-)	15	30	30/	1.0	5	0	0	Mather & Platt	10	10	51/3	- 11	3	18	2
Brush Ord. (5/-)	8	9	8/9	- 3d.	5	2	10	Metal Industries(B)	ő	8	47/6	1.2	3	7	6
Burco (5/-)	15	171	15/6		5	13	0	Met. Elec.CablePref.	5妻	51	21/3	2.2	ð	3	6
Callender's	15	20	52		3	16	0	Murex	20	20	105/9		3	15	6
ChlorideElec.Storag	e15	15	80/-	10	3	15	0	Pye Deferred (5/-)	25	25	27/6	+6d.	4	11	0
Cole, E. K. (5/-)	10	15	30/	10	2	10	0	Revo (10/-)	171	171	42/6	4.9	4	2	4
ConsolidatedSignal	24	271	6 3	+ &	4	9	0	Reyrolle	12 <del>]</del>	124	68/9		3	12	8
Cossor, A. C. (5/-)	7불ㅎ	10*	25/-	-2/-	2	0	0	Siemens Ord.	71	71	33/-		4	11	0
Crabtree (10/-)	171	171	37/9		4	12	9	Strand Elec. (5/-)	71	10	7/9		6	9	0
<b>Crompton Parkinson</b>	1							Switchgear & Cow-							
Ord. (5/-)	20	221	30/6	+1/-	3	14	9	ans (5/)	20	20	18/6	+ >-	õ	8	1
E.M.I. (10/-)	6	8	30/9	6d.	2	12	0	T.C.C. (10/-)	ā	71	20/-		3	15	0
Elec. Construction	10	121	52/-		4	16	2	Т.С. & М.	10	10	53/-	+6d.	3	15	6
Enfield Cable Ord.	121	121	57/-	6d.	4	7	9	TelephoneMfg.(5/-)	9	9	11/3	+3d.	4	0	0
English Electric	10	10	50/		4	0	0	Thorn Elec. (5/-)	20	20	23/9	**	4	4	2
EnsignLamps (5/-)	25	15	21/3		3	10	8	Tabe Investments	20	20	97/-		4	2	4
Ericsson Tel. (5/-)	22*	20*	55/6	+6d.	1	16	0	Vactric (5/)	Nil	NI	14/9	+3d.			
Ever Ready (5/-)	40	40	41/-xd	+6d.	4	17	7	Veritys (ä/–)	73	7 <u>1</u>	7.'6	4.5	5	0	0
Falk Stadelmann	71	71	33/6	22	4	9	7	WalsallConduits(4/-	)55	55	48/6		4	10	7
Ferranti Pref	7	7	30/		4	13	4	Ward & Goldstone							
G.E.O. :								(5/~)	20	20	26/9	+34.	3	15	6
Pref	61	61	34/-		3	16	6	WestinghouseBrake	121	14	75/-	+2/-	3	14	9
Ord	171	171	93/-		3	15	1	West, Allen (5/-)	71	71	7/3		ā	3	ភ

Dividends are paid free of Income Tax.

#### Stocks and Shares (Continued from page 720)

of the stock,  $\pounds 9\frac{1}{2}$  million, was made in January, 1937, at  $92\frac{1}{2}$ .

#### **Cable & Wireless Preference**

Cable & Wireless pays its  $5\frac{1}{2}$  per cent. preference dividend on March 31st and September 30th. The ordinary stock having received 4 per cent. annually for six consecutive years, the preference may be regarded as useful investment to give a return of f4 16s. per cent. on the money. According to the last published figures, the preference dividend was covered about one-and-a-half times. The present price of 114 cannot be called expensive for an investment of this class. The ordinary stock is a point up at  $82\frac{1}{2}$ . The dividend on this stock, which is paid once a year, is due for declaration early next month.

#### **Brush Electrical**

The Brush Electrical Engineering Company held its annual meeting to-day, Tuesday, and the report already published showed that there had been an increase in the tax provision from £25,000 to £93,000. The advance in trading profit of £47,500 is thereby more than swallowed up, but the dividend, as previously announced, was advanced from 8 per cent. to 9 per cent. and the surplus of current assets shown by the accounts is a little larger than that of a year ago. The company has formed an obsolescence reserve of £120,000 which is to be increased as opportunity offers. At 8s, 9d, the price is rather easier on sales by people who bought the shares and the option at lower prices and who are not averse from taking a good profit.

#### **Radio Shares**

Lively dealings take place daily in shares of the companies which after the war are expected to be amongst the foremost to develop television. The favourite shares at the moment are Philco. The price keeps firm at 14s. E.M.I. have been a quiet market, and the price is 6d. lower at 30s. 9d. E. K. Cole have extended their offer to acquire the outstanding Ensign Lamp shares to June 27th. Activity continues in Cossor shares, the price of which has come back to 25s. Pye deferred, usually slow to move, are better at 27s. 6d. 1.194

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### Electrical Specifications Recently Published

The numbers under which the specifications will be The numbers 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.

A LLMANNA Svenska Elektriska Aktie-bolaget, and T. Eek.—" Means for driving an electric generator on board a ship." 2781. March 3rd, 1942. (Convention date not granted.) (560862.) C. M. C. Armstrong.—" Boiler water level and like clarm or circrelling doubles and charm

and like alarm or signalling devices and steam trap controls." 16094. November 13th, 1942. (560960.)

Automatic Telephone & Electric Co., Ltd., and P. N. Roseby.—" Electrical signalling systems." 14891. October 23rd, 1942. (560943.)

British Thomson-Houston Co., Ltd.-"Electric valve circuits for interchanging power between alternating current and direct current circuits." 10147/42. July 22nd, 1941. (560901.) "Laminated insulating material." 6159/42. May 7th, 1941. (560983.) Privide Thompson Houston Co. Ltd.

British Thomson-Houston Co., Ltd., and V. E. Milward.—" Sweep circuits for cathode-ray tubes." 13996. October 30th, 1941. (560894.)

(560894.)
R. Collier, and Arcolectric (Twickenham), Ltd.—"Snap-action electric switches." 868.
January 18th, 1943. (561004.)
G. H. Crook.—" Electric signalling inter-locking systems, with particular application to railways." 14588. October 19th, 1942. (560989.)
P. P. Eckersley.—" Secret signalling systems."
15839. October 29th, 1940. (560923.)
P. P. Eckersley and R. E. H. Carpenter.— " Electrical signalling systems." Cognate applications 18126/40 and 16253/41. December 24th, 1940. (560925.)
" Electric signalling systems." 10215. July 21st, 1942. (560930.)
English Electric Co., Ltd., J. A. Fraser and

English Electric Co., Ltd., J. A. Fraser and R. W. Humm.—"Electric fires." 9974. July 17th, 1942. (560900.) "Electric fires." 16214/43. July 17th, 1942. (Divided out of 560900.) (560921.)

(560921.) Ferranti, Ltd., and E. D. T. Norris.— "Electromagnetic alternating current appar-atus." 18097. December 21st, 1942. (560972.) D. Gardner.—"Electric furnaces." 13293/42.
April 4th, 1942. (560932.) B. Hinks.—"Electromagnetic switches." 14654. October 20th, 1942. (560871.) A. H. Hunt, Ltd., and R. A. Grouse.— "Manufacture of electric condensers." 14927. October 23rd, 1942. (560946.) Igranic Electric Co., Ltd.—"Electrical illum-ination control systems." 16448/42. November 26th 1941. (560988.)

26th, 1941. (560998.) C. P. Johnson, J. J. V. Loustalan, and Tele-graph Condenser Co., Ltd.—"Electric ter-minals." 16134. November 14th, 1942. (560961.)

R A Lister & Co., Ltd., and W. M. Harrison. —"Voltage regulators for use with alternating current generators." 15655. November 5th, 1942. (560884.)

Marconi's Wireless Telegraph Co., Ltd.-"Television transmitting tubes." 12097/42.

January 29th, 1941. (560904.) "Electron dis-charge device." October 30th, 1941. (560959.)

Marconi's Wireless Telegraph Co., Ltd., and N. H. Clough.—" Protecting arrangements for thermionic valve circuits." 12801. September 10th, 1942. (560906.)

Mond Nickel Co., Ltd.—" Welding rods." 14791/42. October 28th, 1941. (560957.) Murphy Radio, Ltd., and P. C. Cullen.— " Superheterodyne receivers for telegraphy and telephony." 15388. November 2nd, 1942. (560880.)

G. R. Shepherd (Westinghouse Electric International Co.).—" Method of and apparatus for converting thermal energy into mechanical or electrical energy.", 15621. November 5th, 1942. (560883.)

Siemens Bros. & Co., Ltd., and D. A. Christian.—" Apparatus involving the electrical measurement of an elapsed time interval." 16378. November 19th, 1942. (560887.) "Repetition of electrical impulses." 19631/43. November 19th, 1942. (Divided out of 560887). (560891.)

S. J. Smith.—" Electrical measuring or indi-cating systems." 14663. October 20th, 1942. (560872.)

P. A. Sporing and Telegraph Condenser Co., Ltd.—" Electrical condensers." 1059. January 21st, 1943. (560977.)

Standard Telephones & Cables, Ltd., and J. Handley.—" Machines for manufacturing soldered parts." 14893. October 23rd, 1942. (560944.)

Standard Telephones & Cables, Ltd., and G. C. Hartley.—" Automatic telecommunica-tion exchange systems." 14804. October 22nd, 1942. (560936.)

A. V. Tomlinson (Union Switch & Signal Co.).
"Electrical relays." 14615. October 19th,
(560870.) "Electrical dry rectifiers."
1681. October 20th, 1942. (560873.)
G. W. Walton.—"Systems of apparatus for 1942. 14681.

determining or transmitting variable mag-nitudes." 11290. September 3rd, 1941. (560928.) "Generators, detectors and repeaters of ultra-short electromagnetic waves." Cognate appli-cations 27995/39 and 30567/39. October 16th, 1939. (560982.)

Westinghouse Brake & Signal Co., Ltd., L. E. Thompson and A. Jenkins.—" Alternating electric current rectifiers of the selenium type. 14611. October 19th, 1942. (560869.)

Westinghouse Electric International Co.-

"Overload responsive electric circuit-breakers." 14792/42. October 21st, 1941. (560916.) H. K. Whitehorn.—" Gun of electrical pro-jector type." 6314. August 1st, 1942. (560896.)

#### **Peruvian Electrical Imports**

SUBSTANTIAL increase in imports into Peru of electrical apparatus occurred during the December, 1943, quarter. The total was 4,826,000 soles, against 2,436,000 soles in the corresponding period of 1942 ( $\pounds 1 = 26$  soles, approximately.)

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# **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

Australia.-COMMONWEALTH.- P.M.G's Department. May 30th. Automatic telephone switching equipment (2,000 type), Sch. C.4349. July 4th. Plugs, Sch. C.4372. July 6th. B.P.O. uniselector maintenance parts, Sch. C.4336.

New Zealand.—Auckland City Council. Sep-tember 14th. Two crematorium furnaces.

Salford.-Electricity Department. May 31st. Street lighting standards (36), steel or concrete. (See this issue.)

North - West Midlands. — Joint Electricity Authority. July 25th. Circulating water pumps and pump house. (See this issue.)

#### **Orders** Placed

Australia.—New SOUTH WALES.—Public Works Department. Accepted. Steam raising plant for extension "D" at Port Kembla power station (£59,201).—International Combustion (A'sia), Ltd. VICTORIA.—Department of Public Instruction. Accepted. One 50-kVA three-phase alternator, Stawell Technical School (£120).—British G.E.C. Cardig. Health Compittee Accepted Very

Cardiff.—Health Committee. Accepted. X-ray equipment (£1,622) .--- Watsons.

Electricity Committee. Accepted. Morrison electric van (£568).—W. Lewis & Sons. Hospital Committee. Accepted. Electric battery renewal and repairs (£211).—Tudor Accumulator Co.

Cheshire.—Emergency Committee. Accepted. Six 1-kW fires (18s. 8d. each) and twenty-four 2-kW fires at (30s. 8d. each)-Belling & Co.

Durham.—County Council. Accepted. Elec-tric washing machine for the County Maternity Home at Bishop Auckland (£235).—T. Bradford & Co.

Lighting Co... Electrical Glasgow.—Corporation mittee. Accepted. Annual stores. fittings and accessories.—British Electrical & Manufacturing Co. (six months) and Holland House Electrical Co. (six months).

Transport Committee. Accepted. Overhead electric travelling cranes for car works.—Clyde Crane & Engineering Co. (£5,434). Gear wheels.—Metropolitan-Vickers (£1,850); British Thomson-Houston Co. (£1,850).

London.-ST. PANCRAS.-Contracts Committee. Accepted. Battery for Garrett electric vehicle (£174)—Britannia Batteries; Switch-gear.—A. Reyrolle & Co. (£147); W. Lucy & Co. (£189).

Newcastle-on-Tyne.-City Council. Accepted. Two shadowless lamps for the Newcastle-on-Tyne General Hospital (£190).—Kelvin, Bottomley & Baird.

Warwickshire .--- Health Committee. Accepted. Electrical work at Warwick Hospital (£136).— Midland Electric Light & Power Co. Electrical installation at Solihull Hospital extension (£941).—France's Electric, Ltd.

### **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.

Bootle.—Extensions at the Technical College (£10,124); borough engineer.

Cumberland.—Maternity home at Penrith; county architect, 4, Alfred Street North, Carlisle.

Gateshead.—Alterations to the police build-ings, including new electrical installation (£1,060); and alterations to the Central Transport Depot (£2,000); borough engineer.

Goole.-Fire station (£6,000); Chief Regional Officer. N.F.S.

Hampshire.—County office extensions, Win-chester (£10,000); county architect.

Hebburn-on-Tyne.-Extensions to offices, Palmers, Hebburn, Co., Ltd.; Cackett, Burns Dick & McKellar, Ellison Place, Newcastle-on-Tyne.

Kent.—Four huts for technical institute and day technical schools, Canterbury, and canteen at Beaver Road School, Ashford; county architect, Maidstone.

Lancashire.—School canteen, Penwortham (£3,708); P. A. Baines & Son, Ltd., builders, Ribble Saw Mills, Preston.

Lancaster.—Houses (£20,000); C. B. C. Storey, Westfield Memorial Village, Lancaster.

Leicestershire.—Additional school canteens (£2,800) and enlargement of Glen Hills Council School; county architect, Leicester.

Liverpool.—Eight-storey block of flats for Housing Committee; L. H. Keay, city architect, Municipal Buildings, Dale Street, Liverpool, 2.

Loughborough.---Gymnasium, Loughborough College (£12,000); education architect, Leicester.

Newcastle-on-Tyne.—Alterations and addi-tions to buildings at the Walker Hospital and the General Hospital to provide canteens; R. G. Roberts, city architect, 18, Cloth Market.

Nursery, Cruddas recreation ground for the City Council (£4,000); E. Jeffcock, builder, Newburn-on-Tyne.

Northamptonshire.—Extensions, London Road Hospital, Kettering; county architect.

Northumberland.-Ante-natal and post-natal hostel and residential nursery (£6,000); county architect, County Hall, Newcastle-on-Tyne.

Nottinghamshire. — Five school kitchens  $(\pounds7,625)$ , hutments for defectives at Carlton  $(\pounds7,400)$ , extensions to County Institution, Mansfield  $(\pounds3,825)$ , and additions to Worksop Technical College  $(\pounds1,200)$ ; county architect.

Sunderland.—Installation of electric lighting, fittings, etc., at Valley Road School; Education Committee Architect, 2, Mowbray Villas, Sunderland

Swansea.—Proposed T.B. Hospital for the Council of the King Edward VII Welsh National Memorial Association; P. Thomas, president of the Royal Institute of British Architects.

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Wan song They say that when the swan sings it is about to die. Our swan (which the artist has tricked up out of a Spire fixing) heralds the demise of the millions of nuts and washers that it

replaces. Spire fixings take many forms. They do the job of a nut and washer, but they do it with more efficiency and less effort on the part of the operator. Many Spire fixings are integral with the component that is to be fixed so that no nut or washer at all is needed. The Spire 'idea' is



not restricted to 'nut and bolt' assemblies. Whenever there is a fixing, clamping, holding job to do there is a chance that Spire could help you. So if you will tell us your immediate assembly problem — we shall gladly design yet another. It may not be as elegant as the Swan but it will do a job of work reducing your assembly time and saving material and cost for you.

#### That's FIXED That!

Here's a little chap in action. Reference No. NU 531. Its uses are legion. Wherever there is blind assembly work, wherever your operatives are fumbling with nuts and washers the NU 531 will save time and cost and a lot of bad temper. Clip it into position and it stays 'put' until you are ready to tighten up the screw. No washer needed of course.



#### **★** A BETTER way of fixing

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



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# BRUSE LJUNGSTRÖM *TURBO-GENERATORS*



## ALTERNATOR VENTILATION

- Closed Circuit System with Integral Ventilation.
   Modern Aerodynamic Principles embodied in self-contained Fans.
   Distributed Short Length Air Paths.
   Air Flow direct to Cooler supported by Stator Frame.
- Foundation Arrangements Eliminated.



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ELECTRICAL REVIEW

May 19, 1944





The illustration shows a Hick Hargreaves Low Level jet type Condensing Plant with "Hivac" Ejector and split casing Extraction Pump working in conjunction with a 5,000 kW. Turbo-Alternator.

Types and all AUXILIARY EQUIPMENT from Turbine Flange to Boiler Check Valves



This photograph shows a group of grey and high duty alloy iron castings produced in our foundry and includes a number we supply to well-known electrical gear manufacturers. We have every modern facility for producing light precision castings for the electrical trade, and shall be pleased to quote for your requirements on receipt of drawings and/or samples.

CASTINGS FOR THE ELECTRICAL

Newman, Hender & Co. Ltd

ELECTRICAL REVIEW

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Ltd

Readers of the article "OCCLUDED GASES" in the March 17th issue of "Electrical Review" were told that

AMMONIA in make-up water

can cause

# BOILER CORROSION

They may not know that PERMUTIT'S

# **"DEMINROLIT"**

## PROCESS

is in use for Ammonia Removal at large generating stations in this country.

Full particulars on application to The Permutit Company Ltd., Water Treatment Engineers, Permutit House, Gunnersbury Avenue, W.4, (Telephone : Chiswick 6431) ELECTRICAL REVIEW

"MIRRLEES-GILL" AXIAL-FLOW

May 19, 1944

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PUMPS for CONDENSER CIRCULATING LAND DRAINAGE DRY DOCK PUMPING FLOW BOOSTING STORM WATER PUMPING SEWAGE IRRIGATION PAPER PULP CIRCULATING AND MIXING VERTICAL SUBMERGED TYPE HORIZONTAL SPLIT-CASING TYPE VERTICAL SUBMERGED

> TYPE 150 Tons of water per min. for Land Drainage

> > GLASGOW

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ENGINEERS

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May 19, 1944



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# communications

It took many, many weeks for the news of Nelson's Battle of the Nile to reach this country. To-day—imagine a world without telegraphic and telephonic communication, whereby news is flashed from one side of the earth to the other in a split second. It is all a matter of smooth working in the various constituents of the whole.

#### \* \* \* \* \*

In the field of improved electrical communications," Walsall" has played no small part in smoothing the way for cables through the "snag"—free smooth interior of "Walsall" Conduits and through Conduit Fittings with bushed entries over which cables can be drawn without risk of abrasion.

WOLSALL CONDUITS LTD-WEST BROMWICH-STA

Improved communications ? Decidedly !

# STRICT CONTROL OF

THE RHEOSTATIC COMPANY LIMITED SLOUGH TELEPHONE: SLOUGH, 23311/6. TELEGRAMS: RESISTANCE, SLOUGH



# SIMPLICITY which is perfection

Without recourse to springs, wedges or similar secondary aids Slydlok interlocking contacts and terminals are longitudinally self-aligning and cannot be disengaged by vibration or concussion. Hence their widespread adoption by the Forces for use on land, in the air, under and on the sea where continuous tremors or sudden convulsion are normal conditions of service.



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May 19, 1944

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England HQ IN THE HEART OF BEDFORDSHIRE JOHN BUNYANS COTTAGE, ELSTOW VILLAGE, BEDFORD

Atlantic

Charter

HE Atlantic Charter is the foundation upon which the hands and mind of man will again be free to create and build in the World of Peace, bringing almost unbelievable visions of new opportunities, new markets and trade development.

When peace returns, the resources of W. H. Allen, Sons & Co. Ltd. will again be directed to world-wide business with friends, old and new, in full harmony with the spirit of the famous Charter. Then, the full range of Allen products and the latest technical progress in the design and application of power generating plant and pumping machinery will be available to all concerned with reconstruction and development schemes in any part of the world (

M.H. Allen, Sons & Co., Itd., Bedford, England.

O SHIP OF STATE! Sail on. O Union strong and great! Humanity with all its fears. With all the hopes offuture years. Is hanging breathless on thy fate!

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ELECTRICAL REVIEW

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May 19, 1944



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Corrosion is a ruthless enemy. It attacks constantly, viciously, unceasingly.

Wire and Wire Ropes are victims of its venom. Nothing can exterminate it. It will remain a tremendous opposing force for all time. But—



- the last word in Galvanizing, provides the strongest possible defence against corrosion.

### **BRITISH ROPES LIMITED**

HEAD OFFICE : DONCASTER OFFICES AND WORKS THROUGHOUT CREAT BRITAIN



MODUFACIURERS OF WIRE WIRE ROPES & MEMP CORDAGE



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H ING CH RA This illustration shows W. & G. Lampholders, one of many types of lampholders supplied with and without porcelain interiors. A wide and comprehensive range of electrical accessories is available to consumers for National

> Catalogue BH1039, sent on request, gives fuil details.

Service.

WARD& GOLDSTONE LTD. PENDLETON, MANCHESTER. 6.

As pioneers of this type of motor we have supplied over 3,000 machines to one customer alone

HIGH EFFICIENCY TOTALLY ENCLOSED Surface Cooled type from 1 to 150 H.P. PNONE: CROSSHULLS 200 (2Lines) GRAMS: GREEN-CROSSHULLS 200 ELECTRICAL REVIEW

May 19, 1944

"We've bought this for you, Sir!"



Little stampings and pressings for electrical, radio and engineering use.

ELOUVERSONS STON, BIRMINGHAM,



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### Electrical Review, May 19, 1944

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exhaustive tests such as are indicated by these oscillographs ...

PROVED BEYOND DOUBT. B.E.T. Current

Transformers are designed to withstand specified short-circuit

**British Electric Transformer Company Limited** 

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May 19, 1944

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CITY TUBE AND CONDUIT MILLS SMETHWICK, BIRMINGHAM Telephone Smethwak 1511 (5 Ines) London T0 Finsbury Pavement, E.C.2 Liverepool Caledonian Buildings 14 Tithebarn St. 2

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ELECTRICAL REVIEW

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A STEMENS QUALITY PRODUCT

Advi. of STEMENS ELECTRIC LAMPS AND SUPPLIES LIMITED.

38/39 Upper Thames Street London. E.C.4 Branches at Belfast. Birmingham, Belstol, Cardill, Dublin, Glasgow, Leeds, iirecroaol. Munchester, Newcastle-on-Tyne. Rottingham, Sheffield

THERMOPLASTIC



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May 19, 1944



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ELECTRICAL REVIEW

A useful range of Panel type Units is described in Catalogue W.O.I. This includes Wedge type H.R.C. Cartridge Fuses in Porcelain Carriers, Wedge type Links with or without Porcelain Carriers, all of which are available for front or back connection, with or without bases.

FUSE & LINK

UNITS

PANEL MOUNTING

The illustrations show a front connected unit fitted with a wedge type link (an left) and a back connected unit with H.R.C. cartridge fuse in porcelain carrier (an right)

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WT.HENLEY'S TELEGRAPH WORKS CO. LTD. MILTON COURT. WESTCOTT. DDRKING. SURRE



IGRAVIIC Electric Control Gear

Equip your electrically driven machines with the "right" control gear — IGRANIC, which will give positive protection to motor and machine and keep them working to secure maximum production.

> Illustration shows IGRANIC Contactor Panel for control of Travel motion of 6-ton Slab Charger for Steel Mill.

IGRANIC ELECTRIC CºL™ BEDFORD & LONDON

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ELECTRICAL REVIEW May 19, 1944 60 Unst use Hidwel 5+6 Higher Conductivity Greater strength hon-magnetic LAN 7 FS LANGLEY ALLOYS LTD. LANGLEY BUCKS WINDING THE LARGEST BUYERS OF 11 of all types, Armatures, Transformers, HEATING ELEMENTS BUY FROM Coils, etc. Priority contracts wanted. 10 Also electrical assembly and instru-Vireohms Ltd. 把 ment wiring. "REWINDS" PEASHILL ROAD Electrical Engineers and Manufacturers NOTTINGHAM 37 ST. JOHN'S HILL WHO SUPPLY ALL TYPES OF ELECTRIC BATTERSEA, LONDON, S.W.II ELEMENTS FOR MANUFACTURERS **BATtersea** 2283 ROMLEY-LANGTO MATERIALS, WORKPEOPLE DIRECTORS & MANAGEMENT, All British CAPITAL VARNISHED COTTON HIGH-GRADE TUBING - INSULATED INSULATING & FLEXIBLES ELECTRICAL WIRES THE BROMLEY-LANGTON ELECTRIC WIRE & INSULATOR CO. LTD. BUCKS. TRADING ESTATE SLOUGH

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ELECTRICAL REVIEW

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The IDEAL CONTROL nt ELECTRIC FURNACES ELECTROPLATING PLANTS X-RAY EQUIPMENTS SUPPLY SYSTEMS TESTING PLANTS **RECTIFIERS** FOR HAND OPERATION REMOTE CONTROL AUTOMATIC CONTROL The »BRECO« ON LOAD VOLTAGE REGULATOR WITH STEPLESS REGULATION BRENTFORD TRANSFORMERS LTD MIDDX BRENTFORD STRONG RELIABLE BEST QUALITY FINLAYSONS bled Quali cing Three

FINLAYSON BOUSFIELD & GO. LTD., JONNSTONE, SCOTLAND.

ELECTRICAL REVIEW

May 19, 1944



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Our standard products, the result of nearly 70 years' experience in the electrical industry, are the basis of successful transmission, transformation and control of electricity.

Our engineers and designers will gladly co-operate with you.

WE MANUFACTURE : CABLES-RUBBER AND THERMOPLASTIC. PAPER INSULATED UP TO 66 kV.

CABLE BOXES and ACCESSORIES, SWITCHGEAR, TRANS-FORMERS, STATIC CONDENSERS, OVERHEAD LINE MATERIAL, INSTRUMENTS, A.C. WELDING EQUIPMENT, "CHARLTON" ELECTRIC WATER HEATERS

JOHNSON & PHILLIPS LTD., CHARLTON, LONDON, S.E.7 Telephone : Greenwich 3244 (13 lines). Telegrams : "Juno," Charlton, Kent

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WINNER!

is the opinion of the resident engineer of an important Electricity undertaking, contained in a letter we have just received.

"We must congratulate you on turning out a very sound job ... personally we have not met a Well Glass Fitting, even at double the price, which would appear to possess the characteristics of your sample submitted."

This is typical of its general reception ; have you tried it yet ?

No steel authorisation required.

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Issued by Rowlands Electrical Accessories Ltd., R.E.A.L. Works, BIRMINGHAM 18

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May 19.

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# LUNNULLIJ WAR EMERGENCY LIMPET ADHESIVE TAPE

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To meet the shortage of rubber we have temporarily ceased manufacture of the famous "Blackley," "Limpet" and "Jockey" tapes and in their place is introduced a "War Emergency Limpet" tape, which will meet all the exacting requirements of B.S.S. 1078-42 consistent with the lowest possible consumption of rubber.

This tape represents the highest quality which can now be manufactured. It is sold only on a yardage basis in  $\frac{1}{2}^{*}$ ,  $\frac{3}{4}^{*}$  and 1° widths, in rolls of 50-yds., 25-yds. and 10-yds.

We shall be pleased to furnish prices, technical data, etc., on application.

CONNOLLY'S (BLACKLEY) LTD., MANCHESTER 9 Telegrama : "Connollys, Blackley." London Office : OSWALDESTRE HOUSE, STRAND, W.C.2 Telegrama : "Syllonoc, Estrand, London."

We have over 25 years' experience



in designing and manufacturing a very varied range of Small Electric Motors, Alternators, Generators and Electro-Mechanical apparatus. Our products are known throughout the world for reliability and stability under the most exacting conditions. In addition to producing special designs in quantity at competitive prices, we are interested in your experimental needs. As soon as they are released from the claims of war production our research and design laboratory together with our manufacturing resources will be at your disposal.

BECKENHAM, KENT

Write for particulars of any special type of apparatus that interests you; we will forward details and literature when available

SMALL ELECTRIC MOTORS LTD.

A subsidiary of

BROADCAST RELAY SERVICE LTD.



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The G.E.C. are specialists in valves and other electronic devices which find many applications in industry and scientific research.

The following are a few of the classes of electronic tube which have already found their place in industry.

#### VACUUM AMPLIFYING VALVES

For all cases in which the amplification of small voltages is required, with continuous control of amplification ov r a wide mane of frequencies.

As self oscillators for generation of high frequency voltage and power

#### VACUUM RECTIFIERS

For Extra High Tension Voltages in cable and condenser testing, etc.



For power rectingation at medium and high voltages. For radio irequency detection

In peak volumeters.

#### HOT CATHODE MERCURY VAPOUR RECTIFIERS

For high current received outputs in radio transmitters and power circuits.

#### GASFILLED RELAYS (THYRATRONS)

For trigger controls and various industrial research work. Used where an instantaneous release of power is required from a low voltage source.

#### PHOTO CELLS

Vacuum or gasfilled-with various characteristics both in applied voltages and colour response.

#### ELECTROMETER VALVES

Used in conjunction with glass electrode for pH determination.

#### CATHODE RAY TUBES

For acoustic tests, sound and waveform analysis, pressure indication, chemical analysis, educational demonstrations, monitoring, isboratory instruments, electro-medical and biological investigation, navigation axis, etc.

Acres, of The General Electric Co. Ltd., Magnet House, Kingston, London, W.C.2

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ELECTRICAL REVIEW

(Supplement) 67

#### .....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, For Whitsun see notice below.)

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 beading 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, Stam-ford Street, London, S.E.I. Cheques and Postal Orders should be made payable to ELECTRICAL REVIEW LTD, and crossed **REVIEW LTD.** and crossed.

Original testimonials should not be sent with applications for employment.

## WHITSUN

Classified Advertisements for our issue of June 2 should reach us by first post on FRIDAY, May 26

#### OFFICIAL NOTICES TENDERS, ETC.

# NORTH-WEST MIDLANDS JOINT ELECTRICITY AUTHORITY

#### Tender for Circulating Water Pumps

THE North-West Midlands Joint Electricity Authority invite tenders for the supply, delivery and erection of :

Circulating Water Pumps and Pump House Equipment (Form of Tender No. F.138).

One copy of the specification may be obtained from the Consulting Engineers. Messrs. Merz & McLellan, 32, Vic-toria Street, London, S.W.1, on or after the 19th May. 1944, on payment of a fee of £5 35.

Additional copies of the Specification may be obtained from the Consulting Engineers on payment of \$2 2s. for each additional copy.

Sums paid on any number of copies up to four will be refunded on receipt of a bona fide tender.

remoted on receipt of a bona had render. Sealed tenders, with all relative documents endorsed with the appropriate title of the Specification, must be delivered in triplicate, in plain envelope with no mark disclosing the identity of the sender, to the Clerk to the North-West Midlands Joint Electricity Authority, Towo Hall, Stoke-on-Trent, not later than Tuesday, 25th July, 1944. The Authority does not bind itself to accept the lowest

or any tender.

or any tender. Prospective tenderers are requested to note that it is the intention of the North-West Midlands Joint Electricity Authority to place Contracts for the equipment covered by the above Specification as soon as possible so that design and drawing office work can be completed, which will enable manufacture to be commenced as soon as the British Government Control Authorities decide that manu-facturing capacity is available. 140

#### CITY OF SALFORD

#### **Electricity** Department

TENDERS are invited, by first post Wednesday, 31st May, 1944, for the supply and delivery of 36 steel street lighting standards or alternatively 36 concrete street lighting standards.

Further particulars can be obtained on application to the City Electrical Engineer, Frederick Boad, Salford, 6.

H. H. TOMSON Town Clerk. 148

#### SITUATIONS VACANT

None of the vacancies for soomen advertised in these comme of the contaction for wooten anternoed in the common (a) has living with her a child of hers under the woman (a) has living with her a child of hers under the ade of 14, or (b) is registered under the Bland Persons Acks, or (c) has a Ministry of Labour permit to allow her to obtain employment by individual effort.

#### COUNTY BORDUGH OF CROYDON

#### **Electricity** Department

#### Distribution Superintendent

A PPLICATIONS are invited for the appointment of Distribution Superintendent. Applicants must be Corporate Members of the Institution of Electrical Engineers and/cr hold a University Engineering Degree: have a sound engineering training: have practical experi-ence in the planning, construction and maintenance of 38-kV, 66-kV, and L.T. mains and substations, and of the administrative duties connected with a large Under tabing. taking.

taking. The salary will be £750 per annum, rising by two annual increments of £25 to £800 per annum, plus war bonus—at present, £33 16s, per annum. Form c1 application obtainable from Mr. F. N. Rendell-Baker, M. I. E. E., Chief Engineer and General Manager, "Electric House." Wellesley Road, Crcydon, and appli-cations, endorsed "Distribution Superintendent," should reach me by Wednesday, the 31st Mar, 1944. Canvassing, directly or indirectly, will disqualify. Distribution Superintendent.

E. TABERNER Town Clerk.

Town Hall, Croydon.

147

## WIGAN AND DISTRICT MINING AND TECHNICAL COLLEGE

THE Governing Body invites applications for a post as LECTURER IN ELECTRICAL ENGINEERENG Duties to commence 1st September, 1944. Candidates should hold a good honours degree in Electrical Engineer-

should hold a good honours degree in industry and in teaching. Salary in accordance with Burnham Technical Scale. Bonus in accordance with Soulbury award. Further particulars and application form will be sent by the undersigned on receipt of a stamped addressed foolscap envelope. Applications should be sent in as soon as possible, and in any case not later than 25th May, 1944.

8th May, 1944.

J. F. S. ROSS, Principal and Clerk to the Governing Body.

A N Electrical Contractor's Manager required by Eastern A N Electrical Contractor's Manager required by Eastern Counties firm at present engaged on work of national importance. Most be a "live," capable man with sound hnowledge estimating, buying, labour control and op-to-date business methods. Permanent post with excellent post-war prospects. Replies treated in strict confidence. State experience, age and commencing salary.-Box 5941, c/n The Electrical Review. CABLES. Prominent C.M.A. firm require experienced CableS. Prominent C.M.A. firm require experienced and salary required.-Box 113, c/o The Electrical Review.

CLERK wanted by well-known electric motor repair firm in South London. Good salary and prospects to live and intelligent man.—Box 143, c/o The Electrical

to live and interingent many Review. DEPARTMENT Manager required for London works manufacturing electrical instruments, capable of taking control, planning and research; state technical qualifications, experience, age and salary required.—Box 124, c/o The Electrical Review. FLECTRICAL Contractors in Leeds require experienced Storekeeper. Must be fully conversant with all types

ELECTRICAL Contractors in Leeds require experienced of electrical installation materials and be capable of organising receipt and despatch of such materials for large contracts. Excellent post-war prospects for right man with initiative. Reply, giving full details of age, experience and salary required, to—Box 142, c/o The Electrical Paniear

with militative. Reply, giving full details of age, experience and salary required. to—Box 142. c/o The Electrical Review.
 ELECTRICAL Contractors, with head office in London, opening branch in Glasgow, require Area Manager, with knowledge of all classes of power and lighting installations, preferably with connection in Scotland. Details of experience, age and remuneration, in confidence, to—Box 117, c/o The Electrical Review.
 ELECTRICAL Engineers (London) require Man for opening branch be able to type. Discharged soldier or exempt.—Rox 5866, c/o The Electrical Review.
 ELECTRICAL Manufacturers require Lighting Representatives for Scotland, North-East Coast, Yorkshire, West Country with South Wales. London. Electrical and ighting knowledge desirable. Ex-Service men preferred, age limit 36. Reasonable remuneration with sound postwar prospects. Details of deucation, areas known. National Service position, and if car driver, to—Box 4986, c/o The Electrical Review.
 ELECTRICAL Wholesalers require a Clerical Assistant. Conversant with trade and materials as handled.—Box 24, c/o The Electrical Review.
 MEMALE Assistants required for the supervision of interesting statistical and technical work in an Electric Lamp Factory. At least secondary education and fair aptitude for simple calculations and record keeping desirable. Fermanent and progressive positions with good post-war prospects are offered, but temporary services of really suitable applicants will be considered. Apply at once for particulars to—Crystel Limits. Applicants should not see flags of the segment of the segmen

NSPECTOR required to take charge of inspection and **I**NSPECTOR required to take charge of inspection and quality control in works producing specialised elec-trical components. Knowledge of electric motor manufac-ture preferred, experienced A.I. D. procedure. Permaencey to right man.—Box 146, c/o The Electrical Review. **TUNIOR** Clerical Assistant, male or female, required in **U** buyer's office for chasing deliveries, knowledge of electrical material would help. Write, stating age, salary, etc.—Box 123, c/o The Electrical Review. **TUNIOR** Clerk compared to relectrical contractors' office

JUNIOR Clerk required for electrical contractors' office Good prospects and wages. Reply in confidence to-The Secretary, Johnson & Tanner Ltd., Worcester Park urre

Let Storter, 5682 Letter, 568

**REPRESENTATIVE** with connection shipbuilders, engineers, etc., to sell welding cables and flexibles. Excellent commission.—Box 5890, c/o The Electrical Review.

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