THE

ELECTRICIAN

THE TECHNICAL NEWSPAPER OF THE ELECTRICAL INDUSTRY

JUNE 13 1947
SIXPENCE

The switches of the modern inter-communication loudspeaker telephone must be capable of withstanding constant use in the busy office of to-day.

A.B. Metal Products ensure the dependability of their switches by means of low contact resistance, self-cleaning contacts and the "Finger Touch Operation" embodied in their design.

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INDEX TO ADVERTISERS IN THIS ISSUE

The New KANGO "S" TYPE HAMMER

The new "S" Type Kango Hammer has been introduced to fill an essential need for a light, handy, yet powerful hammer designed to stand up to hard and continuous work within its very useful capacity.

A most important feature of this new "S" type hammer is that owing to its light weight it can be used for all ceiling work where the much heavier hammers are outside the physical capabilities of the workman to operate, furthermore its use will, in the majority of cases, dispense with the elaborate staging that the work usually entails.

SPECIFICATION

Length	19 inches
Weight	12 lbs.
Number of blows	1,550 per min.

Drilling in Concrete, Depth 2".

No. 6	12 Secs.	No. 12	23 Secs.
No. 8	18 "	No. 14	26 "
No. 10	21 "	No. 16	30 "
		No. 18	32 Secs.

The current consumption of the "S" type is less than 360 watts.

For heavier work, either the Kango C or D type Hammers, of which we have good stocks, are recommended.

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MISCELLANEOUS ADVERTISEMENTS

TENDERS

CITY AND COUNTY BOROUGH OF BELFAST.
ELECTRICITY DEPARTMENT.

TENDERS are invited for the Supply, Delivery and Erection of:—

Mercury Arc Rectifier Equipments.

Specification (No. G.82) and Form of Tender may be obtained from the City Electrical Engineer and General Manager, East Bridge Street, Belfast, on deposit of two guineas. (Cheque to be made payable to the Belfast Corporation Electricity Department.) This deposit will be refunded provided a bona fide tender has been sent in and not withdrawn. Extra copies may be obtained at one guinea each, which sums will not be returnable.

Sealed tenders, endorsed with the name and address of the firm tendering, and marked "Electricity Department, Tender for Mercury Arc Rectifier Equipments," must be lodged with the undersigned not later than 4 p.m. on Friday, 27th June, 1947.

The lowest or any tender will not necessarily be accepted.

An official receipt must be obtained for every tender delivered by hand. Tenders sent by post should be registered.

JOHN DUNLOP,
Town Clerk.

City Hall,
BELFAST.
4th June, 1947.

SITUATIONS VACANT

MUNICIPALITY OF SINGAPORE.
ELECTRICITY DEPARTMENT.

Assistant Meter Superintendent.

THE Municipal Commissioners of Singapore invite applications for the appointment of Assistant Meter Superintendent on the permanent staff of the Electricity Department, the appointment to be in the first instance on a three years' agreement.

Applicants should be graduates of the Institution of Electrical Engineers or have equivalent qualifications and should be fully conversant with the fixing, testing and maintenance of all types of Direct and Alternating Current (single and polyphase) meters, sub-standards, protective systems and the testing and maintenance of operative and protective gear.

The selected candidate must pass a medical examination.

Initial salary $440 to $500 a month according to age and experience for the first year of agreement and rising thereafter during agreement (and if service be continued) by annual increments to a maximum of $600 a month (plus Cost of Living Allowance of $115 a month to a single applicant and $170 a month to a married applicant at present—based on salary of $440 a month). The dollar is equivalent to 2s. 4d.

Free passage will be provided with half salary during the voyage to Singapore.

Eight months' leave with full pay is normally granted after four years' service. A Provident Fund is operated by the Municipal Commissioners.

Applications stating age, birthplace, whether married or single, giving details of education, qualifications, training and experience, accompanied by copies of three recent testimonials, must be lodged with Messrs. Peirce and Williams, No. 1, Victoria Street, London, S.W.1 (Agents to the Municipal Commissioners), not later than 7th July, 1947.

EXPERIENCED Drawing Office Personnel for automobile and aircraft electrical wiring systems, cable assemblies, junction boxes, terminations.—Ward & Goldstone Ltd., Sampson Works, Frederick Road, Manchester 6.

SITUATIONS VACANT

CITY AND COUNTY BOROUGH OF BELFAST.
ELECTRICITY DEPARTMENT.

APPLICATIONS are invited for the following positions:—

(a) Chief Technical Assistant.

Applicants must have a sound engineering training, have a University degree in Electrical Engineering, and be Corporate Members of the Institution of Electrical Engineers, and have experience in the design and layout of modern generating stations, electrical transmission and distribution systems. They must not be more than 40 years of age on 1st July, 1947.

The salary for the position is in accordance with Grade 3, Class J, of the National Joint Board Schedule of Salaries for Technical Engineers on the staff of Authorised Undertakers. The scale is £785 for the first two years, £803 for the third and fourth years and £821 after the fourth year.

(b) Consumers' Engineer.

Applicants must have a sound engineering training and possess the Higher National Certificate in Electrical Engineering or be Corporate Members of the Institution of Electrical Engineers. They must not be more than 40 years of age on 1st July, 1947.

The salary for the position is in accordance with Grade 8a, Class J, of the National Joint Board Schedule of Salaries for Technical Engineers on the staff of Authorised Undertakers. The scale is £487 for the first two years, £499 for the third and fourth years, and £510 after the fourth year.

(c) Assistant Consumers' Engineer.

Applicants must have a sound engineering training and possess the Higher National Certificate in Electrical Engineering. They must not be more than 40 years of age on 1st July, 1947.

The salary for the position is in accordance with Grade 9a, Class J, of the National Joint Board Schedule of Salaries for Technical Engineers on the staff of Authorised Undertakers. The scale is £389 for the first two years, £398 for the third and fourth years, and £408 after the fourth year.

Preference will be given to ex-Service candidates possessing the required qualifications.

In computing applicants' ages for the purpose of the age qualification clause, any periods of war service in H.M. Forces will be deducted from applicants' actual ages, provided that this will not apply to applicants whose actual ages would be over 45 years on the date of taking up duty.

Applications must be made on official forms, which can be obtained from the City Electrical Engineer and General Manager, Electricity Department, East Bridge Street, Belfast, and, with copies of not more than three recent testimonials, should reach the Town Clerk, City Hall, Belfast, not later than 4 p.m. on Friday, 27th June, 1947.

Canvassing, oral or written, if proved to the satisfaction of the appointing authority, will disqualify.

JOHN DUNLOP,
City Hall, BELFAST. Town Clerk
4th June, 1947.

THE BRITISH ELECTRICAL AND ALLIED INDUSTRIES RESEARCH ASSOCIATION is requiring an ASSISTANT for its INFORMATION BUREAU at "Thorncroft Manor," Leatherhead, Surrey. Applicants should possess a good technical background, a working knowledge of French and German, and preferably have had previous experience in information or intelligence work. The post carries a salary of £450, plus cost of living bonus of £59 16s. (Males), and superannuation under the F.S.S.U. scheme. Applications should be addressed to the Director, B.E.A.I.R.A., 15, Savoy Street, London, W.C.2.

SITUATIONS VACANT

STOKE-ON-TRENT CORPORATION ELECTRICITY DEPARTMENT.

METER TESTERS (2) GRADE 1.

APPLICATIONS are invited for the appointment of two qualified Meter Testers. Applicants must be capable of testing single-phase, polyphase, and D.C. meters and also maximum demand indicators, and indicating and recording instruments.

The wages and conditions will be in accordance with the Agreement of the National Joint Industrial Council for the Electricity Supply Industry; wages at present £5 17s. 6d. gross per week of forty-seven hours. The appointments will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidates will be required to pass a medical examination.

Application form and further details may be obtained from the General Manager, Electricity Department, 31, Kingsway, Stoke-on-Trent. Completed applications must be returned in the envelopes provided so as to be received not later than Monday, 7th July, 1947.

HARRY TAYLOR, Town Clerk.

CAMBRIDGE UNIVERSITY.

ENGINEERING DEPARTMENT.

THE Vice-Chancellor gives notice that the Appointments Committee of the Faculty of Engineering intend to appoint several University Lecturers and University Demonstrators in Engineering. The appointments will be subject to the Statutes and Ordinances of the University. Further particulars and forms of application may be obtained from the Secretary of the Appointments Committee, Engineering Laboratory, Cambridge, to whom applications should be sent so as to reach him by Monday, 7th July, 1947.

IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY.

LECTURER in "Electronics" required in Electrical Engineering Department. Candidates must have experience of high vacuum work. Industrial experience is also desirable. Commencing salary £500 p.a. with Federated Superannuation. Applications with full details of qualifications to the Head of the Electrical Engineering Department, Imperial College, London, S.W.7.

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FLUORESCENT and Industrial Light Fittings with Protectafil Shock Absorber, Starter Switches, Chokes, Mains Transformers, Immersion Heaters, 1½ and 3 Gall. Storage Heaters, Door Chimes, Wood Switch Blocks, Fire Bars, Pear Switches, 2 way Light and Heat Adaptors, Batteries. Send for list. —J. E. Wildbore, 26, Marlborough Street, Oldham.

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METRO-VICK Mains transformers. New and Unused Ex Ministry of Supply. 4 K.V.A. Oil filled. Input 230 Volts, 50 Cycles. Output 18 000 Volts. Packed in Manufacturer's Crate. £15 carr. fwd 3½ K.V.A. Oil filled Input 230 Volts, 50 Cycles, Output 21 000 Volts. £15 carr. fwd. Substantial discounts can be given for quantity orders.—Wireless Instruments (Leeds) Ltd., 54-56, The Headrow, Leeds, 1. Tel. 22262.

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24—230 volt 1 phase 50 cycles Capacitor Start Motors with Condenser ⅛th h.p., 1 450 r.p.m. — Oldfield Engineering Company Limited, 96, East Ordsall Lane, Salford, 5.

400 VOLTS 3 phase 50 cycles Squirrel Cage Induction Motors, Flange Mounted, fitted with ball and roller bearings, screen protected type, 6 off.—Crom-Park, 2 h.p. 960 r.p.m. 4 off—E.E.C., 2 h.p., 960 r.p.m.—Oldfield Engineering Company Limited, 96, East Ordsall Lane, Salford, 5.

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SACKS and Bags in excellent condition for all commodities, as low as 4½d. each. Write: John Braydon Ltd., 230, Tottenham Court Road, W.1. Tel. No.: Museum 6972.

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BRITISH Electric Co. (Beco) Ltd., can supply most types of A.C. and D.C. Motors from stock.—British Electric Co. (Beco) Ltd., Electra House, 25/29, Lower Road, Rotherhithe, S.E.16. Bermondsey 3449.

RUBBER STAMPS can assist in many ways. Are yours satisfactory and in good condition? W. L. Boughton, maker of all kinds, 53, Kenley Road, Merton, London, S.W.19.

FLUORESCENT lighting fittings, 4 ft., 40 watt, Flush and Trough complete with tubes and guaranteed control gear from stock.—Apply:—Scemco Ltd., Scemco House, 6/7, Soho Street, London, W.1. GER. 1461/2/3.

FLUORESCENT LIGHTING.—CHOKES, extra quality, elongated, 4 ft., 40 W., tapped 200/250 V., silent working, each unit guaranteed, measurements 1⅞ in. by 1⅞ in. by 8½ in. Price £1 5s. each net. Carriage extra.—Write Scemco Ltd., Scemco House, 6/7, Soho Street, London, W.1. Tel.: GER. 1461/2/3.

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TUESDAY AND WEDNESDAY, JULY 8th and 9th, 1947,
at 11 o'clock punctually each day.
VIEW DAYS: THURSDAY AND FRIDAY, JUNE 26th and 27th.
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NOTE: Applications for catalogue to be sent in envelopes marked ASH top left hand corner.
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MISCELLANEOUS STORES, PLANT AND EQUIPMENT,
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A.C. MOTORS, 1-100 h.p., 500-1 500 r.p.m. Any make fitted with ball and roller type bearings. Must be good machines, such as you yourselves would buy. Alternatively motors for rewinding will be considered.—Oldfield Engineering Co., Ltd., 96, East Ordsall Lane, Salford, 5.

ELECTRICAL steel sheet or laminations of reputable make, .014 in. to .020 in. thick will be purchased for cash in any quantity by Davenset Electrical Works, Leicester.

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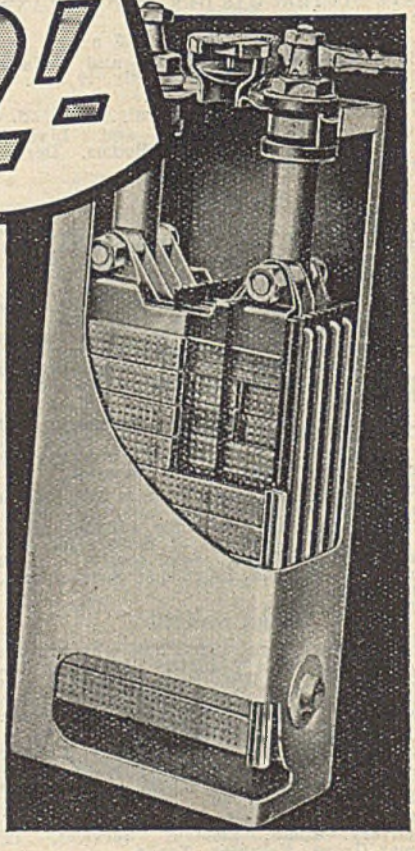

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THE

ELECTRICIAN

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Editor: STANLEY G. RATTEE, A.M.I.E.E. *Publisher and Manager*: JOHN VESTEY

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Daimler House, Paradise Street, Birmingham
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SCOTTISH OFFICE:
116, Hope Street, Glasgow, C.2
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HOME AND OVERSEAS - - - 30s.

Heavy Plant

THE importance of engineering in the industrial reconstruction and export drives has long since been apparent to those directly concerned, but its value is now being recognised by officialdom. Compliments to the efforts so far made were, in fact, offered at a conference at the Ministry of Supply last week, when it was announced that engineering exports are by volume now 150 per cent. above the 1938 figure and that they account for one third of our total overseas shipments. Recognition was given also of the fact that on the industrial side progress can only be made so long as the manufacture of heavy plant is permitted to proceed without interruption, and in order that this may be brought about and that the supply of materials and labour may be facilitated, the production of heavy electrical machines is now being regarded in much the same light as was a war operation a few years ago.

The new organisation which has been set up by the Ministry of Supply to carry out the staff work and of which details were given in our last issue, has as its objective the production of 1 400 MW of generating plant per annum for the next seven years to meet the growth of load and for replacements—but, we submit, unless the organisation has the fullest co-operation of all the similar bodies operating under other Ministries, such objective will not only be hard to reach, but will be impossible of attainment. Before the war the average

annual build-up in maximum demand increased by roughly 700 MW and though orders for new generating plant did not at that time by any means tax our manufacturing capacity, the circumstances obtaining to-day are not quite the same.

Materials and Delays

MANY manufacturers engaged in the production of electrical machines include floor space in their complaints against shortages—not because their works are too small for the demands made upon them but because, due to the materials position, many plants in process of construction take longer to complete and occupy for longer than would normally be the case, floor space which would otherwise be taken up by other machines ordered later. The 1 400 MW of new plant hoped for by the new organisation is approximately twice the volume of demand pre-war, and unless something is done to facilitate a more normal and quicker flow of materials so that manufacturers can clear the floors of their works by completing orders in a shorter time period than now, there is a danger that manufacturing capacity may become congested with orders which the industry cannot clear.

A Priority Danger

THE electrical industry can absorb all the appropriate materials available to it, but giving the industry priority in the consumption of those materials is of little value unless the makers of the materials are in their turn given priority of equal value for their manufacture. With coal supplies to the steel industry, for instance, below the normal level, the production of electric and other steels will in some measure determine the rate at which generating plant can be made, will have an appreciable effect upon the time required to complete the machines, and will too decide how often and how quickly space in the works can be made vacant for further new plant. It is reported that the makers of heavy electrical plant are making good deliveries, though by what standard is not clear. The makers themselves appeal for kinder treatment, whereby their manufacturing resources, fed with all the raw materials needed, could be used to overcome most, if not all, of the difficulties being experienced by industry generally and power stations in particular.

I.E.E. Transmission Section

THE announcement by Mr. ANDREW LEE, chairman of the I.E.E. Transmission Section, at an informal dinner last week, that it has been decided to resume the summer meetings of the Section will call to mind the many successful outings of pre-war days. The meeting arranged for September 16-17, 1939 was, it will be remembered, to have been held in Yorkshire, and to have included visits to the Ferrybridge and Thornhill power stations. The outbreak of war prevented the meeting taking place and it is therefore pleasing to note that the venue next September will again be Yorkshire, with all its technical and scenic interest. As in previous years the meeting will be held over the week-end, that is September 13-14, and with Mr. LEE in the lead it may be relied upon that the meeting will be packed with as much entertaining activity as the two days will allow.

The Mechanicals' Centenary

THE Institution of Mechanical Engineers is to be congratulated upon reaching the centenary which it has this week been celebrating in London, and as an indication of the progress which has been made in that time, an exhibition is being staged at the Science Museum, South Kensington. Much has happened since the institution was founded in 1847 with GEORGE STEPHENSON as the first president, and the Clayton Lecture by Prof. J. D. COCKCROFT on Tuesday, on the subject of nuclear energy as a source of heat and power, made clear how the field of the mechanical engineer has expanded. It is perhaps significant that during the centenary year, the new mechanical engineering research organisation—of which details were given in our last issue—should have been set up with the institution's secretary, Dr. H. L. GUY, as its first chairman, for the institution will be as influential in promoting development in the future as it has been in leading inventive genius in the past. As the years have gone by the professional mechanical engineer has become closely allied to his electrical colleague and though both have contributed to the celebrations this week, it is to the mechanical engineer alone that

tribute has so rightly been paid, and to whom the electrical engineering world owes so much for its progress.

The Electric Vehicle

THE annual luncheon of the Electric Vehicle Association attracted many personalities well-known for their work in promoting the electric vehicle, but few could have said more to advance the cause of the vehicle than did the President of the E.D.A., Lord BRABAZON. He referred to the vehicle as being free from dollar expenditure on fuel, and this point, we submit, should be used in efforts to obtain more steel for the manufacture of the vehicles. Sir JOHN KENNEDY also said something which it would be as well to act upon, namely, that though the industry is working hard to develop the future of the electric vehicle and to promote its wider adoption for the delivery of food, and other duties, the supply industry has never shown any enthusiasm for the vehicle when it came to using it for delivering its own services. While such apathy remains it cannot be expected that others, less versed in the merits of the vehicle, will adopt it, nor can they be expected readily to believe all that is said about the vehicle when the supply industry itself appears to have little faith in it.

Electricity and the Farmer

THE Agricultural Shows which were recently held in Northern Ireland and the West Country are generally judged to have been among the most successful ever held. Interest in the many applications of electricity to farming needs was supported by lively inquiry with respect to deliveries, running costs, and the degree of operating skill required, while favourable criticism was accorded the many demonstrations. So far as Northern Ireland is concerned, the impression gained from our visit to the show is that the demand for power, the orders for wiring installations and for equipment are far in excess of the number which can be met for some time. The farming community has during the last eight years had plenty of opportunity of seeing the advantages of electrification in various forms, many of their own processes included, and the result would seem to be that much of the prejudice of pre-war years has given way to a demand which present-day generating capacity and networks would find it hard to meet. The N.F.U. has long since expressed its appreciation of what electricity can do for the farmer, and judging from the experiences at Belfast and Cheltenham the enthusiasm of the union is being fast transmitted to its members.

Changing Picture of Science

VIEWED with a sufficiently long perspective, the history of physical science presents a picture of alternating enlightenment and confusion. Observations limited by the tools available at the time have in the past led to a certain theory; further observations, with better tools, have shown the need for modifying that theory and have in time made it untenable. Then, when the picture has become obscured by contradictions and unexplained phenomena, there has arisen a further theory to integrate the facts then available into a new and more accurate whole, or so it appears to be. In astronomy, this process of development has been plain. NEWTON, postulating a common law acting throughout space, brought astronomy and, in fact, the whole of physics, into what seemed at the time to be a final form. But within the last 50 years, radio-activity, relativity, quanta and particularly the recent advances of nuclear physics have each brought their separate complications, until to-day the student must learn of more than six fundamental particles where only recently two were thought sufficient.

Gravity and Magnetism

AT a recent meeting of the Royal Society, Prof. P. M. S. BLACKETT, apropos of the above, delivered a paper which may in future years be seen as a turning point in the direction of simplification. Succeeding in measuring the magnetic field at the surface of a star, and working from the already known fields of the earth and sun, he has concluded that any large rotating body must be inherently a magnet. His new physical law suggests a relation between gravitation, the electric field and the magnetic field, and thus makes feasible a considerable unification of the general picture. Further researches which are to be undertaken will test the validity of Prof. BLACKETT'S observations experimentally.

Electric Vehicle Association

The Battery-Electric as a Saver of Dollar Expenditure

AT a luncheon of the Electric Vehicle Association of Great Britain, Ltd., in London on June 4, Lord Brabazon, president of the E.D.A. and the chief speaker recalled the fact that whereas 40 years ago at the Circuit des Ardennes, on a Minerva car, he had led the field with an average speed of just over 60 m.p.h. for some 370 miles, the world's first road speed record, was established in 1899 when an electrically-driven vehicle exceeded 60 m.p.h. The first battery-electric vehicle to run in England, he continued was built in London in 1889 and, by virtue of a special permit granted by Scotland Yard, was driven by Mr. Frank Crawter from Kentish Town to Oxford Street. Still dipping into the past, Lord Brabazon recalled that in 1900 a fleet of 50 electrically-driven passenger vehicles was plying for hire in

MR. A. W. BARHAM, *chairman of the Electric Vehicle Association,* SIR FELIX POLE, *president.* SIR JOHN KENNEDY, *deputy chairman Electricity Commission, and* LORD BRABAZON, *president, E.D.A.*

London, but with the advent of the petrol car, the need for the "town" vehicle disappeared and the use of the electric passenger vehicle never really developed beyond the experimental stage.

The electric vehicle industry had been built up in the field of goods transport. It had proved its worth and he was convinced that it would play a larger part in the future. Among the advantages it offered were freedom from dollar expenditure on fuel, rapid acceleration from rest; cleanliness, especially when applied to food delivery; and instant starting.

Sir Felix Pole, president of the Association, suggested that standardisation of batteries could do much to advance the popularity of the electric vehicle, while

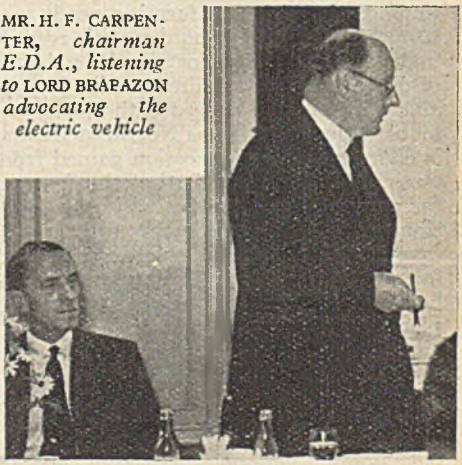
MR. V. W. DALE, *general manager and secretary E.D.A. with* MR. R. BIRT, *borough electrical engineer, Ealing*

some advance in design and saving in the weight of batteries would do even more.

Mr. A. W. Barham, chairman, recounted some of the history of the electric vehicle and said that a vehicle with a light-weight body and range of 80 miles was at any rate in view.

Sir John Kennedy, of the Electricity Commission said that while the supply industry was apathetic to the merits of the electric vehicle, it could not be expected that those less electrically-minded would adopt it. Example was better than precept.

MR. H. F. CARPENTER, *chairman E.D.A., listening to* LORD BRABAZON *advocating the electric vehicle*



Messina Power Station

Some Brief Details of the New Diesel Driven Plant

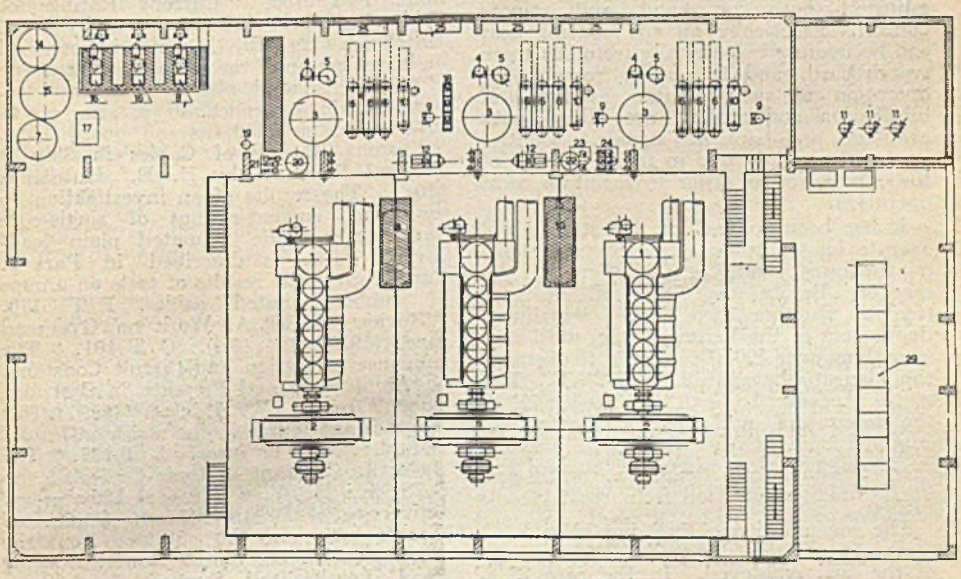
THE shortage of solid fuel in Italy has raised the problem of the conversion from coal to oil and the employment of Diesel machinery, especially in the generation of power. Among the Italian concerns which have taken up the question may be mentioned the Società Generale Elettrica della Sicilia which, in addition to the reconstruction of old power stations damaged in the war, has started the construction of new. Since Sicily is short of water power, and the exploitation of the existing water resources would in any case have involved the construction of plants which could not be completed in less than three or four years, preference has been given to the erection of Diesel-electric stations, the first of which is the medium size Messina plant.

The station will have an ultimate installed capacity of 11 600 kW made up of three identical Diesel-electric generating sets, each consisting of a Diesel Fiat engine of 5 400 H.P. at 187.5 r.p.m. coupled to a three-phase generator of 5 600 kW, at 11 000 V, 50 period, built by the Officine di Savigliano at Turin.

This is the first, not only Sicilian but also Italian, power station for uninterruped service to be driven by Diesel machinery. And taking into consideration the importance of the service to be rendered and the characteristics of the Diesel engines employed—double acting type machines working at a rather high speed—and above all, the fact that they have been designed for the use of " furnace oil " instead of Diesel oil, it can be understood that great interest is being shown in its development.

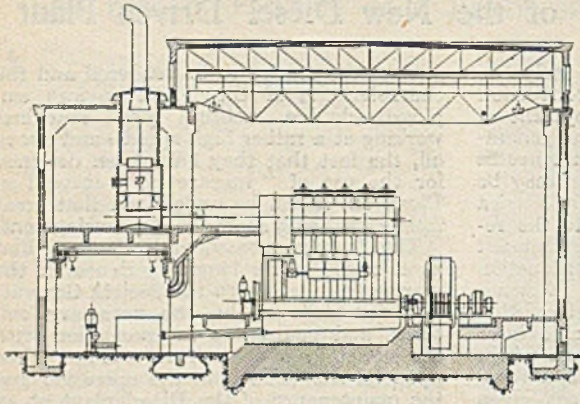
The Stabilimento Grandi Motori Fiat as a result of its long experience in the marine field has given the Società Generale Elettrica della Sicilia the necessary evidence and guarantees in connection with the economics of the scheme and has taken upon its shoulders both the operation and the maintenance of the Diesel plant at an annual charge, as it is done with shipowners in the marine field. Two sets are already in operation, while the third will, it is expected, be completed this month; the first two sets were put in operation 12 months after the order was placed.

The three generating sets consist each of a Fiat Diesel engine working on the two-cycle double-acting principle, each formed of five cylinders having a diameter of 650 m/m and a stroke of 960 m/m. Each engine, which is directly-coupled to its own air pump, develops a normal 5 400 H.P. and 5.950 H.P. maximum. The electric generator is in each case of the open type,



Layout of the new station at Messina

rated at 5 600 kW and was built by the Officine di Savigliano at Turin with double supports and coxial main and secondary exciters. The three sets are placed parallel



Elevation of one of the Diesel-electric sets

in a building measuring 20 by 40 m. served by a bridge crane of 40 tons capacity. At one side of the engine room there is the main switchboard and on the other side the repair shop.

Speed regulation is obtained through two centrifugal regulators, one for operation and the other for safety; the first acts uninterruptedly by means of an oil servomotor which proportions output on the basis of demand, while the second takes up load only when the speed exceeds a certain determined figure. The normal speed of the operation regulator can be adjusted both by hand and remote control. Practically all the control gear can be operated electrically from the main switchboard, and for safety reasons the operation of such circuits as those of lubrication and cooling are fitted with acoustic and optical signals. Control devices are duplicated in the proximity of the auxiliaries in order to facilitate local operation.

It has been pointed out the station will operate on "furnace oil," this representing the lowest quality of fuel offered on the market. Before use, the oil is heat treated through two large centrifugal depurators of the Veronesi type, until it is something over 100° C. in order to decrease the viscosity between 1° and 2° E. The steam necessary to heat the furnace oil in the depurators and in the heaters is supplied from exhaust gas boilers inserted in the silencers or, when the engines are started, from an electrode boiler of 70 kW rating.

The consumption of fuel per kWh is of course in relation to the calorific power of the fuel employed. In the case of a good "Diesel oil" of $d = 0,9$ to 15° and of a calorific value of over 10 500 cal./kg., and in the case of a low quality "furnace oil" of $d = 0,98$ to 15° and of a calorfiic value of over 9 000 cal./kg. the following comparison is given:—

Diesel oil.	Furnace oil.	
254	276	grammes at full load
265	287	grammes at ¾ load
300	324	grammes at ½ load

It is expected that some reduction in consumption will be obtained through the insertion of an exhaust gas turbine which will operate a turbo-blower or an electric generator. In regard to the consumption of lubricating oil, the comparable figure has been fixed at 2 grammes per kWh, but the Stabilimento Grandi Motori Fiat expect to realise a consumption of not more than 1.45 grammes per kWh owing to improvements realised in the quality of such oils, as well as owing to special devices fitted to the lubrication pumps which govern the power in relation to the load on the main engine.

E.R.A. Reports

THE following reports have been published by the British Electrical and Allied Industries Research Association: F/T 155, "Current Ratings of Cables in Ships" (First Report), by E. E. Hutchings (12s. 6d.), in which is described an investigation of the direct current rating of rubber-insulated, plain lead-covered, unbraided, single-core cables of sizes up to 0.4 sq. in. installed as on board ship. "Current Ratings of Cables in Ships" (Second Report), by E. E. Hutchings (10s.). The results of an investigation to determine current-ratings of single-core varnished cambric insulated plain lead-covered cables is described in Part I. Part II gives the results of tests on groups of rubber-insulated cables. F/T 170, "Review of E.R.A. Work on Overhead Lines (1920-46)" (5s.). G/T 191, "The Influence of Design and Circuit Constants on Arc Energy and Pressure in Cartridge Fuses," by H. W. Baxter (16s.). This report is the fourth in the series on fundamental research on fuses. L/T 172, "The Dielectric Constant of Ionic Crystals," by B. Szigeti H. Wills, Physical Laboratory, University of Bristol (14s.). Copies of these reports may be obtained from the association at Thorncroft Manor, Dorking Road, Leatherhead, Surrey.

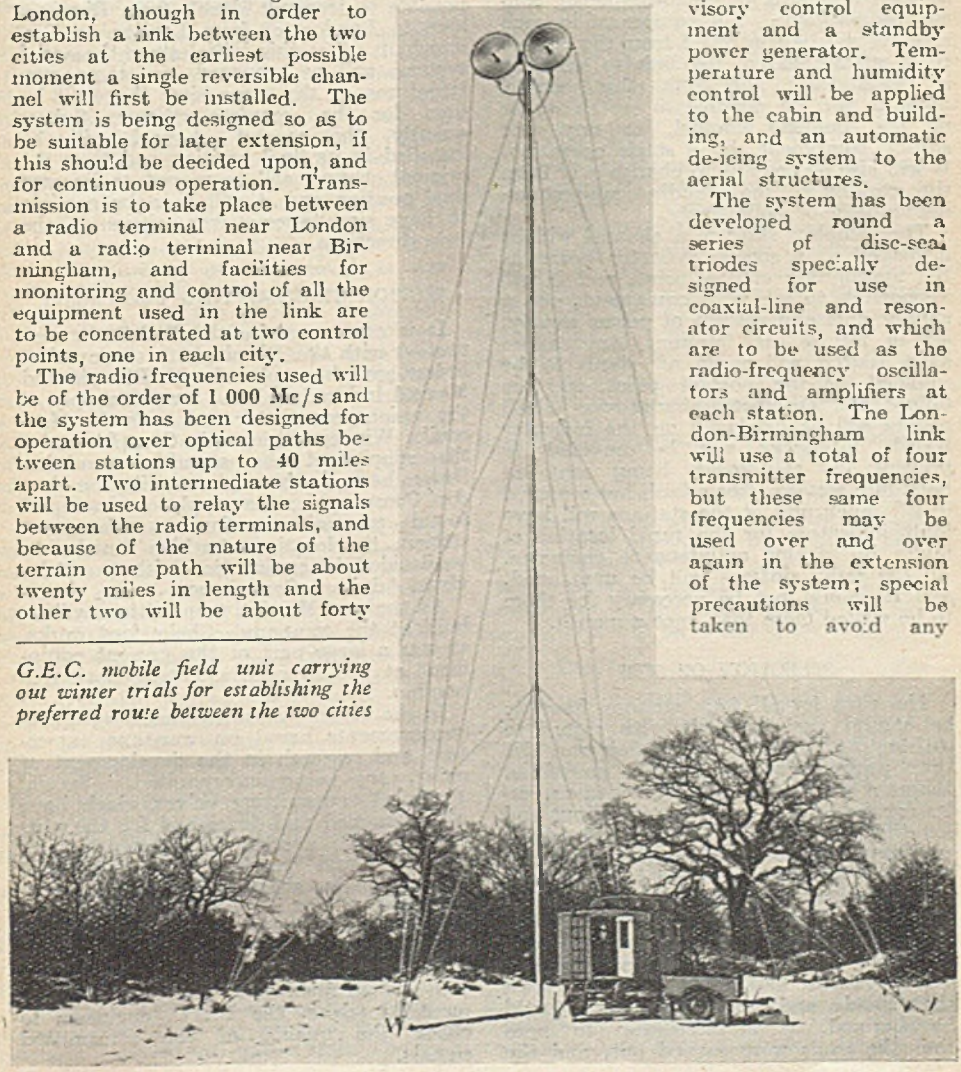
LONDON-BIRMINGHAM TELEVISION

RADIO-RELAY ARRANGEMENTS — ORDERS PLACED

THE London-Birmingham television radio-relay link, which the General Electric Co., Ltd., is to design and supply to the Post Office, is intended for the transmission of television signals having the waveform of the present 405 line, 50 frames per sec., signals transmitted from Alexandra Palace. When completed it will permit television signals to be relayed simultaneously from London to Birmingham and from Birmingham to London, though in order to establish a link between the two cities at the earliest possible moment a single reversible channel will first be installed. The system is being designed so as to be suitable for later extension, if this should be decided upon, and for continuous operation. Transmission is to take place between a radio terminal near London and a radio terminal near Birmingham, and facilities for monitoring and control of all the equipment used in the link are to be concentrated at two control points, one in each city.

The radio frequencies used will be of the order of 1 000 Mc/s and the system has been designed for operation over optical paths between stations up to 40 miles apart. Two intermediate stations will be used to relay the signals between the radio terminals, and because of the nature of the terrain one path will be about twenty miles in length and the other two will be about forty miles. At each station there will be a lattice steel tower, of the order of 80 ft. high, which will carry a 9 ft. square cabin containing the r.-f. and signal channel equipment, and outside which the transmitting and receiving aerial systems, each approximately 12 ft. in dia., will be mounted. At the foot of the tower there will be a small building which will contain the power supply units for the signal channels, the supervisory control equipment and a standby power generator. Temperature and humidity control will be applied to the cabin and building, and an automatic de-icing system to the aerial structures.

The system has been developed round a series of disc-seal triodes specially designed for use in coaxial-line and resonator circuits, and which are to be used as the radio-frequency oscillators and amplifiers at each station. The London-Birmingham link will use a total of four transmitter frequencies, but these same four frequencies may be used over and over again in the extension of the system; special precautions will be taken to avoid any



G.E.C. mobile field unit carrying out winter trials for establishing the preferred route between the two cities

drift in transmitted frequency. The receivers will be of the superheterodyne type, but by a special modulation technique video-frequency signals will not appear except at the input and output of the system at the radio terminals.

STANDBY EQUIPMENT

All equipment, except the aerial systems, in each channel at a station will be duplicated and the standby equipment will automatically switch into service in the event of a failure in the working equipment. The aerial systems will be automatically switched from the working to the standby equipment, in the event of such a failure, by radio-frequency contactless switches. The equipment in each channel will be controlled from the control point at the end of the link to which it is transmitting, and from this control point it will be possible to switch on or off the complete channel, or any one station equipment, by a single operation. It will also be possible to change-over from the working to the standby equipments, individually or collectively.

The complete state of a channel will be displayed on a special indicator board at the appropriate control point, and it will be possible to see what equipment, power supply unit and system of power supply, are in use at each station. Any failure at a station will cause an alarm to be sounded at the control point, and the failure and automatic change-over which results will be displayed on the indicator board. Interlocks will be provided to prevent any equipment being switched back into service after a fault has occurred in it. Each unit at the stations will have fault indicators for the rapid location of faults by visiting maintenance engineers. All the radio stations will be unmanned, and it should not be necessary for them to be visited more than once a month.

SELECTION OF SITE

The sites for all four stations have to be chosen very carefully with regard to satisfactory operation of the link and also the preservation of local amenities. Before a site can be finally decided on, extensive field trials must be carried out and for this purpose two vehicles have been equipped as mobile laboratories, each containing a transmitter, a receiver, measuring apparatus, and its own power supply generator. Field trials were carried out over possible routes, using these vehicles and portable masts for supporting the aerial systems, and the trials have shown that steady and consistent signals should be obtained. It is interesting to note that the trials were carried out, and the vehicles were operating continuously, during the severe weather of January and February last. Trials were also carried out to determine the effect on the signal strength of an aircraft flying in, or close to the beam, and it was found that the proposed gain control of the system would reduce such interference to a negligible amount.

The installation of the radio link is to take place in two parts and initially a single channel, with its standby equipment, will be installed. The direction of transmission of this channel, which comprises one of the two sets of equipment to be used in the final scheme, will be reversible, so that at any time it will be possible to transmit signals from Birmingham to London or from London to Birmingham. For this initial stage the aerial systems will be mounted on temporary structures on the same sites that will be used for the complete scheme. Subsequently the second channel will be installed in its final position and then the original channel will be moved to its own final position and it will then be possible to have simultaneous transmission in the two directions.

STATION TRANSMITTING EQUIPMENT

It is announced by the B.B.C. in connection with the Birmingham station that orders have been placed with Electric and Musical Industries, Ltd., for the supply of the vision transmitter and with the Marconi's Wireless Telegraph Co., Ltd., for the supply of the sound transmitter. Orders have also been placed with the Marconi Company for the supply of vision and sound transmitters for a subsequent station, the location of which remains to be decided in conjunction with the Television Advisory Committee.

All the new Marconi transmitters will be built at the company's Chelmsford works, as was a large part of the present equipment at the Alexandra Palace station in London.

In the vision transmitter many technical improvements based on war-time experience and research in the development of radar, are being incorporated. Special air-cooled transmitting valves which have been designed and developed for the purpose will be another important feature. In the sound transmitter, a modulator of a design far ahead of anything hitherto produced will, it is claimed, be used. All the controls of the transmitters will be mounted on a central control desk and a special room at the transmitting station will contain monitoring and testing equipment to enable the B.B.C. engineers to check the quality of the transmitted signals.

THE WHEATSTONE BRIDGE NETWORK

By G. W. STUBBINGS, B.Sc., A.M.I.E.E

THE theory of the Wheatstone bridge network is touched upon very lightly in elementary books on electrical engineering where the use of this network for the measurement of resistance is explained. The complete theory of the network is very interesting, but it involves some complicated elementary mathematics. Some points of this theory, additional to those found in the usual textbooks, can easily be worked out by concise methods and with simple algebra.

The Wheatstone bridge network is usually represented diagrammatically in the form of a complete quadrilateral, as shown in Fig. 1, where the resistance values are maked symbolically. It is very easy to show that when four of the resistance values satisfy the relation $ad = cb$ there will be no current in the OP branch containing a galvanometer. In this condition the MN, or battery branch, of the OP, or galvanometer branch, are said to be conjugate. The essential symmetry of the network is best realised by considering Fig. 1 to be, not a plane figure, but the plan of a skeleton tetrahedron of which the base is MPN and the vertex O. The network is then seen to consist of three pairs of arms or opposite branches, each pair consisting of a side of a base of the skeleton solid and a sloping edge not in direct contact with it. Any pair of arms are conjugate when the products of the resistances in the other two pairs are equal.

When two arms of a pair are conjugate, such as MN and OP in Fig. 1, then the resistance of the network between M and N with the e branch removed, is independent of the resistance g of the other conjugate arm, for there is no current in the g branch; it is the same whether the g branch is open or short-circuited. This resistance is therefore $(a + b)(c + d)/(a + b + c + d)$. If a and b are the ratio arms in resistance measurement, so that $b = na$ and $d = nc$, n being the multiplying factor, the resistance from M to N will be $(n + 1) \times \frac{ac}{a + c}$. Reciprocally, with the g branch open, the resistance of the the network between the points O and P will be $(a + c) \times \frac{n}{1 + n}$, and this resistance is independent of that of the battery or MN branch. With the network complete, the currents in five of the branches other than OP are independent of the resistance g.

If the values of the resistances a, b, c and d depart slightly from the condition for conjugateness, a current will appear in the g branch of the network, and, by Thevenin's theorem, this current will be equal to the p.d. between P and O with the g branch removed, divided by the sum of the resistance g and that between the O and P points, r. The deflec-

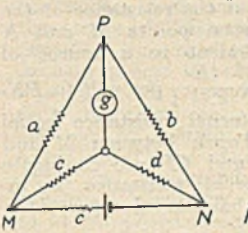


Fig. 1

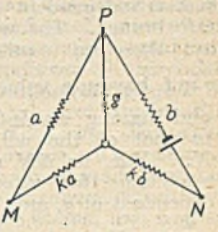


Fig. 2

tion of the galvanometer will be proportional to $I_g N$ where I_g is the current in it and N the number of turns in the coil. The galvanometer resistance g will be proportional to the number of turns and inversely proportional to the cross section of the wire for a given coil size. But as the wire cross section will be inversely proportional to the number of turns, it follows that g is proportional to N^2 and N is proportional to $\sqrt{g}$. For a stipulated open circuit p.d. of O and P, the galvanometer deflection will therefore be proportional to $\frac{\sqrt{g}}{g + r}$, and this will have its greatest value when $\sqrt{g} + \frac{r}{\sqrt{g}}$ is a minimum, or when $g = r$. As the MN and OP branches will for small values of I_g be approximately conjugate, the open-circuit resistance between O and P will be independent of the resistance of the MN branch, and will have the value $(a + c) \times \frac{n}{1 + n}$. This is, accordingly, the best value of the galvanometer resistance. If $n = 1$, and the ratio arms are equal, the value of r is equal to d, that of the resistance being measured, and, in this condition, the g and d resistances should be equal for maximum sensivity.

If, the MN and OP arms of the network being conjugate, a source of e.m.f. without resistance is introduced in one of the other arms of the bridge, as shown in Fig. 2, a current will appear in the OP branch. As the condition for conjugateness is satisfied, the c and d resistances can be put respectively equal to ka and kb, where k is a constant. If the parallel resistance of the OP and the OMP paths is denoted by f then it can readily be seen that if the MN branch is

removed, the p.d. between M and N per volt of e.m.f. in the PN branch will be $kb + \frac{kf}{k+1} = \frac{k}{k+1}\left[f + b(k+1)\right]$ divided by the total resistance of the circuit starting and ending at the source of e.m.f. But this resistance is the quantity in the square brackets of the last expression. The open-circuit p.d. of M and N is therefore $\frac{k}{k+1}$ per volt of e.m.f. in the PN branch, and this p.d. is independent of the resistance of the OP branch. The open points M and N are therefore equivalent to a source of e.m.f. having a value $\frac{k}{k+1}$ per volt in PN, and having an internal resistance equal to that of the network between M and N. But, as MN and OP are conjugate branches, this internal resistance is independent of g, and has the value $(a + b) \times \frac{k}{k+1}$. If the branch MN is restored, the current in this branch will therefore be independent of the value of g, and, conversely, the current in g will be independent of the resistance in the MN branch, and will be the same whether this latter branch is open or short-circuited. This is the principle of Mance's test for battery resistance. The maximum current from M to N in a short-circuit of these points will be the p.d. $\frac{k}{k+1}$ divided by the internal resistance $(a + b)\frac{k}{k+1}$ and this current will be $\frac{1}{a+b}$ per volt of e.m.f. in the PN branch and will be independent of the values of the resistances in the MO, ON and OP branches. Therefore, if a source of constant e.m.f. is included in one of a pair of arms of a Wheatstone bridge network of which another pair are conjugate, the current in one conjugate branch will remain constant while the current in the other is varied by alteration of its resistance. If the available voltage of a supply varies owing to resistance drop in the source and the supply leads, a conjugate bridge network can be used so that a constant current is obtained in one conductor while an adjustable variable current from the supply flows in another.

Institution of Electrical Engineers

AN informal dinner was held in London by the I.E.E. Transmission Section on June 6, when the chairman of the Section, Mr. J. Andrew Lee, presided, supported by, among others, Mr. J. Hacking, vice-president, and the Chairmen of the other Sections. The President and the Secretary were unable to be present due to their attendance at the Summer Meeting of the I.E.E. Western Centre at St. Austell.

Mr. Lee, in proposing the toast of the guests, said that the Section had grown to a membership of 2 000, but there was plenty of room for more. The scope of the Section included not only overhead lines and cables, but anciliary apparatus and terminal equipment, and a large influx of new members could therefore be hoped for. The Section Committee had this year decided to revive their Summer Meeting, and at the invitation of the Central Electricity Board and the Yorkshire Electric Power Co., they would visit the Yorkshire area on September 13 and 14 next. During the current session there had been two joint meetings with the Measurements Section, the success of which led him to hope that other joint meetings would be arranged. Other Sections might follow the example with advantage, for there were so many contacts common to all, that mutual interest was easily found.

Mr. Hacking, in reply, said that the Section covered a field wider perhaps than that of any other Section. With respect to the Organising Committee to which he had been appointed, he said that some might view the nationalisation prospects with some misgiving, but no matter what Government had been returned at the last Election, there was no doubt that it would have included in its programme some measure fundamentally and technically the same as nationalisation, with a central authority and area boards and a link between the two.

* * *

The annual conversazione of the institution is being resumed this year and will be held at the Science Museum, South Kensington, on June 19, from 8 to 11 p.m. Prior to the war it was customary to send an invitation card to each member, but this year invitations will be sent only to those who ask for them. It is therefore essential that those members who wish to attend should obtain an invitation card by applying to the Secretary. An application form for this purpose has recently been sent to all members in the British Isles. Evening dress (or uniform) and decorations, or dinner jackets will be worn.

Mechanical Engineers' Centenary

Institution Celebrations and Commemorative Exhibition

CENTENARY celebrations of the Institution of Mechanical Engineers began in London on Monday when Mr. Herbert Morrison, Lord President of the Council, addressed the opening session. In connection with the celebrations a commemorative exhibition was opened to the public on Tuesday at the Science Museum, South Kensington, and this week some relics of George Stephenson have been on view at the institution's headquarters in Storey's Gate. The South Kensington exhibition closes on August 24. On Tuesday, the author of the Clayton Lecture was Prof. J. D. Cockcroft, who chose as his subject "The Possibilities of Nuclear Energy for Heat and Power Production," and below is given an abstract of his remarks.

At the beginning of his lecture, Prof. Cockcroft recalled the setting to work, in December, 1942, of the nuclear pile at the University of Chicago. This, he said, was the first occasion on which the controlled release of atomic energy was demonstrated. The pile consisted of some hundred tons of pure graphite in which was embedded uranium and uranium oxide. The nuclear fuel was added by stages, and when about six tons was placed in position, the chain reaction began, heat being derived from the splitting up of the atoms.

ENERGY OF FRAGMENTS

Demonstrating, by means of a slide, a typical fission process, in which an atom of U235 divided, on entry of a neutron, into atoms of barium and krypton, Prof. Cockcroft said that the energy possessed by these fragments was some 30 to 40 million times as great as that released by any equivalent chemical process. The barium atom moved at a speed of 10^9 cm./sec. and the krypton, being somewhat lighter, still faster. Even after the fission process was complete, the resultant products were unstable, and in the course of their decay through a series of radioactive stages into stable atoms, which might take several years, considerable quantities of heat were evolved, an important factor in the design of piles.

Compared with coal, the fission of U235 released vast quantities of energy. As an example, Prof. Cockcroft cited the complete combustion of one kilo of coal as yielding $6 - 8 \times 10^6$ calories, while the same quantity of U235 would produce perhaps 2×10^{13} calories. If it were possible completely to destroy one kilo of matter, 2×10^{16} calories, or 1 000 times this amount, would be liberated.

Two types of nuclear reactor were possible, using either fast and slow neutrons. In the case of the fast reactors, the atoms of U238 swallowed up so many neutrons that a chain reaction could not develop unless a proportion of the U238 was removed. The method employed in slow reactors was to slow down the neutrons by a factor of 10 000. This gave a better chance of fission. The slowing down was performed by a moderator, a substance which for maximum effect had to be composed of light atoms, and had to have both a low rate of neutron absorption and high density.

CHOICE OF A MODERATOR

The first moderator material to be considered was ordinary water, but it was found that the normal hydrogen atom captured too many neutrons, and the chain reaction accordingly just failed to develop. Heavy water was next tried, and this substance was a practicable moderator. Although its cost was in the neighbourhood of £500 000 per ton, many tons had been produced, and at least two heavy water piles were now in operation.

The next moderating materials considered were beryllium and carbon. Of these, the former was very scarce, but carbon, in the form of graphite, was found suitable.

Describing the mechanism of the chain reacting pile, Prof. Cockcroft said that, arising from one spontaneously liberated neutron, fission was caused in U235, thus increasing the number of available neutrons. Then, after about 200 collisions in the graphite, the fresh neutrons were slowed down to such a speed as to produce fission by the slow process. Some, however, would be embedded in atoms of U238 to produce, through the stage of neptunium, the artificial element plutonium, which had very similar properties to U235.

Determining the working of the pile was the "multiplication factor," k. If k were greater than one, then the number of neutrons in a very large system would increase to infinity. In a pile of smaller dimensions, however, some neutrons would escape and it was necessary, therefore, that the pile should be a certain minimum

size before the chain reaction would develop.

The control of the nuclear reaction was made possible by reason of the fact that some of the neutrons emitted during fission were delayed. If the multiplication factor increased slightly above unity, perhaps one per cent. of the resulting neutrons would be born up to one minute later, and this provided a most desirable inertia.

For controlling the speed of reaction, rods of boron or cadmium, with a high rate of neutron absorption, were inserted into the pile, and these permitted a stability of working as great as one part in 10 000. Some emergency measures of stopping the reaction were still necessary, however, in the event of the controlling mechanism breaking down, and further control rods were placed so as to be driven instantly into the pile if the recording instruments showed a dangerous increase in activity.

The heat generated arose initially, Prof. Cockcroft explained, in the form of kinetic energy of the fission fragments, this being converted into heat energy when the fragments came to rest in the uranium rods. Illustrating the quantities of energy which might be made available by a pile, he said that if only one gramme of U235 were burned in a day, this would be the equivalent of 1 000 kW.

The power level at which a pile could be operated was dependent upon the rate at which the heat could be removed. If the pile were uncooled, a power of between 50 and 100 kW was possible. Blowing air past the uranium rods increased this figure, and would permit levels of several thousand kW. as at Clinton in the U.S.A.

RADIATION PROBLEM

One of the problems of nuclear energy was the intense radiation produced by the reactions. A pile operating at 1 000 kW destroyed 3×10^{16} atoms of U235 every second, equivalent to the radiation from two million grammes of radium. Even a pile rated at one watt radiated at the same rate as one gramme of radium.

One foot of concrete decreased this radiation by a factor of ten, and to protect the operating personnel it was necessary to use a screen of concrete one foot thick for a one watt pile, and rising to seven feet when the power level was one megawatt. There was laughter when Prof. Cockcroft remarked that an "atomic car," which had been suggested in some quarters, would, if it were to have the equivalent of a 30 H.P. engine, require a shield of concrete six feet thick.

Among the other serious consequences of radiation were that when the pile was shut down, it continued to generate heat, and it was therefore impossible to get to the interior in order to do repairs. As a result, the mechanism had to be designed to run indefinitely and this, at present, was one of the least satisfactory features of pile design.

Of the different types of pile which might be constructed, Prof. Cockcroft said that one using several tons of heavy water might possess a multiplication factor of 1.15. If graphite were used as a moderator, the multiplication factor would be less than 1.07, and the pile would, consequently, be larger.

THE SMALLEST PILE

The use of enriched uranium would increase the multiplication factor and also result in a smaller pile, the limit being reached with pure U235 and a few litres of heavy water. By this method, a pile could be made no larger than a petrol can and giving between ten and 100 kW for ten to 100 years.

To prevent corrosion and the escape of fissile material, the uranium rods had to be sheathed in some metal, of which there was a very limited choice, possessing a low neutron absorption. It was likely that the first power producing pile to be built would use aluminium-sheathed rods, cooled by a closed circulating high-pressure gas which had also to have low absorption properties.

In such a system, the temperature at which the pile could be operated—and hence the thermal efficiency—was governed by the "creep" limit of the aluminim, which was between 350° and 400°C. The problem now before engineers and metallurgists was to remove this limitation by finding some substitute for the aluminium. If they succeeded, then quite possibly gas, instead of steam, turbines could be used to convert the heat into electric power, with a thermal efficiency as high as 37 per cent.

Another difficulty was that the fission products occurring in the uranium metal increased the neutron absorption of the pile as a whole, and therefore the rods had periodically to be taken out and purified, with an inevitable loss of U235. It was not at present possible to say what proportion of the fissile energy in a pile of natural uranium could be utilised, but it might be that of the one to three neutrons arising from each fission, one would produce plutonium and hence give the pile greater fissile energy than that of the U235 alone.

There had been various estimates made as to the costs of operating the piles as a

source of electrical energy, and it seemed probable that the final cost would be of the same order of magnitude as that of coal. The capital cost of a pile capable of producing 75 000 kW had been estimated in the U.S.A. at $25 000 000, compared with $10 000 000 for a coal-fired plant. Of these amounts, the electrical equipment accounted for $5 000 000.

Concluding his lecture, Prof. Cockcroft spoke of the chances of a practical utilisation of atomic energy. He thought that in five years an experimental pile, using aluminium-sheathed uranium and working at an efficiency of 15 per cent., was possible. A rough estimate could be made of its output, but not, at present, of its operating life. The next step would be to raise the operating temperatures.

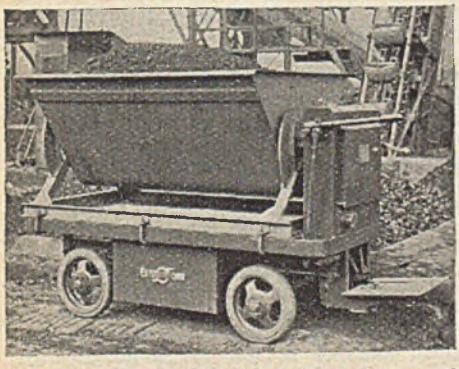
Much had still to be done by chemical engineers to find a way of disposing of radio-active waste products, and it would take probably a decade before all the necessary solutions were found. There were also political and economic problems.

Atomic energy could make a very great contribution to the power needs of the country and, if a determined effort were made to overcome all the difficulties, another scientist, speaking five years from now, would be able to give a much better estimate of the possibilities.

Other proceedings of interest to electrical engineers included three short papers on Wednesday, by Sir Johnstone Wright, Prof. A. G. Christie, and Dr. Adolf Meyer, dealing with Mechanical Plant for Power Stations, in this country and the Dominions, in the United States and on the Continent, respectively.

Electric Truck Aids Fuel Recovery

FUEL recovery at the Agecroft power station, Salford, by separating combustible matter from the ash at the boiler dumping bars and returning it to the boilers mixed with the fresh coal supply, has been facilitated by the recent introduction of the electric truck illustrated on this page. One man driving the truck now does the work of three labourers previously employed with wheel-barrows, giving an annual saving in wages of approximately £500.



An "Electricar" tip-truck in use at Agecroft power station, Salford

Fuel which has been incompletely burned is collected in hoppers at the rear of the grates and loaded on the truck, which is fitted with an easily removable side-tipping body of 15 cwt. capacity. The truck transports the fuel to the coal dump, some 200 yds. away, and makes about 20 journeys a day. In addition, the truck is used for the disposal of flue grit, two journeys a day being made, and during peak load periods, it carries loads of coal to the boiler house floor for supplementary hand-firing. At other times, it carries fire bricks into the boiler house for furnace maintenance.

The electric truck is regarded as being ideal for these applications, as it can be driven by the unskilled labour normally employed in coal handling plants, and is very robust, therefore being in continuous service with little maintenance under difficult conditions. With body equipment manufactured and fitted by the St. George's Engineers, Ltd., of Salford, the truck is a Crompton Parkinson one-ton type "Electricar." To keep it in operation 24 hours a day, two sets of interchangeable batteries are used.

Modern scientific instruments used for research and testing in electrical and mechanical engineering are displayed at an exhibition now being held in the booking hall of Charing Cross underground station. Opening the exhibition on Tuesday, Mr. John Wilmot, Minister of Supply, said that Britain now led the world in the manufacture of precision instruments. The enormous amount of research and development work done during the war was to-day yielding fine results, and there was every indication that mounting exports in this field would be maintained.

Watford Industrial Exhibition

DETAILS OF DISPLAYS OF ELECTRICAL INTEREST

WHILE Watford has been looked upon as an important industrial centre for some years, the diversity and extent of its manufactures have not been generally realised, and with the object of making its products better known at home and abroad and also attracting new concerns to the district, the Corporation, with the co-operation of the manufacturers, organised an industrial exhibition. This was opened by Lord Brabazon of Tara at the Town Hall, on Thursday, June 5, and it will remain open until June 18.

The stands are attractively arranged and the effectiveness of the various displays is enhanced by the efficiency of the illumination, which is by Mazda fluorescent lamps. The general scheme was planned by engineers of the lighting department of the British Thomson-Houston Co., Ltd., and the equipment was loaned free of charge by the company. Below are mentioned exhibits of electrical interest:—

The British Thomson-Houston Co., Ltd., of Langley Road, Watford, on their stand give prominence to a fluorescent lamp for street lighting, and a fitting for a large store or showroom, where soft, dignified lighting is required. It is of egg-crate louvred design, planned on sound optical lines. While the lamps are not visible, a completely unrestricted light is directed downwards. It is of unit construction in 4 ft. lengths, any number of which can be joined together. Incorporated in the fitting is a louvred spot light for display purposes, which can be placed anywhere in the row. The glass sides of the fitting can be tinted in any colour. Mazda 40 W fluorescent lamps are used with it. The display also includes a new acid resisting, totally enclosed fluorescent lighting unit.

Transformers and Welders, Ltd., Sandown Road, Watford, are showing a typical core and winding assembly of a standard distribution transformer; a transformer tank with standard fittings for a Standard A.F.1 type portable welder, and a Standard A.F.2 type portable welder; off-load tapping switches; a selection of small general purpose transformers; and insulating materials.

Wild-Barfield Electric Furnaces, Ltd., Electrurn Works, Watford By-Pass, Watford, are exhibiting a selection of laboratory muffles, and workshop and toolroom equipment, most of which is self-contained.

Watford Instruments, Vale Road, Watford, have on view electro-mechanical and electronic test gear for industry, and stroboscopic equipment for the examination of movement and vibration and the checking of speed; automatic control gear for industrial processes; selector switches for control circuits and transformer switching; and specialised a.c. and d.c. relays

Stand of the B.T-H. lighting department showing new developments in fluorescent lamp fittings and other equipment

and contactors for close limit working. Of special interest is the "Multimeg," a prototype instrument, reading directly up to 10 000 megohms.

The Watford Electric and Manufacturing Co., Ltd., Whippendell Road, Watford, are demonstrating their equipment for maximum demand control, consisting of a central control panel, a load chart, comparator and signalling system; and also showing the Watford-Pigral equipment for centralised automatic control of a heating system by the application of resistance thermometry.

E. F. Electro, Ltd., Willow Lane, Watford, are showing switches, switch sockets, sockets and plugs.

The Watford Electricity Department, which supplies at low prices an area of 61 sq. miles, has an advice and information stand. For industrialists requiring 150 kVA or more, a maximum demand tariff with a net annual charge of £4 5s. 6d. per kVA is offered.

Buck and Hickman, Ltd., Watford By-Pass, have on their stand a display covering the manufacture of spiral bevel and straight bevel gear cutters and equipment, tooling equipment, automatic screw machines, fire control instruments and special machine tool equipment.

French Fuel and Power

Plans for Increasing Coal Output and Electricity Generation

UNDER the Monnet Plan, some details of which have been recently published, national reconstruction in France on an extensive scale with wide developments in certain basic industries is to be actively pursued. First place is being given to coal and electricity, including water power. Although the possibility of using vegetable oils as fuel has already been tested on a small scale with palm oil and one or two others of oleaginous origin, it is not anticipated that it will be necessary to look to these at present in the national fuel and power schemes; though these oils have been mentioned as possible sources of fuel in the large scale developments of French colonial oilseeds which also form a section in the Monnet Plan.

A ten-year period beginning from 1946 is first of all envisaged, and in regard to coal it is intended that annual output shall be increased to 65 million tons by 1950, and to 70 million tons in 1955. Before the war average yearly output over a period of fifteen years ending 1939 was about 50 million tons; but this, of course, declined seriously during the war, and in 1944 was only 17.2 million tons. Estimate for 1946 was 48 million. Mine workers include a considerable percentage of foreigners—prisoners of war and others—and it is hoped that these will still be available for some years at all events. But owing to mechanisation and other improvements some decline in total numbers working in the mines is anticipated: 1946, 322 200; 1950, 286 860; 1955, 283 700.

COAL RESERVES

The Commission de Modernisation des Houillères has gone carefully into the question of coal reserves, and although it is, of course, only possible to compute very approximate figures, the table opposite is believed to be fairly accurate, though column B is only regarded as hypothetical or possible. Column A = certain or probable; C = A + B; D = estimated annual output, and E = probable life, namely, C ÷ D.

In addition to supplies from her own mines it was hoped that in the Peace Treaty France would secure 20 million tons per annum for 20 years from the Ruhr. And further, a very considerable development of water power is contemplated by the Commission de Modernisation de l' Electricité.

This part of the Monnet Plan for the ten-year period is as ambitious and far reaching as the others. In 1938 total electricity supply was estimated at 21 000 million kWh (21 milliards), or about 433 kWh per head, as compared with 3 189 Norway, 2 480 Canada, 1 264 Sweden, 1 117 U.S.A., and 654 Germany. It is pointed out, however, that the figures for

	(millions tons)				
	A	B	C	D	E (years)
Nord et Pas de Calais	850	2 650	3 500	35.5	99
Moselle	2 360	3 000	5 360	15.7	315
Loire	90	140	230	4.1	56
Gard. Herault ...	160	300	460	3.3	134
Tarn...	100	—	100	1.4	72
Aveyron	32	30	62	0.8	78
Bourgogne	62	20	82	2.4	34
Centre	28	25	53	1.4	36
Fuveau	100	120	220	1.5	146
Alpes (La Mure) ...	60	25	85	0.5	170
Hostens et Landes ...	110	20	130	1.3	56
Miscellaneous ...	20	50	70	1.4	50
Totals	4 000	6 400	10 400	70.3	

Norway and Canada are greatly enlarged by the existence in those countries of large scale electrochemical and metallurgical industries, so that the ordinary consumer may not be so much better off as the average per head would indicate. It is considered absolutely essential, in the national economic interests, that electricity should be available to satisfy the needs of all kinds of consumers. The Plan proposes that, for 1946, the target should be 25 milliards kWh, of which 13 milliards would be from water-power; and that this latter figure would increase to 24 milliards by 1950. At the same time the thermal stations both at the mines and at distributing centres should be modernised to the utmost with a view to using coal to best advantage and effectively supplement water power. This would make possible important extensions in several basic industries, such as the chemical and metallurgical. Aluminium production, for example, would be doubled by 1950-1 (using over 2 000 million kWh); iron, steel, sulphuric acid, chlorine, cyanamide, etc., would also show a substantial increase. And electricity would be much more widely used in glass-making, rubber manufacture, the pulp and paper industries.

The Plan envisages a total demand for electricity of some 40 milliards kWh pending the proposed modernisation. The 1946-7 period will be difficult, and even the least efficient of the thermal stations (using, e.g., 750 gr. coal per kWh as compared with the modern 450 gr./kWh) will have

to be employed to maximum capacity. It is also anticipated that blast furnace gas, hitherto very inefficiently utilised, will become available in greater abundance, i.e., by 1951, 14.5 milliards cu.m. of 900 cal./cu.m., yielding 3.8 milliard kWh. All these estimates must take into account, too, the need for having reserve capacity in electricity generation to provide against excessively dry seasons which might have a disastrous effect on water-power.

It is not expected that the supply of necessary material and equipment will be an impossible task; but the labour position will be more difficult. It will be necessary to increase the number of workers very quickly from 22 000 (including 7 000 war prisoners) to 50 000. It will be necessary, furthermore, to look to American and Swiss collaboration for some of the more specialised hydro-electric equipment. Though it is hoped that French suppliers may be in a position to deliver all the boilers, turbines and alternators required, as well as other equipment, a certain amount of plant has already been ordered from abroad; transformers from England, and miscellaneous gear from Switzerland and the U.S.A. Delay in imports from the last named may hold up certain important hydro-electric works.

Shortages In Lighting Fittings Industry

SHORTAGES of essential raw materials are held responsible for curtailing output of electric light fittings and delaying recovery, according to the annual report of the Electric Light Fittings Association for the year 1946. Unprecedented national demands for sheet steel gravely handicapped production of many types of fittings, and a regular flow of non-ferrous metal, glass, paint, plastic powders, etc., was not forthcoming to ease the production situation.

Reviewing the activities of the association during the year, the report states that in view of the very large number of firms now entering the fittings industry, the Council's attention has been directed towards setting up an associate class of membership to which such firms can be admitted, subject to general acceptance by full members. Admission to this class of membership for a probationary period, it is felt, would be of assistance to the future well-being of the industry and to the maintenance of good trading practice. The total membership of the association is at present 45.

CERAMICS AND LAMP HOLDERS

Efforts have been made to secure supplies of porcelain lamp holders from overseas, since the available capacity of the ceramics industry in this country has been almost entirely taken up by Government housing contracts and for other official purposes. Similarly, attention has been given to the possibility of obtaining lighting glassware from foreign sources.

Referring to the need to preserve sight and economise use of fuel by the employment of well-designed lighting fittings, the report discloses that an approach has been made to the Chancellor of the Exchequer, suggesting the abandonment of purchase tax on these articles. The matter is now under consideration.

Among subjects considered by the technical committee during the year were street lighting, vitreous enamel and other finishes and the standardisation of bi-pin lamp caps and holders for fluorescent lamps.

NEW OFFICERS

Mr. A. J. Burbidge (General Electric Co., Ltd.) has been re-elected president of the association and chairman of the Council for 1947, and the Council for 1947 has been elected as follows:—

For decorative and commercial fittings section: Messrs. E. Barnard (Falk Stadelmann and Co., Ltd.), M. H. Galsworthy (Galsworthy, Ltd.), S. W. Hamlyn (Dernier and Hamlyn, Ltd.), C. Harvey (C. Harvey and Co.), A. Mansell (Edison Swan Electric Co., Ltd.), H. C. Pride (F. H. Pride, Ltd.).

For industrial fittings section: Messrs. N. C. Hodson (Veritys, Ltd.), A. E. Iliffe (Benjamin Electric, Ltd.), F. W. Norris (Revo Electric Co., Ltd.), D. H. Ogley (Wardle Engineering Co., Ltd.), F. W. Thorpe (F. W. Thorpe, Ltd.), K. Scott Adie (Rowlands Electrical Accessories, Ltd.).

For street lighting fittings section: Messrs. C. Hughes (Siemens Electric Lamps and Supplies, Ltd.), W. C. Huston (British Thomson-Houston Co., Ltd.), J. J. Leggett (Electric Street Lighting Apparatus Co.), W. T. Souter (Holophane, Ltd.), E. Stroud (Brighton Lighting and Electrical Engineering Co., Ltd.), G. J. Wells (Engineering and Lighting Equipment Co., Ltd.).

Electrical Personalities

We are always glad to receive from readers news of their social and business activities for publication in this page. Paragraphs should be as brief as possible.

MR. LESLIE STEPHEN RICHARDS has recently been appointed electrical engineer to the Henley's Tyre and Rubber Co., Ltd., at their Gravesend works. He has a wide electrical experience, having commenced his electrical career with the Felixstowe electricity department, with whom he held various positions until August, 1940, when he took up work of national importance as section engineer at various ordnance factories for the Office of Works. Mr. Richards was appointed services electrical engineer with Imperial Chemical Industries, dyestuffs division, in 1946, leaving later to become assistant electrical engineer with the St. Anne's Board Mill Co., Ltd., at Bristol.

MR. L. S. RICHARDS

LIEUT.-COL. S. C. GUILLAN, T.D., has been appointed secretary of the Institute of Metals and editor of its publications. He will take up his duties with effect from July 1.

MR. S. D. THORP, who was employed in the contracts department of A. Reyrolle and Co., Ltd., Hebburn, has been appointed technical assistant with the Ilford electricity department.

MR. LESLIE C. GAMAGE, vice-chairman and joint managing director of the General Electric Co., Ltd., president of the Institute of Export, and chairman of the B.E.T.R.O., took part in the B.B.C. discussion on "Britain's Crisis—Ways and Means," on June 5.

MR. A. C. GIBBS, consumers' engineer with the Boston and District Electric Supply Co., Ltd., since 1938, has taken up an appointment at Eastbourne. His successor is Mr. James H. Fairhead, who for a number of years has been with the Mid-Lincs. Electric Supply Co., Ltd., in the Spilsby, Skegness and Lincoln districts. Mr. Gibbs was district engineer at Holbeach before going to Boston.

MR. A. A. SHOEBRIDGE, assistant commissioner of the New South Wales Department of Road Transport and Tramways, and Mr. S. B. Berry, of the same department, have arrived in London, where they are studying the working of the transport system. They are also interested in the progress of orders for British 'bus chassis.

MR. TORVALD V. MALMSTROM, assistant director of the Royal Academy of Engineering Sciences, Sweden, is in this country for a two-week visit under the auspices of the British Council. He will, during his stay, visit among other places the Intelligence Division of the D.S.I.R., the N.P.L., the E.R.A., the E.D.A. and the E.A.W.

MR. ARTHUR MANSELL has resigned his position as manager, lighting section of the Edison Swan Electric Co., Ltd., and has been appointed manager to R. and A. G. Crossland, Ltd. Originally with the British Thomson-Houston Co., Ltd., Mr. Mansell was transferred to the Edison Swan Electric Co., Ltd., in 1929. Mr. Clifford P. Banham has been appointed manager of the lighting section as from June 2. Mr. C. P. Banham was trained with the B.T-H. Co., Ltd., at Rugby, and subsequently transferred to the illuminating engineering department of the Edison Swan Electric Co., Ltd., in 1929.

MR. A. B. WILDSMITH, assistant director to the Electrical Wholesalers' Federation, has been appointed director and secretary of the federation in succession to Mr. A. Albrecht, who died last month. Mr. Wildsmith was born in 1893 and educated at Douai Abbey, Woolhampton. He served in the R.F.A. from 1914-1919. On demobilisation he joined the Edison and Swan Co., Ltd., being their West End and later their export representative in London until 1922. After three years with a firm of wholesalers, Mr. Wildsmith, with Mr. E. D. Young, commenced operations as electrical wholesalers under the title of Young and Wildsmith, Ltd. In 1929 this firm became a member of the E.W.F., on the Council of which Mr. Wildsmith served from 1934 to 1939. In 1939 he resigned his interests with

MR. A. B. WILDSMITH

Young and Wildsmith and took up the appointment of assistant director to the E.W.F.

MR. H. E. GOODRICH, M.P. for North Hackney, and chairman of the London and Home Counties J.E.A., it is reported, is about to take up a Government appointment, possibly on the Electricity Commission.

LORD FORRESTER, managing director of Enfield Cables, Ltd., who was seriously injured by a fall in Portugal some weeks ago, has returned to England and is making good progress towards recovery at Oxford, where he is undergoing special treatment.

MR. JOHN A. SUMNER, city electrical engineer, and Mr. W. G. Weston, chief administrative officer, Norwich electricity department, have been elected chairman and hon. secretary, respectively, of the newly constituted Norwich group of the Institute of Industrial Administration.

SIR EDWARD APPLETON, secretary of the Department of Scientific and Industrial Research, received the honorary freedom of Bradford at a special meeting of the City Council on Monday, convened to mark the centenary of the incorporation of the borough of Bradford.

MR. W. NITHSDALE, resident director at Hartlepool for Richardson, Westgarth and Co., Ltd., received a presentation on the occasion of his retirement. He said that the company were now firmly established in the production of generating machinery.

MR. N. HUNTER and Mr. J. P. Wadling contributed a paper on ship welding on the Tyneside at a three-day summer conference held by the Institute of Welding at Newcastle-on-Tyne last week. Mr. R. C. Thompson and Mr. J. P. Allan dealt with ship welding on the Wear, and Mr. J. A. Dorrat, of the North-Eastern Marine Engineering Co., Ltd., lectured on welding as applied to marine engineering. At a dinner at Newcastle, Mr. N. Hunter asserted that everything the Americans had done during the war in the way of welding to expedite the building of ships had been learned from this country. Mr. H. B. Robin Rowell (Hawthorn Leslie and Co., Ltd.), proposing the toast of "The Institute of Welding," said that welding was a coming feature of shipbuilding. The delegates toured about 26 shipyards and engineering works in the North-East. Mr. A. Dyson, national president of the institute, attended the conference.

Obituary

SIR ALEXANDER GALLOWAY ERSKINE-HILL, on June 6, aged 53 years. He was on the boards of some 15 companies, including the L. and N.E.R. the Scottish Power Co., Ltd., and the Metropolitan Electric Supply Co., Ltd.

MR. LEONARD F. SPEARING, personnel manager of Philips' Blackburn Works, on June 4, aged 46 years. Mr. Spearing had served the company for 18 years, first as production manager at the Mitcham works, and then at Blackburn when the works there were opened. He was appointed personnel manager in 1942. He was vice-chairman of the sports' club.

MR. L. F. SPEARING

MR. E. L. REEVE, chairman of the Executive Committee of the Crompton-Parkinson Sports Club at Chelmsford, on June 8, aged 47 years. He collapsed and died at Shenfield, Essex, on Sunday while training for a long-distance walk.

MR. FRANK HODGES, one of the original members of the Central Electricity Board, on June 3, aged 60 years. He was formerly secretary of the Miners' Federation of Great Britain, and also secretary of the International Miners' Federation, an office he retained until 1926. Elected to Parliament as the member for Litchfield in 1923, he was appointed a Civil Lord of the Admiralty in the first Labour Government. After leaving the Miners' Federation he became associated with colliery and engineering undertakings. He was a member of the C.E.B. from 1927 until his death.

MR. F. HODGES

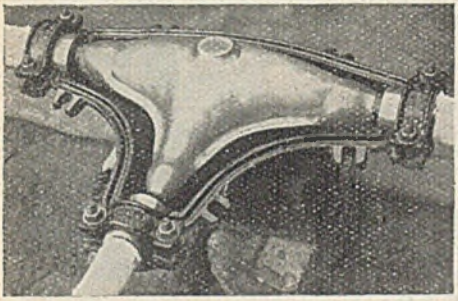
PROF. W. H. M'MILLAN, Hood Professor of Mining at the University of Edinburgh and Heriot-Watt College, on June 9, aged 61 years. In 1940 he was temporarily released to take up the position of mining supplies officer for the Scottish region under the Ministry of Fuel and Power, and returned to his university duties in September, 1945. Prof. M'Millan was a member of the I.M.E. Council and Special Lighting Committee. He was also a member of the Institute of Fuel and other bodies.

MR. OSWALD WERNET, of Newport, retired electrical engineer, left £4 335 (net £3 721).

Equipment and Appliances

Pressed Copper Service Boxes

A new accessory made by British Insulated Callender's Cables, Ltd., for electrical mains installations and jointing work—the pressed copper service box—is being produced at a time when materials for the familiar lead box are in very short supply.

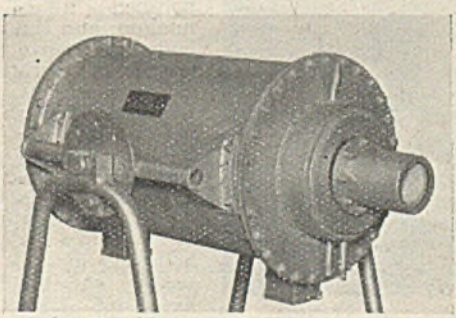


The pressed copper service box inserted in a cast iron protector

The copper box, the makers point out, is a new product and should not be regarded as a substitute, but as an alternative to the lead box, since it offers many advantages over the established type. Foremost among these is greater mechanical strength combined with lightness. The copper box will withstand more rough treatment in handling, in transit or in storage than a lead box, and consequently it arrives in the jointer's hands in much better shape. This means that he does not have to spend his time dressing out dents, or making lengthy preparations for jointing and plumbing, when he could be getting on with the main part of his work. For a given weight many more copper boxes can be stored, loaded or transported than can lead, and the lighter copper boxes are much easier for the jointer to handle. The robustness of the boxes, it is claimed, also simplifies the problems of the supply engineer whose work is held up for lack of the necessary cast iron protection boxes. Although primarily designed for use in protection boxes, the pressed copper box is more adaptable to improvised methods of protection against mechanical damage and corrosion. Where cast iron protection boxes are not considered necessary, cover tiles can be placed below and above the box, with bricks round the sides ready for filling with compound. An efficient bonding attachment is available for use in such cases. The boxes are made in two halves from hot tinned copper sheet $\frac{1}{32}$ in. thick. A range of eight boxes caters for the usual sizes of branch and main cables, the larger boxes being ribbed for greater strength. By virtue of the special design of the cable entries, each box will accommodate a range of cable sizes, the copper sheet being scored axially so that it readily opens up to form " fingers " to fit the cable sheath. Filling of the box is effected through a central flanged hole in the upper half, both the filling hole and the cap being made oval to prevent rotation of the cap during the wiping operation.

High Temperature Tube Furnace

Designed for work at temperatures up to 1 700° C., the tube furnace illustrated below is one of the most recent products of Wild-Barfield Electric Furnaces, Ltd. The furnace is mounted on trunnions supported by a tubular steel framework. Lock-nuts are provided to hold the tube either vertically or horizontally. An external cylindrical casing of mild steel contains high-temperature insulation surrounding a refractory tube containing refractory granules, which itself surrounds a further tube in which is embedded a molybdenum winding. The tube proper of the furnace is made of high-temperature refractory material, and a space is left between this and the tube containing the winding. Water jackets are located at the ends of the equipment to prevent overheating there, suitable water inlet and outlet pipes being provided. To prevent oxidation of the winding, an inlet for a suitable atmosphere is provided at one end. The gas passes between the furnace tube and the winding and is then led away. Wedge type seals prevent gas



This Wild-Barfield high temperature furnace may be used vertically or horizontally

escape at the ends of the equipment. Lead-outs from the heating winding are taken to gas-tight terminals. The furnace

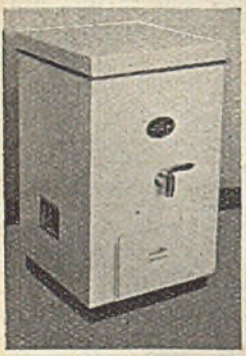
is rated at 12 kW, and the dimensions of the tube are 3 in. diameter by approximately 1 ft. 10½ in. usable length.

Capacitance-Resistance Bridge

The first product of Thrush Radio and Electrical Industries, of 1, St. Thomas's Square, London, E.9, a firm recently formed to manufacture radio receivers and scientific instruments, is a capacitance-resistance bridge with an accuracy of ± 2 per cent. The instrument employs a Wheatstone bridge circuit, the two ratio arms being made variable and consisting of a calibrated potentiometer which gives direct ratio readings. The third arm is the internal standard selected by the range switch, whilst the component under test constitutes the fourth arm. A 50 cycles voltage is applied to the bridge and the out-of-balance voltage is fed to a dual purpose "magic eye" valve to give a visual indication of balance. Using the internal standards, the bridge will measure capacitance, in three ranges, from 5 pF to 50μF, and resistance from 5 Ω to 50 MΩ. Capacitance, resistance and inductance measurements may also be made against external standards, and a leakage test is available for most types of condenser. Power factor, given as a direct percentage reading, may be measured on condensers of from .05 to 50μF. The bridge, which weighs 4½ lbs., has a power consumption of approximately 8 W, and is housed in a black crackle-finished case.

Electric Home Laundry

Production at the Blackwood, Monmouthshire, factory of South Wales Switchgear, Ltd., will start this month on a newly designed electric hand-operated home laundry. The top casting of the unit is of polished aluminium, and the body is stove enamelled with a toe recess at the base. When not in use, the unit is covered with a vitreous enamelled table top. The wringer is normally housed in a recess at the base of the machine, and is attached to the top casting when in use by clamping a single knurled screw. The hand-operated washing unit is a combined lid and agitator, the lid being of pressed aluminium through which passes a stainless steel spindle carrying at one end an aluminium die-cast paddle and at the other the operating crank and handle. The boiler is available for 200-250 V. The total loading is 3 kW and two switches give three-heat control.



A forthcoming electric washer, built by South Wales Switchgear, Ltd.

Self-Contained Infra-red Lamp

A new Mazda infra-red lamp, now being produced by the British Thomson-Houston Co., Ltd., is considered to be a major advance in the science of infra-red drying and baking for industrial purposes. The new lamp, which is rated at 250 W, has a parabolic shaped bulb with a satin frosted crown. The lower half of the inside surface of the bulb is silvered to form an internal reflector which concentrates the infra-red rays from the lamp. A mechanically attached (non-cement) cap enables the lamp to withstand the severe heating conditions in an infra-red oven. The new lamp is a self-contained unit which enables any form of external reflector to be dispensed with. The contour of the internal reflector is such that the beam has a narrow spread of not more than 120° and, by suitable spacing, it is easy to arrange a bank of fittings so that the resultant energy field is evenly spread within narrow limits. Lamps can also be mounted much closer together since there are no external reflectors to be accommodated and this, in turn, permits a higher degree of concentration where it is desirable. The new lamp is considerably lighter than the combination of lamp and external reflector and this makes it eminently suitable for portable or transportable banks, in such places as garages and repair shops where it may be necessary to bake relatively small areas of paintwork. In order to maintain its initial efficiency, a reflector which is exposed to the atmosphere must be given constant attention to prevent the tarnishing of its polished surface. The reflector in the new lamp is protected by the glass bulb which is very easy to keep clean. Owing to the low temperature of the filament, the reflector is subject to very little blackening and it maintains its initial degree of efficiency almost to the end of lamp life.

The new Mazda 250 W internally silvered infra-red lamp

Electricity Supply

Chester.—The Corporation is to seek sanction to borrow £7 000 for the purchase of electrical instruments and meters.

Burnley.—The R.D.C. has approved a lay-out by Lancashire Electric Power Co., of a proposed new power station between the railway and river Calder, at Padiham and Northtown.

Torquay.—The Corporation is seeking permission to borrow £5 000 to be expended on the purchase of consumers' apparatus and £1 867, for the provision and laying of cables between Albert Road and Upton Valley sub-station.

Guildford.—The B.C. has received from the Hambledon R.D.C. an application for a supply of electricity to a new housing estate at Bramley, made up of 16 permanent houses; the estimated cost of the scheme is £2 032. The Council has under consideration a scheme for supplying electricity to a new housing estate at West Clandon, at an estimated cost of £2 815.

Barrow-in-Furness. — The Corporation proposes laying an additional distributor a cost of £2 600, and reconstructing and laying a 5-way kiosk at Cartmel at a cost of £6 000, a kiosk and mains extensions at Bardsea at an estimated cost of £1 150, a kiosk at Rampside to control incoming and outgoing lines and to facilitate the stepping-up of this area, from 6 600 V to 11 kV, at a total estimated cost of £1 800.

Scarborough.—The T.C. is applying for sanction to borrow £15 000 for mains and services, £10 000 for sub-stations and equipment, £4 000 for meters, and £1 000 for consumers' apparatus. The T.C. has decided not to take any action to secure a remission of purchase tax on essential domestic electrical appliances. No action is also to be taken on a recommendation by the I.M.E.A., to secure an amendment of the Electricity Bill.

Stockton-on-Tees.—The T.C. has accepted the tenders of A. Reyrolle and Co. Ltd., and W. Lucy and Co., for switchgear and C. A. Parsons and Co., Ltd., for transformers in connection with extending supply at the Phœnix Works and additions to the Station Road sub-station, Norton, and the new Eastbourne Estate substation. The Borough Electrical Engineer has reported to the T.C. on the effects of the Council's development scheme on the undertaking. He stated that the old transformer station at present within the gasworks was urgently needed by the gas department and provision should be made for a new transformer station on another site, and also that in place of the present showrooms and offices which would have to be removed if the scheme was adopted, provision should be made for improved accommodation on a suitable site in the High Street area. The Engineer stated that he had no objection to the future transformer station, testing station, stores, etc., being situated to the north of Church Road.

Carlisle.—The first report of a municipal undertaking to reach this journal for the financial year ended March 31, 1947, has been received from Mr. A. C. Thirtle, electrical engineer of the city electricity department. The statement of accounts shows an excess of income over expenditure of £65 365, leaving a net surplus of £3 549, compared with £2 448 in the previous year. Units sold for the year amounted to 50 659 762, an increase of 10.3 per cent. The maximum demand recorded was 17 220 kW, compared with 17 635 kW, and the load factor (units sent out) rose from 35.6 per cent., in 1945-46, to 39.4 per cent. The analysis of units sold shows an increase of 42 per cent. during the year in the consumption of farms, and on 253 dairy and arable farms greater than 30 acres an average consumption of 3 827 units per farm, at an average price per unit sold of 1.23d., was recorded. Comparing the rise in working costs with increases in electricity charges over the war period, the report points out that since 1940, fuel has increased by 170 per cent., salaries and wages (for the same personnel) by about 50 per cent., and sundry stores and replacements by 58 per cent. Over the same period, the average price received for units sold has risen by 9.1 per cent. only, from 1.22d. to 1.33d. per unit. Charges to farms and some miscellaneous consumers are now below pre-war rates and the largest increase in price, of 26.4 per cent., has been for supplies to factories and workshops. There was no change in the capacity of the Willow Holme generating station during the year, which was run as a base-load station for the C.E.B., only 17 per cent. of the units sent out being used in the Carlisle area of supply. The efficiency of the station on a units-sent-out basis was 22.7 per cent., the modern high-pressure plant being responsible for 86.9 per cent. of the output at a thermal efficiency of 24.56 per cent.

Contracts Open

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

Madras, June 19.—Supply, delivery, erection and commissioning of switchgear, reactors and auxiliary equipment for the Basin Bridge "B" power station. Specifications from Messrs. Merz and McLellan, Milburn, Esher, Surrey; deposit £5 5s. for first copy and £2 2s. for subsequent copies.

Middlesbrough, June 21.—Supply and delivery of street-lighting equipment. Specification from Borough Electrical Engineer, Corporation Electricity Works, Snowdon Road, Middlesbrough; deposit, £1 1s.

Manchester, June 23.—Supply and delivery of 24 415 V a.c. sub-station switchboards and supply, delivery and erection of two mercury arc rectifier equipments at Mount Road and Gorton substations. Specifications from Chief Engineer and Manager, Electricity Department, Town Hall, Manchester, 2; deposit, £1 1s.

Exeter, June 25.—Supply, delivery and erection of 6.6 kV metal-clad feeder switchgear. Specification from City Electrical Engineer, Electricity Offices, 46, North Street, Exeter.

Manchester, June 27.—Supply, delivery and supervision of erection at the waterworks hydraulic power station of one electrically-driven submersible borehole pump with starting and control gear, etc. Specification from the Secretary, Waterworks Offices, Town Hall, Manchester, 2; deposit, £1 1s.

Warrington, June 30.—Supply of transformers. Specifications from Borough Electrical Engineer, Electricity Works, Warrington; deposit, £1 1s.

Chester, June 30.—Wiring of 148 houses on Blacon housing estate. Specification from City Engineer and Surveyor, Municipal Offices, Chester; deposit, £1 1s.

Manchester, June 30.—Supply, delivery and erection of lifting gear for i.d. fans for Nos. 71 and 72 boilers at Stuart Street generating station. Specification from Chief Engineer and Manager, Town Hall, Manchester, 2; deposit, £1 1s.

Birmingham, July 1.—Supply and delivery of one 20 MVA, 32/11 kV, outdoor O.N. type three-phase transformer. Specification from Chief Engineer and Manager, Electric Supply Department, 14, Dale End, Birmingham, 4; deposit, £2.

Pretoria, July 1.—Supply, delivery and erection of one 180 000 lb. and one 27 000 lb. overhead electric travelling crane. Specifications from City Electrical Engineer in Pretoria or from Messrs. Merz and McLellan, Carliol House, Newcastle-on-Tyne, 1; deposit, £2 2s.

Birmingham, July 1.—Supply, delivery, erection, testing and putting to work of cast iron water pipework (up to 8 in. diameter) and associated valves, hydrants, fittings, etc., required at Hams Hall "B" station. Specification from Chief Engineer and Manager, Electric Supply Department, 14, Dale End, Birmingham, 4; deposit, £2.

Burnley, July 1.—Work and equipment in connection with new electrical laboratory at the Municipal College: (a) Supply and installation of bus-bar assemblies in suitable trunking system; (b) supply and installation of wiring, conduit, switchgear, panels, etc., between machine sets, bus-bars and test benches; (c) supply of transformer equipment; (d) supply of various measuring instruments. Specifications from Director of Education, Education Offices, Burnley.

Bankside Station

REPLYING to questions in the House of Commons on Tuesday, Mr. Silkin stated that he was now satisfied that sulphur and other noxious fumes from the Bankside power station could be eliminated. In order to ensure that the design of the plant to be installed was satisfactory, a pilot gas-washing plant was to be constructed, and when the results of this were available, the Electricity Commissioners would consult with the Ministers of Health and Works. He would keep in touch with these discussions.

As regards noise, Mr. Silkin said that the Electricity Commissioners imposed a condition in giving their formal consent that the undertakers should provide efficient methods for ensuring the avoidance of noise, and he had no reason to think that a difficulty would arise.

Mr. Silkin said that the station site had been decided and he did not propose to re-open the matter. The Royal Fine Art Commission would be consulted on the design of the building.

Industrial Information

Radio Manufacture in India

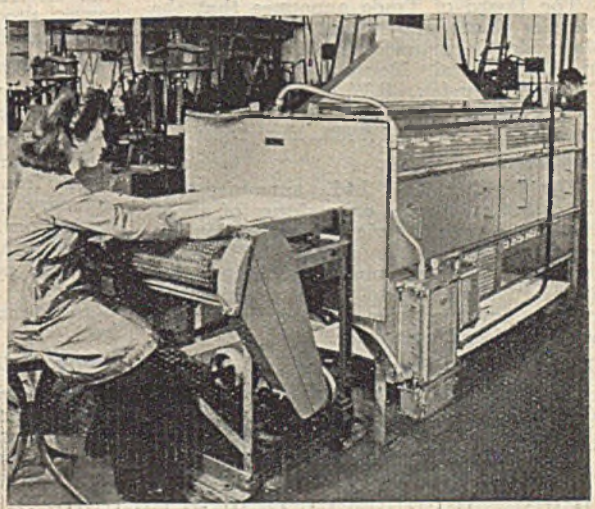
The establishment of an extensive radio manufacturing concern in India backed by the British firm of E. K. Cole, Ltd., of Southend-on-Sea, is being planned on a joint British-Indian basis. A suitable site for this new venture in Hyderabad has been located by two representatives of the British company. Technicians from this country will assist the Indian representatives of the British undertaking.

Site for New Cable Factory

In 1945 W. T. Henley's Telegraph Works Co., Ltd., acquired a factory at Birtley, Co. Durham, and have since been producing certain classes of electric cables at this small factory to augment the output of their southern factories at North Woolwich and Gravesend. They have now obtained an extensive site at Newtown, a little way to the south of Birtley. The civil engineering work has commenced and arrangements have been made to proceed with the erection of the new cable factory as quickly as possible.

Drying Balsa Wood by Infra-red Oven

The International Model Aircraft Co. carry on a considerable home and export trade in model aeroplane kit sets, and to speed up production they installed recently the Metrovick electric infra-red oven shown in the accompanying illustration for drying the balsa wood sheets from which the sets are made. Before the design of the parts is impressed, the balsa wood sheets are soaked in water; this prevents tearing of the fibres and ensures that a clean line is impressed. Depending on the season, air drying took days or even weeks; with the electric infra-red oven, the drying time is four minutes. The plant, fitted with 80 Metrovick infra-red lamps having a loading of 20 kW, measures 8 ft. by 4 ft.



Electric infra-red plant for drying balsa wood sheets for model aircraft

E.I.B.A. Annual Meeting

The annual general meeting of the Electrical Industries Benevolent Association, and also an extraordinary general meeting for the purpose of changing the designation of "Life Member" to "Senior Member" under Rule 4 of its constitution, will be held at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2, at 11.30 a.m., on Thursday, July 24.

A.I.Lg. Centenary Celebrations

In connection with the centenary celebrations of the Association des Ingénieurs sortis de l'Ecole de Liége (A. I. Lg.), an International Exhibition of Scientific Research and Industrial Control will be held at Liege from August 2 to September 28, and there will be a congress on the past, present and future of Belgian industry from August 30 to September 14. There is to be an electrical section in the exhibition and over sixty speakers will deal with electrical subjects at the congress.

Copper Alloy Sand Castings

The publication of the Code of Procedure in Inspection of Copper-Base Alloy Sand Castings (B.S. No. 1367-1947) by the British Standards Institution represents an interesting and important development. It is the purpose of the code "to indicate procedures which will give the maximum possible information on the properties of sand castings with reasonable expenditure of materials, time and labour, and to standardize inspection procedure in order to facilitate industrial inspection and ultimately to assist both the designer and founder in improving the quality of castings." Attention is drawn to the neces-

sity of close co-operation between the designer and the founder at all stages, and it is emphasized that this co-operation, particularly in the early stages, can greatly facilitate the work of both parties. Copies can be obtained from the British Standards' Institution, Publication Sales Department, 24, Victoria Street, S.W.1, price 2s. 6d., post free.

New Branch Premises

W. T. Henley's Telegraph Works Co., Ltd., announce that as from June 2, 1947, the address of their Liverpool branch will be Empire Buildings, Fazakerley Street, Liverpool, 3 (Telephone: Central 4066/7).

Flanders Fair

The second International Fair of Flanders will take place in Ghent between September 20 and October 4. The agents for South England are S. R. Tippett and Co., Ltd., and for the north, Robertson, Buckley Co., Berey's Buildings, George Street, Liverpool, 3.

Summer Dishes

Recipes for light, nourishing dishes suitable for hot weather are given on the "Cheerful Rationing" card for June, issued by the Electrical Association for Women, 35, Grosvenor Place, London, S.W.1. These include cream of carrot soup, carrot flan, cherry flan, and several new sandwiches.

Plastics Material Section

The Board of Trade announce that the Plastics Material Section of the Raw Materials Department has been removed from Terminal House, 52, Grosvenor Gardens, London, S.W.1, to Horseferry House, Horseferry Road, London, S.W.1. (Telephone: Victoria 6800, Ext. 243.)

Expansion of Plant

The Distillers Co., Ltd., announce that they have authorised expenditure of about £2 000 000 with the view to expanding the output at the works at Salt End, Hull, belonging to their subsidiary, British Industrial Solvents, Ltd. The products involved cover solvents, plasticisers and acetic acid and anhydride.

Degrees in Building Science

In the third report, published for the Ministry of Works (Stationery Office, 1s.), the Building Apprenticeship and Training Council express a desire to see a number of fully developed degree courses in building science at universities, although they recognise that in some cases other arrangements may be more practicable, and they invite universities and all bodies interested in higher education for building to consider what contribution they can make to the development of building science. Among the employers' representatives on the Council is Mr. E. A. Reynolds, of the National Joint Industrial Council for the Electrical Contracting Industry.

Change of Address

The new address of the Mazda lamp and lighting department of the British Thomson-Houston Co., Ltd., is 9, Langley Road, Watford, Herts. (Telephone: 7701).

Lamp Tender

The tender of Thorn Electrical Industries, Ltd., for the supply of Atlas lamps to the L.N.E.R. has again been accepted for 12 months.

Nickel Bulletin

The May issue of the "Nickel Bulletin" covers in its abstracts "Magnetism and Magnetic Alloys"; "Supermalloy: High-Permeability Nickel-Iron Alloy"; "Production of Glass-to-Metal Seals: Technique and Materials"; "Repair-Welding of Cast Iron," and a "Symposium on Hardenability of Steel." Copies may be obtained free from the Mond Nickel Co., Ltd., Grosvenor House, Park Lane, London, W.1.

Industrial Electronics

An article, surveying the wide field of application of electronics and giving some indication of the economic factors involved, has been reprinted in booklet form by the Mullard Wireless Service Co., Ltd. In a brief introduction, the company stress the advantage of employing industrial electronics for the solution of manpower, production and quality problems to be met by manufacturers.

Fuel Abstracts

"Fuel Abstracts," a monthly summary compiled by the Fuel Research Station of the Department of Scientific and Industrial Research, is available to the general public from January of this year. The summary comprises more than 500 abstracts per month of the world literature on all technical and scientific aspects of fuel and power. It is published by the Stationery Office, Kingsway, London, W.C.2 (annual subscription £2 10s., post free).

Jubilee Celebrated

In celebration of their jubilee, George H. Scholes and Co., Ltd., electrical engineers and manufacturers, of Wylex Works, Wythenshawe, Manchester, who were incorporated in 1897, have distributed an attractive brochure, entitled "Half Century," in which is described the growth of the present extensive works at Wythenshawe from the electrical contracting business founded in Manchester in 1897 by the late Mr. George Hamer Scholes, who died in July last year. The present managing director, Mr. F. J. Pearce, started to work

for the firm in 1907. During the war the entire resources of the company were turned over to the production of switches and electrical control components designed for special requirements for aircraft.

P.T. on Car Radio Sets

The Treasury proposes to make purchase tax payable on wireless receiving sets designed for use on road vehicles.

Swedish Water Power

In a paragraph, supplied by the Swedish-International Press Bureau, which appeared under the above heading in our last issue, it was stated that since 1939 the output of water-generated power in Sweden had increased from 9 054 kWh to 14 000 kWh, the word "million" having been omitted. The figures should, of course, have read "9 054 million kWh" and "14 000 million kWh."

Radiolympia

Applications for space in the National Radio Exhibition to be held at Olympia, from October 1 to 11, 1947, exceeded the space available and made it necessary to re-arrange the lay-out of stands in the Grand Hall and to provide extra stands in the National Hall Gallery. The adjustments in the Grand Hall made available 24 centre stands, approximately the same size, so meeting the needs of leading firms which had planned large exhibits. The ballots were carried out on June 4 and 5. One hundred and seventy-five firms have taken space.

Big Works Extensions

The Newcastle-on-Tyne City Council has decided to allow C. A. Parsons and Co., Ltd., to use, for works extensions, land originally intended for educational purposes. The proposed developments, it was stated, involved the expenditure of about £1 500 000. Sir Claude Gibb, chairman of the firm, stated that the land, which was urgently needed, was the only suitable site available. The company had plans in hand for two new bays—the first of six to be built. These extensions would enable the firm to transfer some of its business from the Heaton works and thereby release additional capacity for making transformers and alternators.

Export Catalogue

In addition to the English edition, the export catalogue for 1947 just issued by the Gauge and Tool Makers' Association, has been printed in the French, Spanish and Portuguese languages, and an initial 14 000 copies are being mailed overseas to actual and prospective buyers and importers of British precision tools and gauges. The catalogue, which is of handy size and admirably produced, includes a buyers' guide index intended to serve as a general indication of the products available for export, an illustrated section displaying the principal manufactures of the firms and an alphabetical list of members.

Trade Publications Received

A catalogue of Clix and Genacco electrical accessories recently issued by the General Accessories Co., Ltd., of 21, Bruton Street, London, W.1.

A new illustrated publication (No. S.G. 111) issued by the English Electric Co., Ltd., Queen's House, Kingsway, describing their range of air-compressor equipments, type "A.C."

Four radio component brochures published by the Plessey Co., Ltd., Ilford, Essex, describe in some detail, with illustrations, ranges of variable condensers, trimmers, loudspeakers and switches.

A booklet entitled "Bakelite Progress," with coloured illustrations, published by Bakelite, Ltd., 18, Grosvenor Gardens, London, S.W.1. It describes, among other products, plastic printing materials.

The new catalogue of Metway Electrical Industries, Ltd., King Street, Brighton, giving particulars and prices of their iron, kettle, toaster, and fire elements, fire spirals and tubular bars.

New publications by Protolite, Ltd., Central House, Upper Woburn Place, London, W.C.1, giving details of their "Prolite" tungsten carbide tube drawing plugs, lathe files, tungsten carbide bar drawing dies and tube drawing dies.

An illustrated booklet issued by the publicity department of Lancashire Dynamo and Crypto, Ltd., 204, Great Portland Street, London, W.1, describing electrical equipment for gas works manufactured by the L.D.C. group.

Machine Design Application Sheet No. 94 from the Lincoln Electric Co., Cleveland 1, Ohio, U.S.A., giving details of the welded design of a precision tapping machine, and pointing out the advantages of the use of arc-welded steel.

We have received from Oerlikon, Ltd., a serviceable red binder containing Nos. 253, 254, 255, 256 and 257 of the "Bulletin Oerlikon" dealing with, among other subjects, "Shunting Locomotive C.-C. of the French State Railways for Hump Duty," "Utilisation of Waste Heat in Steam Turbine Plants," "Conveyor Installations and their Control," "The New Bristen-Gobzern Aerial Railway," "Steam-Air Plants for Simultaneous Production of Mechanical Energy and Heat" and "Increased Output of Tramway Motors with Less Space for Mounting."

Company News

CABLE AND WIRELESS (HOLDING), LTD.—Div. on ord. stock 4%, less tax, payable July 15.

LEWES AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Net rev. for 1946 £21 072 (£17 765); after exes., deprecn. and taxn., there remains £7 274 (£3 612). To div. 10% (same), fwd. £6 758 (£3 279).

NATIONAL ELECTRIC CONSTRUCTION CO., LTD.—Net prft., 1946, after £23 500 (same) taxn., £37 966 (£30 757). Div. 10% (same) and £27 791 (£20 582) to undivided prfts. acct., mkg. £249 529 (£221 738).

KEITH BLACKMAN, LTD.—Prft. for yr. to March 31 £76 607 (£88 689), E.P.T. post-war refund £22 876, brot. in £45 370, avail. blce. £144 853. To tax provn. £32 000 (£40 500), foundry reconstruction £10 000 (£15 000), defrd. reprs. £2 000, devt. res. £22 876 (nil), pref. div. (net) £6 050, proposed ord. div. 20% £27 500; fwd. £44 427.

RIVER PLATE ELECTRICITY AND OTHER SECURITIES CORPORATION.—Gross divs. and int. recvd. during yr. ended April 15 £77 649 (£77 341), less tax, lvg. £42 797 (£39 361); after allowing for £2 544 (£2 929) inc.-tax recovered and deducting sals., etc., and £1 500 (£1 150) for prfts. tax, there remains £39 740 (£37 027), to res. £10 000 (same), fin. 5 p.c., making 8 p.c. (same); fwd. £17 528 (£17 230).

PARA ELECTRIC RAILWAYS AND LIGHTING CO., LTD.—At a recent meeting of the 6 per cent. debenture stockholders, at which resolutions prolonging the moratorium were approved by the stockholders, the Chairman said: "Your board have received news that with the object of ensuring an adequate supply of power to local factories the tramway service was suspended as from April 17 by order of the authorities. We are unable as yet to judge exactly what effect this suspension will have upon the position of the company, which it cannot be denied remains precarious."

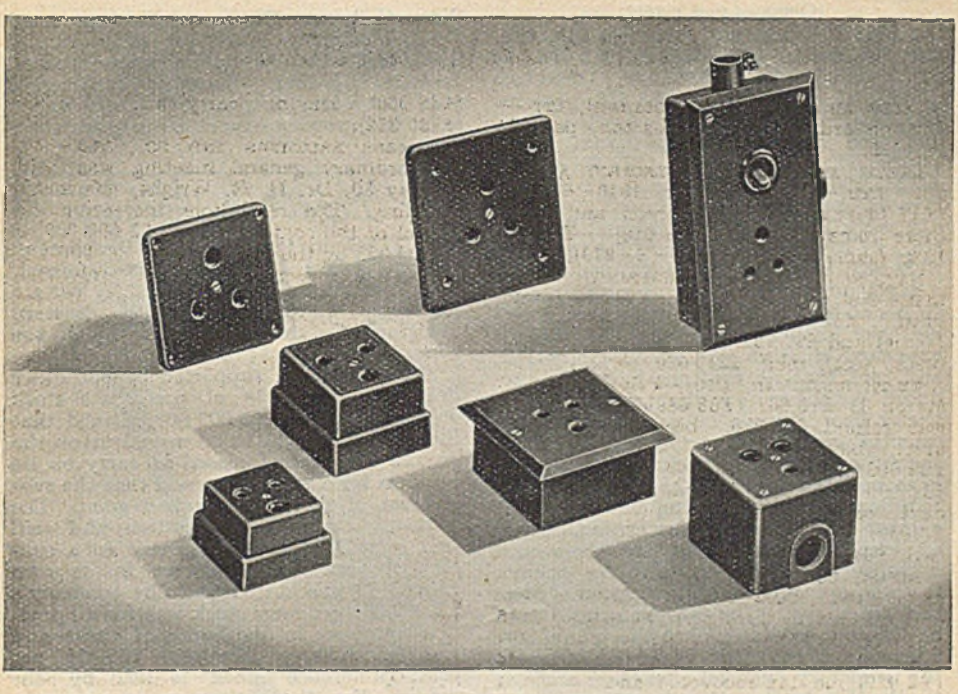
AUTOMATIC TELEPHONE AND ELECTRIC CO., LTD.—Dirs. announce final div. of 7 p.c. on ord. stock, making 10 p.c. for year, and in addition a cash bonus of 2½ p.c., both subject to inc.-tax. A div. of 10 p.c. on the deferred stock and shs., plus cash bonus of 2½ p.c., both subject to inc.-tax, also being paid. Profits for 1946 £456 942, including £193 000 rev. provisions no longer reqd. (last year £658 304 after deductg. £177 412 addnl. rev. provis. required); E.P.T. requires £136 046 (£320 057); dirs.' fees £1 624 (£2 279); deprecn. £80 701 (£75 894); inc.-tax on year's profits £131 562 (£138 381); transfer to reserve nil (£18 000), leaving carry-fwd. £178 360 (£150 852).

SIEMENS BROTHERS AND CO., LTD.—An extraordinary general meeting was held on May 30, Dr. H. R. Wright, chairman, presiding. The resolutions increasing the capital of the company from £3 000 000 to £4 000 000 by the creation of 1 000 000 4% cumulative redeemable second preference shares and the alteration of the articles of association consequential thereto were passed unanimously. The chairman stated that the documents relating to the offer of the 4% cumulative redeemable second preference shares would be sent out to stockholders at the same time as the annual accounts and notice of the annual general meeting, which will be held towards the end of this month or early next.

VACTRIC, LTD.—Sir Frederick Whyte (chairman) presided at the annual general meeting recently. In the course of his address, he stated that the balance sheet revealed a much stronger position than that of the previous year. The company already held an established position in the manufacture of vacuum cleaners and floor polishers, but they had now made an agreement with an American company for the manufacture of an electric washing machine. They had taken active steps to acquire the equipment required for the new programme, and had trained a labour force in Scotland which would serve the needs of a new factory, where they intended to employ three times as many workers as they now did at Chapenhall.

BRITISH INSULATED AND CALLENDER'S CABLES, LTD.—Fst. full accts. now issued cover period of 18 mos. to Dec. 31 last. Consd. prft. and loss for 18 mos., shows trdg. prft. and misc. recpts £3 289 994, plus int. and divs. £87 335, prft. on sales of prop., etc., £148 199, mkg. £3 525 528, less dep. £725 558, dirs.' fees £53 271, int. on debs. £24 556, lvg. £2 722 143; prov. for tax requires £1 508 556, divs. to minority ints. £79 503, fin. div. 6 p.c., mkg. 10 p.c. for period, fwd. £535 063—being £39 943 attrib. to minority ints. and £495 120 to group. Parent co.'s prft. and loss shows trdg. prft. for period £1 584 170. Consd. blce.-sheet at Dec. 31 shows liabs.: Issued cap. of parent co. £11 219 175; cap. resrvs.: (a) amalg. surplus £3 835 776, (b) prov. fund £150 000, (c) contings. £1 000 000, (d) E.P.T. post-war refunds £61 610, from total of which is deducted £646 878 net prems. on acquistn. of shs. in subsids., lvg. resrvs. at £4 400 508; prov. for future

(*Continued on p.* 1614)



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Your enquiries will receive our careful attention.

NETTLE

VICTOR H. IDDON LTD. HARPER RD. WYTHENSHAWE. M/CR.

(*Continued from p.* 1612)

tax £516 801, prft. and loss blce. £495,120, ints. of minority holders £1 562 210, 4½ p.c. deb. stk. £363 788, creditors £5 888 045, tax prov. £1 688 878, pensions £612 537, divs. £339 046. Assets: Freehold and leasehold props., plant, etc., £6 881 372, less dep. £717 377, lvg. £6 163 995, goodwill, etc., £2 115 762, invests. at or under cost £1 907 328, stks. and work in progress £8 335 717, debtors, etc., £7 239 200, tax certs. £598 150, cash £725 956, blce.-sheet total £27 086 108.

ELECTRIC SUPPLY CORPORATION, LTD.—In his address at the annual general meeting, the chairman (Mr. A. J. Fippard) expressed criticism of the Electricity Bill, and said that no evidence had been produced to show how the proposed Electricity Boards would be able to provide an essential public service more efficiently than it was now being performed. The Bill gave no indications of the lines on which the Boards would operate, but there was a great risk of over-centralisation, and it was very difficult to see how these vast aggregations would be able to operate more cheaply than an organisation such as their company. The compensation terms, he thought, would damage the public confidence in a way that would far outweigh the temporary financial advantage accruing to the Electricity Boards through the acquisition of company undertakings on a basis involving such gross unfairness.

JOHNSON AND PHILLIPS, LTD.—In the course of his speech at the annual general meeting, Mr. G. Leslie Wates (chairman and joint managing director) said that although the immediate prospects were good and the net profit of the company was among the best yet reported, the long-term position of the industry as a whole was a matter giving rise to some anxiety. The demand for electrical products seemed limitless at the moment, but they had to envisage the time when Central Europe would again be producing and when the great industries of the U.S.A. would have overtaken their home demand. By then, it would be a matter of life and death for our own industries to have brought their manufacturing technique to the highest level of efficiency, so that costs would compare satisfactorily with those ruling in other parts of the world. Their order book the chairman went on, was the largest in the history of the company, but because of shortages many orders could not be completed for a period of two years or more. Reviewing the activities of the subsidiary companies, Mr. Wates said that Aurora Lamps, Ltd., of Old Kilpatrick, which they had owned for two years, had made steady progress, the limiting factor of sales being the supply of raw material. British National Electrics, Ltd., of Newarthill, near Glasgow, had been owned by the company since the early part of 1946, and was now making water heaters, cookers and fires. Shortage of materials was restricting output, but there was a good and growing export demand for these articles.

Legal Intelligence

SITTING in the Chancery Division on June 5, Mr. Justice Jenkins dismissed, with costs, a petition presented by certain preference stockholders of the Eastern Telegraph Co. for the winding up of the company.

The petitioners, supported by 662 other holders of £365 338 of preference stock out of a total of £2 000 000, alleged that the company ought to be wound up on the ground that it had ceased to carry on its business for a whole year and that the substratum of the company had gone. The company opposed the petition and said that it still continued to carry on a substantial part of its business in its own name. It was stated that the company's £5 000 000 ordinary stock was for all practical purposes in the hands of Cable and Wireless Holdings, Limited. The 3½ per cent. preference stock is held by the public. For the petitioners it was submitted that since the end of 1946 the company was entitled to nothing except to share in a claim against the Government. For the company it was stated that their shareholding in Cable and Wireless, Limited, had now passed to the Government, from whom the directors had to recover proper compensation. It was premature to consider a winding up.

Giving judgment, Mr. Justice Jenkins said that there was evidence, which he accepted, that the concessions dealt with under the agreement of 1929 remained vested in the company. It was said that it had not been proved practicable to obtain the necessary consents and that the winding-up of the company might jeopardise the position, for instance, in Portugal. His Lordship was unable to hold that the company had ceased to carry on its business. The company had (he said) no option but to comply with the Act of 1946 and it might be that, when the compensation was assessed, difficult questions would arise as to the company's future. The amount of compensation was of great importance, and the proper people to look after that matter were the directors of the company. It would be quite wrong at this juncture to make a compulsory winding-up order which would remove them from office, and in these circumstances, a compulsory order would be premature.

Commercial Information

Mortgages and Charges

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

C. FENNER AND CO., LTD.—Tunbridge Well, electrical engineers.—May 3, assignment, securing to Lloyds Bank, Ltd., £1 500 (not ex.); charged on certain contract moneys.

ELECTRICAL AND RADIOLOGICAL INSTRUMENT CO., LTD., London, W.—Apr. 30, series of £10 000 debs., present issue £5 000; general charge. *£500. Nov. 14, 1945.

PROBARTS (EQUIPMENT), LTD., London, S.W., electrical engineers.—Apr. 28, deb., to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; general charge.

R. BARTLETT (ELECTRICALS), LTD., London, N.—Apr. 30, deb., to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; general charge.

Satisfactions

KEGO ELECTRIC CO., LTD., Wembley.—Sat'n May 7, £1 000, reg. Apr. 2, 1942.

TUNSIT ELECTRO-METAL WORKS, LTD., London, E.C.—Sat'n. Apr. 26, of mort. reg. Nov. 30, 1942.

Coming Events

Saturday, June 14

WOMEN'S ENGINEERING SOCIETY, LONDON LOCAL SECTION.—Visit to Imperial College, Exhibition Road, S. Kensington, followed by Annual General Meeting. *2.30 p.m.*

Monday, June 16

UNIVERSITY COLLEGE.—London. At the I.E.E. "The Presentation of Technical Information," the third in a series of lectures by Prof. R. O. Kapp. *5.30 p.m.*

I.E.E., MEASUREMENTS SECTION.—London. At the Connaught Rooms. Section Dinner. *6 p.m.*

Wednesday, June 18

LANCASHIRE AND CHESHIRE RADIO AND ELECTRICAL GOLFING SOCIETY.—Preston. At the Fullwood Golf Club. Competition.

I.E.E., SOUTHERN CENTRE.—Farnborough. At the Royal Aircraft Establishment. "Frequency Modulation," by K. R. Sturley. *7 p.m.*

Thursday, June 19

I.E.E.—London.—At the Science Museum, S. Kensington. Annual Conversazione. *8 p.m.*

A. E. DEES, LTD. Newcastle-on-Tyne, electrical engrs..—Sat'n. Apr. 28, of deb. reg. Jan. 4, 1939.

County Court Judgments

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

QUENTIN, Jno. A., 105, Spring Road, Kempston, electrical engineer. £14 5s. 6d. Apr. 9.

TATE, Ronald L., 20, Ashley Down Road, Bristol, electrician. £17 4s. Mar. 31.

MILLER AND CONNOR (a firm), 186, Western Avenue, Speke, electrical engineers. £19 6s. 8d. Apr. 3.

DEETH, L. A. (male), 238a, Fulham Road, South Kensington, building and electrical contractor. £11 6s. 10d. February 26.

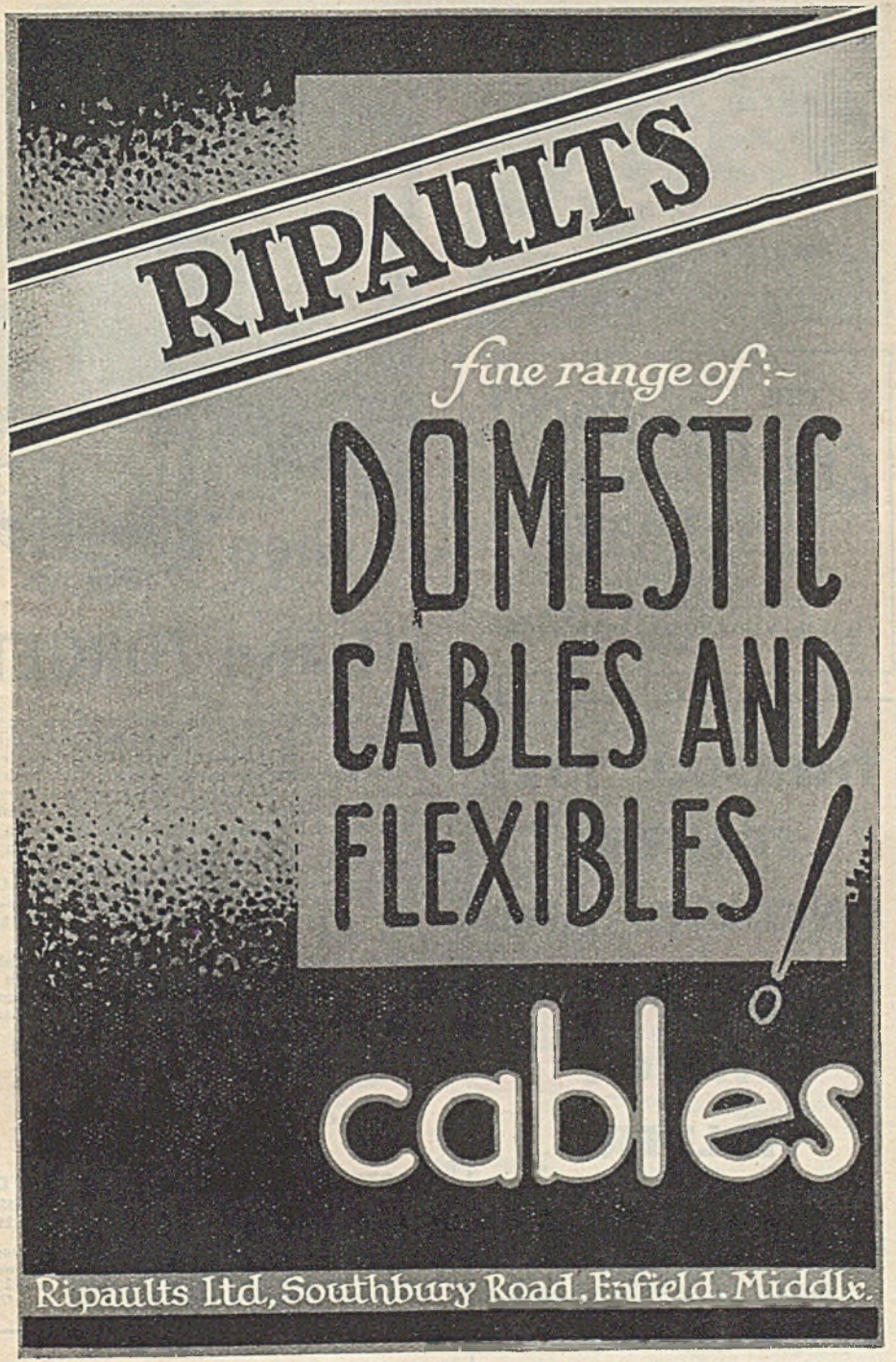
FAULKNER, G. H. (male), Modern Radio, Llanybyther, Carmarthen, radio dealer and engineer. £18 6s. 10d. February 6.

LEBITER, F. (male), 89, North Gate, Ilkeston, radio and electrical engineer, £20 11s. 1d. March 26.

Metal Prices

	Monday, Price	Inc.	June 9 Dec.
Copper—			
Best Selected (nom.)...per ton	£135 10 0	—	—
Electro Wire bars ... „	£137 0 0	—	—
H.C. Wires, basis ... „	£155 0 0	—	—
Sheet ... ... „	£178 10 0	—	—
Bronze Electrical quality 1% *Tin*—			
Wire (Telephone) basis per ton	£177 15 0	—	—
Brass (60/40)—			
Rod basis ... ... „	1s. 2½d.	—	—
Wire ... ... „	1s. 6½d.	—	—
Iron and Steel—			
Pig Iron (E. Coast Hematite No. 1) ...per ton	£8 19 0	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ... „	£34 5 0	—	—
Mild Steel Tape (Cable Armouring) basis 0.04 in.) ... ... „	£21 15 0	—	—
Lead Pig—			
English ... ... „	£91 10 0	—	—
Foreign and Colonial... „	£90 0 0	—	—
Tin—			
Ingot (minimum of 99.9% purity) ... „	£440 10 0	—	—
Wire, basis ... ...per lb.	5s. 6¾d.	—	—
Aluminium Ingots ...per ton	£80 0 0	—	—
Spelter	£70 0 0	—	—
Mercury (spot) ... per bott.	£17 3 6	—	—

Prices of galvanised steel wire and steel tape supplied by C.M.A. Other metal prices supplied by B.I. Callender's Cables, Ltd. The latter prices are nominal only, and do not include any allowances for tariff charges.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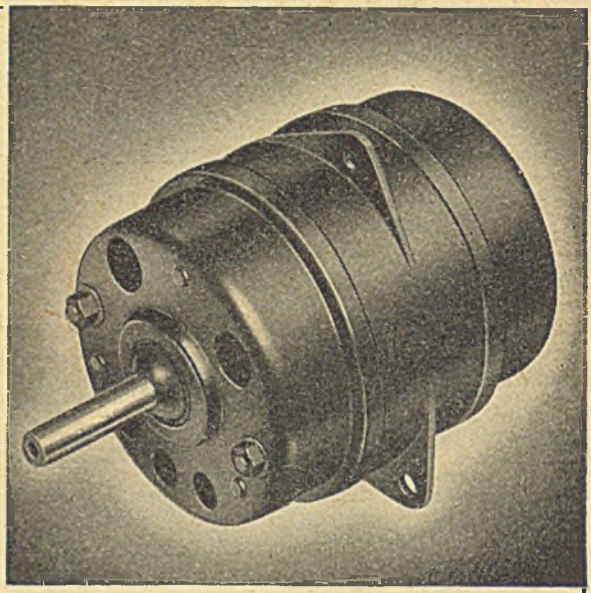

If you make Refrigerator condensers, Air conditioning units, Room Heaters, Fans, or similar appliances you will find these motors particularly effective on account of their

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silence in operation
reliability

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ALSO FRACTIONAL H.P. MOTORS

Squirrel Cage Induction Motors. Split Phase, Capacitor or Three Phase Types. Solid or Resilient mounting. Ball or Sleeve Bearings.

H.P.	Overall Length	Body Diameter	Approx. Weight
1/6	10 7/32 in.	6 9/16 in.	24 lbs.
¼	10 15/32 in.	6 9/16 in.	26 lbs.
½	11 25/32 in.	6 9/16 in.	36 lbs.

Performance curves and data on other types supplied on request.

TWO TYPES TO BE AVAILABLE

Large . . . . . 400 grm/cms.

Small . . . . . 130 grm/cms.

Speed . . approx. 1,100 R.P.M. on load.

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