THE
ELECTRICIAN

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MISCELLANEOUS ADVERTISEMENTS

None of the situations advertised in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 or 40 inclusive, unless he or she is excepted from the provisions of the Control of Engagement Order, 1945, or the vacancy is for employment excepted from the provisions of that Order.

SITUATIONS VACANT

COUNTY BOROUGH OF SOUTHAMPTON.

ELECTRICITY DEPARTMENT.

Appointment of Chief Assistant Engineer.

AMENDED ADVERTISEMENT.

APPLICATIONS are invited for the above-named position, at a salary for Class "II," Grade 1, of the National Joint Board Schedule of £826 per annum, subject to the National increments and adjustments and a deduction for superannuation. The successful applicant must pass a medical examination.

Applicants should each possess an Engineering Degree and/or be a Corporate Member of the Institution of Electrical Engineers, and must have held the appointment of Deputy Chief Official, or an executive position of considerable responsibility, in a large Undertaking operating a selected generating station, and be possessed of sound administrative ability. Previous experience in all engineering matters appertaining to generation and distribution and in the commercial administration of an Undertaking is essential.

Applications, on forms to be obtained from Mr. W. G. Turner, Borough Electrical Engineer, Civic Centre, Southampton, and accompanied by not more than three testimonials and endorsed "CHIEF ASSISTANT ENGINEER," must reach the undersigned not later than noon on 19th October, 1945.

Canvassing, directly or indirectly, will disqualify.

R. RONALD H. MEGGESON,
Town Clerk.

Civic Centre, Southampton.

APPOINTMENTS VACANT.

SOUTH AFRICA.—Two Engineers in Metering and Instrument Section of Testing Department of large Power Company. Qualifications:—Apprenticeship with Instrument Maker or large user; also field experience in maintenance and calibration. Should have passed graduate examination of the I.E.E. Meter and Instrument Section or equivalent. Salary £32/37 per month, according to qualifications. Holiday and Savings Fund allowances additional, plus cost of living index being paid at present £6 per month. Successful applicant required to join Pension Fund, Medical Benefit Society and Sports Club.—Apply, giving full particulars, to Box L.Q.C., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

MANAGER required, with general experience in the manufacture of lead storage batteries. State experience and salary required.—Write Box L.P.O., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

INSULATING VARNISH.—Technical Representative with sound knowledge of Electrical Insulation required as assistant in Sales Dept., to operate mainly in the North and Midlands.—Please state age, experience and salary required, Box L.Q.A., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

SITUATIONS VACANT

BOROUGH OF CHEPPING WYCOMBE (High Wycombe).

ELECTRICITY DEPARTMENT.

APPLICATIONS are invited from men with suitable qualifications for the position of:

1. MAINS ASSISTANT to be responsible to the Mains Engineer and experienced in the installation and operation of H.T. and L.T. underground and overhead distribution systems and equipment. Salary will be in accordance with N.J.B. Schedule, Class "E," Grade 8. (£371-£388).
2. FOREMAN, CONTRACTING DEPARTMENT, to be responsible to the Installations Engineer and experienced in supervision of wiring staff engaged in the construction and maintenance of wiring installations in domestic, business and industrial premises, and in the repair and maintenance of domestic appliances. Salary will be at the rate of £260 per annum, plus war bonus, the present value of which is £59 16s. per annum.

Both 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.

Sealed and endorsed applications, accompanied by copies of recent testimonials, should be delivered to the undersigned not later than Saturday, 6th October, 1945.

The Ministry of Labour and National Service (Technical and Scientific Register) have given permission under the Control of Engagement Order, 1945, for the advertising of these vacancies.

HENRY ROBSON,
Borough Electrical Engineer.

Frogmoor, High Wycombe.

COOKE & FERGUSON LTD., Victoria Street, Openshaw, Manchester. Electrical division, have several vacancies for Sales Engineers and Draughtsmen in high voltage switchgear and electrical accessories. Applications in writing only, stating experience, age and salary required. Previous experience on electrical work essential. These vacancies are open to service personnel and subject to release being obtained from present employment by applicants.

ELECTRICIAN wanted, interested in Stage lighting.—Apply, Theatre Workshop, 112, Highgate, Kendal.

REPAIRS

COOKERS.—We can give good deliveries of Sheet Metal Vitreous Enamelled Electric Cooker parts.—JOHN KING & SON (ENAMELLERS), Ltd., PYRO WORKS, WHITTINGTON MOOR, CHESTERFIELD. Phone: Old Whittington 50.

WORK WANTED AND OFFERED

WE will gladly undertake the making of component parts, etc., on our Lathes, Millers, Drills, etc.—London Electric Firm, Croydon. 'Phone: UPLands 4871.

PATENT AGENTS

KINGS PATENT AGENCY, LTD., B. T. King, A.I.Mech.E. (Patent Agent), 146A, Queen Victoria Street, London, E.C.4. ADVICE, Handbook, and Consultations free. 'Phone: City 6161.

TENDERS

ELECTRICITY SUPPLY BOARD, Dublin, Ireland.

ERNE POWER DEVELOPMENT.

THE Electricity Supply Board invites Tenders for the supply, delivery and erection of:

THE HYDRO-ELECTRIC GENERATING PLANT AT CATHALEEN'S FALL AND CLIFF STATIONS ON THE RIVER ERNE.

Conditions of Tendering, Form of Tender, Conditions of Contract and Specification may be obtained by Contractors from the Chief Design Engineer, Electricity Supply Board, 26, Lower Fitzwilliam Street, Dublin, C.18, by application and on payment of a fee of five guineas, which will be refunded on the receipt of a Bona-fide Tender. Additional copies may be purchased at a cost of one guinea per copy (non-returnable).

Tenders with all the relevant documents enclosed in a sealed cover endorsed "ERNE POWER DEVELOPMENT: TENDER FOR HYDRO-ELECTRIC GENERATING PLANT," must be delivered to the undersigned not later than 12 o'clock noon on Monday, the 28th January, 1946.

The Board does not bind itself to accept the lowest or any Tender.

PATRICK J. DEMPSEY,
Secretary.

Electricity Supply Board,
60-62, Upper Mount Street, Dublin, C.18.

FOR SALE

SEARCHLIGHTS (sale or hire), Carbon Rods, Ebonite, Fibre Hightensite, Porcelain House-wiring and other Cleats, Reels and Knobs, Mirrors, Lenses, Lamp Lowering and Suspension Gear, T.R.S., lead and other Cables, Winches (hand), hundreds of thousands in use, etc.—London Electric Firm, Croydon.

LEATHER FINGER STALLS.—Made of Chrome Hide. Very strong and hard wearing. Length 3 in. Price 4s. per doz. Prompt delivery. Sample on application.—Willson Brothers, Industrial Clothing Manufacturers, Epsom, Surrey.

ENAMELLED COPPER WIRE.—10 tons, slight salvage, for sale to bulk purchasers.—Apply, H. LESTON LTD. (Govt. Contractors), 5, Charles Lane, London, N.W.8.

THE ELECTRICIAN

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Electrical Engineering, Industry, Science and Finance

Bouverie House, 154, Fleet Street, London, E.C.4. Telegrams: "Benbrotric, Fleet, London. Telephone: Central 3212 (Ten Lines).

Midlands Office: Daimler House, Paradise Street, Birmingham. Telephone: Midland 0784.
Glasgow Office: 116, Hope Street, Glasgow, C.2. Telephone: Central 3970.

The Offices of THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations. Until further notice the offices will be open between the hours of 9 a.m. and 5.30 p.m. from Monday to Friday.*

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CHIEF CONTENTS OF THIS ISSUE

E.D.A. Conference

THE papers which were delivered this week at the two-day conference of the Mid-East England E.D.A. were such that they warranted a bigger audience than is within the scope of the area, and but for the difficulties of the times would no doubt, have received wider publicity. The summing up of the post-war problems which beset electrical development was given by Mr. D. BELLAMY, general manager at Hull, whose experience of supply in a battle-scarred city, entitles him to speak in a way which everyone in other bombed areas will appreciate. His remarks indicate the need for an early resumption of sales promotion methods as opposed to the sales suppression tactics enforced during the last six years; for, if as a result of our competitors making capital out of the shortage of generating capacity, possible load shedding and so on, alternative apparatus is bought by the public and installed, the market will be lost for a long time. With the restricted availability of equipment and the "no change" order in operation, the effect would perhaps be immaterial, but with major issues in relation to appliances for temporary and permanent grant-aided houses being decided, our competitors are rightly and naturally taking advantage of the position. If inadequately challenged the results may prejudice the future of domestic electrical expansion for some years to come.

In this connection the paper read by Mr. W. K. FLEMING, borough electrical engineer and manager at Scarborough, is of special interest, for among the many aspects of domestic electrification touched upon was that of consumer research. For many years, he pointed out, we have applied scientific research in connection with the technical progress and practical application of electricity supply, but the importance of the need for expert and specialised study of consumer and market research, is, so far as electrical development is concerned, not yet so fully appreciated. We need to know more about the state of public thinking and of public knowledge, about the experiences, habits and hopes of people respecting electricity supply before we can be sure that electrical service is fulfilling its highest endeavour in meeting the needs and interests of consumers, and research is suggested as a means of measuring opinion on such matters.

Some ways in which this type of research might be of value to the industry would be the investigation of facts and information on existence of and reasons for prejudice and criticism relating to electrical service; the views of consumers on their practical experience of working with electrical appliances; assessing public notice and reaction to various

publicity methods and schemes; and the examination of the consumer market generally, with a view to seeking new applications of electrical methods. Armed with this information any adverse opinions could be corrected by educative publicity; the standards of appliance design and efficiency might be raised; any mis-directed effort in publicity schemes could be eliminated; while an examination of the consumer market might well prove of assistance to all sections of the industry in the formation of future policies.

Cooking and Heating

THE question of policies leads us to the paper by Mr. W. H. DUNKLEY, also of Hull, who spoke on large-scale cooking and space heating; a subject of primary importance at the present time due to the civic restaurant idea and the number of works canteens which may need overhauling following the return of industry to its peace-time occupation—in some cases in premises specially built for munition production, and housing electric cooking equipment of austerity type. With respect to space-heating, Mr. DUNKLEY had something to say about the heat-pump and the work now being carried out by Mr. J. A. SUMNER at Norwich. This form of heating, to which reference was made in THE ELECTRICIAN of June 22, has, it is submitted, the makings of a highly interesting paper.

Trade With Australia

SOME indication of trade prospects with Australia and of the conditions existing in that country are given this week as a result of an interview with Mr. ALAN CROOK, chairman of the Electrical Branch of the Sydney Division of the Institution of Engineers of Australia. Mr. CROOK, who received part of his training at the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd., is on a short visit to this country and is particularly suited to pass judgment upon our trade prospects with the country of his birth, in that he is both importer and manufacturer of electrical goods. His remarks to the effect that the export policy of this country must in future be more aggressive, are confirmation of the views already expressed in these columns on many occasions, while the fact that Australia is self-sufficient in the domestic appliance market, may be news to some. The best prospects for British manufacturers so far as Australian trade is concerned, are apparently to be found in heavy electrical machinery, a field where there is already plenty of evidence of British enterprise but where, with post-war expansion being considered, there are still many opportunities.

Removal of Export Control

UNDER a new Order which became operative on Monday, export licences are no longer required for the shipping of electrical goods, with the exception of lead-acid accumulators, and cooking and heating appliances. It is not expected that this withdrawal of control will have any immediate marked effect upon our overseas shipments, for as was explained in our last issue, these are already fairly extensive. When, however, the industry is given the opportunity of replacing its worn-out machine tools and processing equipment, the absence of licence procedure will encourage many of the smaller manufacturing organisations to enter the overseas market. The lengthy and often patience-testing business of obtaining the necessary permits to trade overseas has hitherto, in many cases, discouraged manufacturers to the extent of avoiding export markets until freedom to act without licences was restored. With the two exceptions of lead acid accumulators and cooking and heating appliances, however, the industry is now free to do its will, and its effect upon the official overseas trade returns for the next six or so months will be watched with interest.

Radio-Frequency Heating Exhibition

THE technique of radio-frequency heating has made such progress during recent years that it warrants an exhibition of its own at Dorland Hall, London. The exhibition, arranged by Rediffusion Ltd., seeks to illustrate how radio frequencies can be used for the heating of wood, clay, rubber, plastics, steel, textiles, etc., in place of the conduction or radiation of heat energy, and very well it does it. The need to increase our productive efficiency and output to the fullest possible level is recognised by all clear thinking persons, and the application of our war-time experiences with radio frequency heating to take the place of longer working hours or by working more

intensively, is generally accepted as one way of reaching that objective. The exhibition is closing to-day, Friday, after an eight-day showing—in our view all too short—and the attendances each day were such as to encourage the belief that the adoption of this form of heating is likely to become more widespread.

E.D.A. Opposition to Plug Uprating

THE new B.S.I. specification uprating the 5 A plug is apparently being subjected to a good deal of criticism by well-known personalities in the industry as well as by associations. Amongst the latter it is interesting to note that the E.D.A. at its September meeting in Manchester, last week, staged a joint discussion of the Council and the North Western Committee of the association, with a view to considering, among other things, the merits and demerits of the specification. At this meeting the opinion was unanimously expressed that to up-grade the 5 A plug to deal with 13 A, and thus expect it to carry a load of 3 kW at normal voltage, was ill-judged and would have the inevitable result (on old installations) of wiring failures. Moreover, the new proposal is, it was pointed out at the meeting, contrary to the unanimous opinion expressed in the findings of the Study Committee. The E.D.A. Council have, therefore, appointed a small committee to interview the appropriate B.S.I. Committee at no distant date and to press for a new plug of 13 A rating, not interchangeable with the old and to be capable of carrying a fuse in the plug itself.

British Council Tours in the Midlands

AN arrangement made by the British Council whereby members of the Dominion and U.S. Forces on leave in this country are enabled to gain first-hand knowledge of the life and work of the industrial Midlands, will be welcomed. The arrangement takes the form of two courses, the first of which commenced this week; the second, which will begin on Monday, will include a visit to the G.E.C. works at Coventry. It is possible that further courses will be arranged in the near future, and with the British electrical industry contributing so much to the needs of the Dominions it would, we feel, be to the advantage of the industry if invitations could be extended to visit in turn all our electrical engineering shops. As to the American visitors, they will as a result of the courses see for themselves that the claim made for the high standard of British technique is no idle boast.

Mr. J. Y. Fletcher

BY the death of Mr. J. Y. FLETCHER, of the G.E.C., the industry has lost a man whose enthusiasm for things electrical was unsurpassed, and whose personality will be keenly missed. Before the war he was to be seen at every function of importance, be it dinner, dance or meeting, while at those gatherings of special interest to his company, such as the inauguration of new street lighting, the opening of new showrooms, and the like, Mr. FLETCHER was a host whose tact, persuasion and honesty made his guests at once at ease to ask whatever they would. By his death, the electrical industry has lost a valuable champion and a good companion; a personality whose opinions upon electrical affairs will be hard to replace.

More Men for Supply Industry Promised

THE limelight of publicity was turned on the man-power needs of the supply industry this week-end by no less important a body than the Ministry of Labour, and a promise was made that at long last something material may result. It has been known for some time that the industry is operating under the greatest difficulties with respect to operatives—the latest returns of the Commissioners shows a need for 970 men of various grades—and if the curtailment of supplies, which occurred last winter, owing to the physical inability to complete in time the programme of overhaul of plant, is to be avoided this winter, supply undertakings must have more labour. The Ministry's contribution to a solution of the problem is to give release from the Services to all who have reinstatement rights in the industry, while under the Class B releases are to be about 1 000 operatives made available to both the gas and electricity supply industries. What effect this will have upon the industry depends upon how soon the extra man-power reaches the industry, for apart from the fact that it is late in the year to think about overhauls, the weather is already turning cold and the possibility of increased heating load is becoming daily nearer.

Radio-Frequency Heating

Applications Demonstrated at Rediffusion Exhibition

HOW radio-frequency can increase industrial efficiency to a marked degree is demonstrated at an exhibition being held by Rediffusion, Ltd., a subsidiary of Broadcast Relay Service, Ltd., at Dorland

Redifon heater R.H.7 drying excess moisture from plaster casts

Hall, Lower Regent Street, London. The exhibition was opened on September 20 by Sir John Anderson.

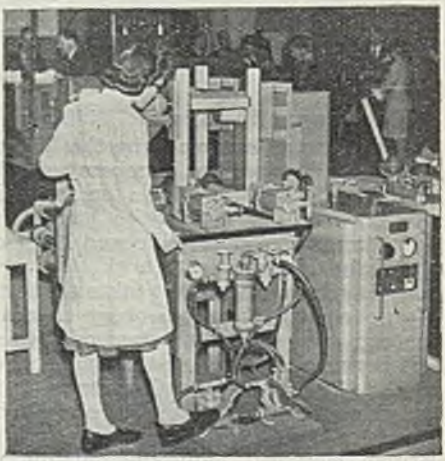
With the extensive range of apparatus on view demonstrations were given in the two forms of radio-frequency heating, namely, dielectric heating of plastics, glues, wood, rubber, asbestos, clay, textiles, food, chemicals, and so on; and eddy current heating of metals for surface hardening. It was pointed out to our representative that with the Redifon method heat is generated directly through the substance under treatment with an intensity and uniformity that could never be obtained in the past by the conduction or radiation of heat energy from an external source into the material being processed. This results in improved quality, the saving of waste, and a greater speed in production.

The exhibits include R.H.21 generators —compact ¼ kW units, with an ingenious automatic heating chamber, chiefly for the moulding industry; R.H.31, 5 kW equipments and a coil assembly, suitable for use with a heating chamber, also for laminated boards, eddy current heating and glueing; R.H.4, 25 kW generator, demonstrating bulk drying of textiles, wool, refractory bricks, etc.; R.H.7, 2 kW generator, supplying power to a continuous drying conveyor, through which pass thick fabrics, paper board and other materials; another R.H.7, 2 kW set, removing moisture from plaster moulds.

In the plastics section there are two working exhibits illustrating the preheating of moulding powder before it is placed in the usual steel mould and subjected to pressure, resulting in time savings of 50 to 90 per cent. With an R.H.31, 5 kW generator and larger heating chamber, 5 lb. of moulding powder may be pre-heated per minute.

Two examples show the application of radio heating to glueing. A Redifon R.H.2, ¼ kW generator, was demonstrated and supplied power to a jig in which a R.A.F. rescue dinghy paddle blade and shaft were glued together in four minutes. The bench displayed produced over 1 000 paddles a week for many months. A second jig is shown making the body of a desk, setting the glue in two minutes. Here the power is derived from a R.H.7, 2 kW unit, feeding 16 joints simultaneously. The jig is made to accommodate several sizes of desk, so that the entire electrode system has to be very flexible.

Other applications demonstrated are the curing of rubber, the welding of polyvinyl chloride by dielectric heating, and the



Here 16 glued joints in a desk are drying simultaneously in a jig supplied with power from a R.T.7 2kW unit

hardening of gear wheels, O.B.A. taps and steel rods by eddy-current heating.

In the gallery are examples of Redifon

communications equipment used during the war, standard I.C.D. equipment of the Broadcast Relay Services, and products of the Small Electric Motors, Ltd. Among the latter is an abrasive saw, which will cut paxolin and such laminated boards with a clean edge, thus eliminating the need for milling, and deal excellently with mycalex, brass, aluminium, and so on.

At the buffet three R.H.21 sets are used for the purposes of heating buns, rolls and sandwiches, the operation taking about 25 seconds. The exhibition closes to-day, Friday.

Trade Prospects in Colombia

Opportunities for United Kingdom Exporters

INDUSTRIAL developments of considerable importance that have taken place in Colombia, South America, are dealt with in a review of commercial conditions in that country published for the Department of Overseas Trade by the Stationery Office (1s. net). The most important was the establishment of an iron and steel industry. The first step in this direction was taken in August, 1938, when the Empresa Siderurgica S.A. was formed at Medellin with a capital of £285,000, with the ultimate object of producing most types of iron and steel products, including sheeting. An electric foundry was installed in 1940 for the production of pig iron, and a steel mill, also at Medellin, is in the course of construction. Output will, it is understood, be confined at first to the manufacture of wire, bars and rods. A second siderurgical undertaking is being developed near Bogota, though this will be limited exclusively to the production of pig iron for foundry workshops.

Industrial developments have caused a much greater demand for electrical power. Though consumption more than trebled between 1933 and 1942, the supply fell increasingly short of requirements. To meet this situation the Government has undertaken a comprehensive scheme of electrification and the close of 1944 saw a number of new hydro-electric plants either under construction or projected. It is calculated that, if the intended programme is carried through, the Colombian hydro-electric plants will by 1960 be capable of generating up to 1 million kW compared with about 160 000 kW at present.

Despite the progress which Colombia has made, and will doubtless continue to make, towards a greater degree of self-sufficiency there can be little doubt that in the immediate post-war years there will be an exceptional demand for imports, more especially of goods which are not manufactured in the country and have been either unobtainable or in short supply owing to the war. There is almost certain to be a great demand for capital goods immediately after the war. The expansion of local industries, the creation of the new iron and steel industry and the large-scale hydro-electric development programme will entail the import of a great quantity of varied machinery and equipment. As industrialisation progresses, so will there gradually arise an increasing demand for machinery of various types. The rapid building development which has been taking place, and will doubtless be more actively resumed after the war, should create a large demand not only for constructional materials, fittings, and so on, but also for public utility services. The demand for imported consumer goods is unlikely, at least for the present, to be affected to any very appreciable extent by increasing domestic production.

The closer economic relations between Colombia and the U.S.A. must be expected to strengthen the position of U.S.A. exporters, but Colombia should offer opportunities for United Kingdom exports of products formerly supplied by Germany. Though it is reasonable to expect that the Colombian Government will take steps to encourage local industry, either by protective tariffs or direct import control, the market as a whole should, in the immediate post-war years, provide increasing possibilities. If United Kingdom exporters are in a position to re-enter the market reasonably soon after the end of the war, and an intensified publicity campaign is undertaken on behalf of United Kingdom products, there seems no reason why the United Kingdom should not retain her pre-war share of Colombian imports.

In 1939 Colombia imported electrical machinery, apparatus and material of the total value of £1,176,000, of which the United Kingdom supplied goods to the value of £11 000, U.S.A. £829 000, Sweden £116 000, and Germany £109 000.

New Electrical Factory.—Production has started at the new factory at South Shields, erected for Wright and Weaire, Ltd., for the making of electrical appliances. The factory covers 50 000 sq. ft., and will eventually employ about 500 people, mostly women.

Post-War Electrical Development

Major Effects of War Reviewed

UNDER the auspices of the Mid-East England area of the British Electrical Development Association an autumn two-day conference was held at Scarborough, on September 26 and 27. Following a civic welcome to the delegates by the Mayor (Ald. G. K. G. Pindar), a paper on "Post-war Problems of Domestic Electric Development," by Mr. D. Bellamy, general manager of the Kingston-upon-Hull electricity department, was read.

Standardisation of Charges

In the course of his paper Mr. Bellamy said there was a serious agitation for standardisation of charges throughout the country, but so long as undertakers continued to function separately within their own statutory areas, with the full financial responsibility for the concerns, there would be diversity and variation in charges, because there was diversity and variation in costs. In distinct and separate areas differences were not pronounced, but where large and separate supply areas were contiguous, any diversity of charge was pronounced and emphasised, and this could only be remedied by effective arrangement, or a co-ordination of the financial structure between the suppliers concerned. There might be something to be said for more standardisation in the form or presentation of tariffs (under the present conditions) and possibly some elimination of alternatives—more clearly to guide the consumer—but this again was governed in many cases by special local conditions, e.g., requirements of rural areas differing from those of residential and industrial areas. Under the present separate statutory authority organisation, those responsible must be satisfied of the equity and simplicity of their own charges.

Effects of Increased Costs

Increased costs of raw materials, labour and manufactured articles needed very serious consideration in relation not only to increased costs, but also the effect upon relative ratios between fixed and running costs. Broadly the general price level today in relation to pre-war showed the following increases:—Coal, over 100 per cent.; materials, 60 per cent.; labour, 35 per cent.

Mr. Bellamy gave an analysis showing that the absolute net cost of fuel alone for the distributed unit on general supplies, exceeded one-third of a penny. That, he said, appeared to determine the unit charge on ordinary distributed supplies at very little less than ½d. per unit. The effect of this need not be feared competitively because the increased cost was common to all competitive supplies and might give them a financial advantage in addition to their advantage of amenity.

The effect of increased costs of apparatus and the effect on hire and hire-purchase schemes gave them a problem for very serious consideration and decision. First and foremost the question of purchase tax must be settled before any definite policy could be embarked upon. Domestic apparatus was one of the urgent necessities of home rehabilitation.

The Domestic Problem

In dealing with the domestic problem, the important factor was that the whole of the temporary houses which were now being erected had a planned kitchen. The straight-line harnessed kitchen equipment in the temporary houses was supplied by the Government as part of the equipment of the house. If similar equipment was not supplied with the permanent houses, would any measure of satisfaction be afforded to the resident by a separate pre-war model electric cooker and wash-boiler, and would there not be a clamour for the refrigerator? On the other hand, there were many objections to the apparatus which was installed in the temporary houses; the cooker was not automatic, it had one hot-plate only, the wash-boiler was of small capacity, and the refrigerator (when fitted) was only 1.5 cu. ft. These were, of course, labelled "temporary" houses, but their temporary life would overlap many new permanent houses.

In the permanent houses, something of the planned equipment type was necessary. Either they should have an attractive post-war cooker or a repetition of the planned equipment, but with the electrical apparatus of the latest type. The equipment in those houses would not be provided by the Government, and it remained yet to be seen whether it would be included in the house by the local authority or private builder, or whether it would be a consumer's choice and a consumer's separate payment. Obviously it was undesirable to put into those houses any electrical equipment which would be obsolete in a few months, and it was also obvious that a plannel kitchen should form part of the design. The ideal would appear to be a table height harness.

Electrical Publicity Methods

Influences of War on Future Policy

ON the second day of the Scarborough conference, Mr. W. K. Fleming, borough electrical engineer and manager at Scarborough, read a paper on "Publicity and Advertising." He said that one result of the war was that a new public had arisen. It was a more informed, better educated and more serious-minded public, and one which had reached a much higher level of independent thinking, critical judgment and appreciation of taste. They would have to approach their public with far more respect than formerly, and advertising would require to be more carefully and intelligently planned in the light of the changed conditions. It would need to be more factual and practical, reasoned and convincing, informative and educative. Their advertising should be directed more positively to women, and, to a great extent, in a new way. The influence of the economic position on their publicity and advertising policy was important. They must be careful not to lead the public to expect more than the economic situation would permit the electricity industry to supply. Intensive publicity campaigns of the direct sales promotion type would not be necessary or desirable for some time to come, and it would appear that during the period of control and scarcity, goodwill advertising must be improved and strengthened. The keynote of their advertising should be advisory, informative and educative, with strong emphasis on the principle of service.

Public Relations

As a branch of commercial and public service administration and of higher management, the subject of public relations had broadened in scope and developed considerably in importance during the past few years. The E.D.A. was, in essence, the public relations department of the electricity supply industry; it had carried out, on behalf of the industry, most of the activities which came within the scope of public relations work. By means of active research on the question of public interpretation and opinion, they should endeavour to strengthen the flow of incoming information, comment and views from the public if they were to attain the ideal state of public relations.

Since every home in the country was either an existing or prospective consumer of electricity, the power of direct appeal by the national newspaper Press, was a strong factor in the use of that medium for general advertising. Also, from the advertising administrative point of view, there was a big advantage in the simplicity and standardisation of blocks and lay-out. Nevertheless, the time had come for a revaluation of this method of advertising; they should not be influenced exclusively by figures of circulation. It was quite fallacious to take the circulation figure of a newspaper and assume that a given advertisement in the paper would be read by that number of people. The type of reader, and the character and efficiency of readership (from the advertising point of view) were the factors which counted. The periodical or magazine Press was a medium that they might consider using to a greater extent, as circumstances permitted both with regard to the size and frequency of the advertisements.

A National Electrical Exhibition

The commercial and documentary type of film would play a big part in the publicity work of the future. It was an expensive medium of publicity, and for that reason required special care in planning if the money was to be wisely spent and the best results obtained.

It was hoped that in time they would be able to establish a permanent national electrical exhibition in London, which would come to be universally recognised as a cultural centre fully representative of the electrical industry, where scientific and practical advice, information and explanation were available to all.

Although the question of industrial design was primarily a matter for the manufacturer, it was nevertheless of importance also to the electricity supply industry, for the sales of electricity could be substantially affected by the appearance, as well as the effectiveness and cost, of the appliances used by consumers. In the design of electrical appliances and equipment, there were great possibilities for the application of a partnership to achieve striking and exciting results.

For many years they had applied scientific research of a highly skilled nature in connection with the technical development and practice of electricity supply and manufacture, and the achievements of the electricity industry in technical progress were well known and recognised. They had not yet fully appreciated, however, the vital importance of the need for expert and specialised study of consumer and market research.

Large Scale Cooking and Heating

Development of the Heat Pump—Application of H.F. Currents

THE third paper read at the Scarborough conference, on September 27, was on "Electricity in Large-Scale Cooking and Space Heating," by Mr. W. H. Dunkley, of Kingston - upon - Hull. He expressed the opinion that it was both morally wrong and commercially unsound to sell large scale electrically-operated installations for heating or cooking where an objective study showed that the cash cost, or fuel expenditure, exceeded that obtainable by other heating agents by an amount that far outweighed the amenity or convenience values obtained. In small-scale installations, amenity was often the most powerful influence, closely followed by the high recovery value of electrical equipment, and its easy transfer from place to place, as in the use of domestic appliances, heaters, cookers, and the like.

The over-riding factors from the community point of view were: (a) the importance of conserving fuel of all kinds; (b) the importance of a clean atmosphere in cities.

A Method of Great Promise

After giving tables showing the respective costs and efficiencies of electricity, gas boilers, fuel oil boiler and coal or coke boiler for space heating, Mr. Dunkley said that heating by the heat pump method by a reversed refrigerator was one of great promise. Though it had been long known, its development had been slow due, it was believed, partly to the pre-occupation of manufacturers with more immediate business, and partly to the need in the present stage of development for an ample winter supply of low-grade heat in well or other non-freezing water. However, work was proceeding, notably at Norwich, where Mr. J. A. Sumner, the city electrical engineer, had a building of 500 000 cu. ft., equipped with a heat pump. Results from this unit would shortly be forthcoming and show a performance co-efficient between 3 and 3.5. This meant that 1 kW of energy instead of releasing 3 412 BTU.'s in a resistance heater will pump up between 10 236 and 11 942 BTU.'s from well water at 52° F. to a serviceable temperature for a hot - water circulation heating system. Electrical power and heating engineers would naturally be alert to find applications for this heating method as soon as suitable units were developed. This development appeared to be overdue. It appeared that units of 10, 25, 50 and 100 kW would meet most requirements. The tabulations in the paper referred primarily to space heating, though the qualifying remarks as to efficiency applied with equal force to cooking. In discussing applications which could be sold, and would give the buyer complete satisfaction, it was important to consider how far the rigid calculations and assumed efficiencies of tables were modified by operating practices and conditions.

It should be clearly in mind always that the fundamental tables did not imply that any heating or cooking proposition was a hopeless prospect for electricity until every circumstance of the case had been carefully examined.

Merits of Electrical Systems

The real value of electric cookery was better demonstrated by its operation records as to clear items of cost, and as to amenity by the opinion of users of electrical cooking plant, particularly of users who had also used solid fuel and gas fired appliances.

The merits of electrical systems for space heating might be listed broadly: (1) Efficiency is calculable, demonstrable and constantly obtainable; (2) very low or nil attendance costs; (3) no fuel and ash handling costs and reduced building costs; (4) instant local hand or automatic control, particularly on direct systems; (5) very low depreciation, particularly on direct system, high recovery value and low cost of extension and rearrangement; (6) great facility of direction of heat to required points, particularly radiant heat; (7) low initial capital costs, particularly for direct heating and for non-storage schemes generally.

Study of data in the light of the above observations and experience of sales work led the author to the view that save for very large and special installations from 250 kW and upwards, unless there was available a specially low rate for supply for midnight hours, a direct method of heating should always be considered first and would generally be found most suitable.

Electricity made and would make its way in the heating and cooking field by the development of equipment of increasing diversity better fitted for its specific duty, whereby the release of energy more intimately approached the exact point where it was required. In this connection applications to industrial processes of radiant, infra red, and high frequency capacitative heating were quite likely to be transferred into the cookery and space heating fields to obtain desired results with a lower expenditure of energy.

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. A. Southworth has been appointed chief engineer of the engineering department of the General Electric Co., Ltd., Witton, in succession to the late Dr. M. L. Kahn. Mr. Southworth was educated at Liverpool University, and he served his apprenticeship with Dick Kerr and Co. After four years in the Army, from 1914 to 1918, he returned to that company as a designer, specialising in traction. He joined the G.E.C. in 1936 as chief of the traction motor design department. During the war he has been engaged exclusively on secret development work in connection with large searchlights, radar and fire control problems.

Mr. A. Southworth

Mr. C. J. A. Galloway (London works manager) has been elected a director of Keith Blackman, Ltd.

Mr. Brian Buchel has been appointed sales manager of Scottish Plastics, Ltd., as from September 17, and will shortly be taking up his duties in Glasgow.

Mr. J. S. Wills, an executive director of the British Electric Traction Co., Ltd., has been elected chairman of the Council of the Public Transport Association.

Mr. Charles H. Newbold-Bradshaw, of Preston, formerly production manager of Ensign Lamps, Ltd., has married **Miss Elsie Foley,** of Preston, at Broughton.

The D.F.C. has been awarded posthumously to **Flt.-Lieut. E. P. C. Kidd,** a member of the staff of Benn Brothers, Ltd., proprietors of THE ELECTRICIAN, who was killed in action over Norway last March.

A member of the China Light and Power Co., **Mr. George I. Angus,** formerly of Accrington, has cabled his safe arrival at Hong Kong after three years as a prisoner of the Japanese.

Following the accession of **Mr. W. H. Higginbotham** to the chairmanship of Edgar Allen and Co., Ltd., the appointment of **Mr. H. L. Wyneken** to the offices of secretary and chief accountant is announced.

Mr. T. Arthur Pond has been elected a director of the County of London Electric Supply Co., Ltd. He has for some years acted as manager to the company and its associated companies and has been with the company for over 40 years.

Among the awards made by the Council of the Junior Institution of Engineers in respect of papers and lectures delivered during 1944-45 was the Tookey Award to **Mr. H. K. Hewett,** of London, for his paper "Electric Traction in Great Britain."

Mr. Charles Pickering, commercial and managerial assistant in the Barnsley electricity department, is to retire after 44 years with the undertaking. When he started the department had less than 200 consumers compared with over 18 000 today.

The Belfast Transport Committee has placed on record its appreciation of the services of **Mr. Samuel Carlisle,** deputy to the general manager and engineer, who is retiring after 45 years' service, and the last six years as acting general manager while **Lieutenant Colonel M'Creery** was on active service.

Sir Andrew Rae Duncan, M.P., Minister of Supply in the last Government, has accepted an invitation to become independent chairman of the executive committee of the British Iron and Steel Federation, under the terms of its new constitution. He was chairman of the executive of the British Iron and Steel Federation from 1935 to 1940. For seven years in the period between the two wars he was Coal Controller, and later was responsible for the grid electricity supply system.

At Stockport Town Council reference was made to the retirement of **Mr. G. H. Oldroyd,** the borough electrical engineer. It was stated his period of office had been the most difficult in the history of the undertaking, owing to depletion of staff, demands arising from breakdowns elsewhere and to meet the call for extra current. Additional plant had to be put down to satisfy the requirements of factories set up in the Stockport area after the devastation in the South.

Two brothers, **Mr. William W. Owens** and **Mr. Robert A. Owens,** sons of the late Mr. William Owens, Londonderry, who had been in Japanese hands from the fall of Singapore, have been released and are on their way to Australia. Mr. William Owens was an engineer in the service of the China Light and Power Co., Hong Kong, and his brother, who is seriously ill, held a similar position with the Hong Kong Electric Co. A third brother, Captain George Owens, of the Merchant Service, has been informed by the Colonial Office that his wife, Mrs. S. M. Owens and a 4-year-old son, who were interned in

Hong Kong, are also on their way to Australia, where the wife and daughter of Mr. W. W. Owens reside.

The late **Mr. Max Falk,** a director and, until recently, chairman of Falk, Stadelmann and Co., Ltd., whose death on September 9, at the age of 78 years, was briefly announced in our issue of September 14, began his career in the City by joining the business of his brother in 1883. At the formation of the concern into a limited company in 1887, he assumed responsibility for the sales direction of the whole of the company's activities. He visited Australia and New Zealand, where branches of the business had already been established. Of later years, Mr. Falk gradually relinquished his control of business matters until, in 1944, he resigned the chairmanship of the company.

Mr. Max Falk

Mr. J. W. Hyde, of the Yorktown (Camberley) and District Gas and Electricity Co., recently gave a lecture to the Camberley Ratepayers' Association on the subject of electricity supply undertakings.

Dr. J. H. Chesters, of the central research department of the United Steel Co., Ltd., has been awarded the degree of Doctor of Technical Science by the University of Sheffield, for his outstanding research on refractories.

The St. Pancras Electricity Committee reports that **Mr. Robert Lee,** chief electrical engineer and manager, will retire after 42 years' service in the electricity supply industry. He took up his St. Pancras appointment in 1932 and will be 60 years of age in December. It is proposed that he should continue his duties in a temporary capacity for a year.

Major R. W. Anderson has been re-elected president of the North of England Institute of Mining Electrical Engineers. Messrs. H. Alder, E. Chicken, J. English, G. Poole, S. Rochester and A. Walker have been elected vice-presidents of the association.

The E.A.W. certificate examination in electrical housecraft for demonstrators and saleswomen was held on June 14, when 51 candidates qualified for the certificate. The total number of certificate holders is now 964. Those who passed with distinction were: Misses E. E. Buckhurst (London), M. B. Corlett (Ramsey, Isle of Man), M. E. Henne (London), J. L. Measor (Bushey, Herts), and M. E. Walker (Widnes, Lancs).

The E.A.W. Certificate Examination in Electrical Housecraft for Teachers was held on June 23, when 104 candidates qualified. Passes with distinction were gained by Misses: D. Barclay (Dalry, Ayrshire), E. M. Booth (Glasgow), V. M. French (Aberdeen), M. E. Graham (Hoylake, Cheshire), C. M. Long (Lichfield, Staffs), E. A. Nichols (Southport, Lancs), B. N. M. O'Neill (Farnborough, Hants), H. St. C. Roberts (Edinburgh); D. E. Simpson (Strichen, Aberdeenshire), E. J. Watson (Aberdeen), and A. McH. Wither (Glasgow).

Obituary

Mr. Leonard G. Carter, managing director of the Carter Electrical Co., Ltd., on September 22, aged 56 years.

Mr. James Young Fletcher, a director of the General Electric Co., Ltd., on September 21, aged 69 years. He had been actively engaged in business until a few weeks ago when he was taken seriously ill. He was a well-known, active and forceful figure and had a host of friends and associates gathered in a lifetime's work in the electrical industry. Mr. Fletcher joined the G.E.C. in 1892 as a junior member of the electric lighting supplies department, and, after five years, went to Ireland to open the first branch of the company in that country at Dublin. He opened another branch in Belfast a few years later, and continued as manager for Ireland until 1906. He then returned to London to take charge of the lighting supplies and switchgear departments. A year later he became manager of the Osram lamp department and from then on was a leading spirit in the development of electric lighting in all its phases. Mr. Fletcher joined the board of the company in 1915 and has thus been a director for more than half of his 53 years with the General Electric Co., Ltd. He was closely associated with the late Lord Hirst in the foundation of the E.L.M.A. and always took a prominent part in its affairs. He served several terms of office as chairman and played an important part in the international trade arrangements conducted by the association. In addition, he was for many years hon. treasurer of the E.I.B.A.

Mr. J. Y. Fletcher

Electrical Accidents

By "SUPERVISOR"

ONE of the most valuable features of the annual publication, "Electrical Accidents," the yearly report of Mr. H. W. Swann, Senior Electrical Inspector of Factories, is the fact that a large number of practical lessons may be learned by those who take the trouble to read it carefully. This is to some extent restricted now that circulation is confined to certain quarters, and it is hoped that full publication will be resumed as soon as may be possible. By careful reading from year to year, the matters that most exercise Mr. Swann's mind, and which cause him the greatest concern, can easily be discerned. The current report for 1944 is no exception to the rule.

Earth Leakage

One matter that has received attention year after year in these reports is persistent earth leakage; much of the present report is occupied with its consideration. If any further evidence were needed regarding the danger of facile dependence upon conduit continuity for protection, the report of 1944 surely provides it. The figures quoted of bonding resistances are, if anything, more alarming than anything that has been stated before, and completely nullify optimistic laboratory reports concerning the conductivity of conduit joints, and similar matters.

No apology is needed for a return to consideration of matters the present writer has often discussed in this column, for it is clear that the solution of the problems involved has not been found. The Inspector's own preoccupation with earth leakage protection can be the justification, if any be required, and the prominence given in his annual reports to this one particular subject clearly shows that it is not receiving the attention from the industry that it deserves.

It is not intended to quote long passages or tables from the present report, but one or two items should receive emphasis. One is, that bonding tests in factories showed resistances of from 20 to over 1 000 ohms, and this latter figure in nine cases out of twenty was investigated by one undertaking alone. When it is realised that these installations were "protected" by fuses—to quote the report—rated at upwards of 50 A carrying capacity, the fire-raising possibilities of reliance upon such bonding is easily realised. In addition, several instances were found where the resistance between electrodes and earth varied between 10 and 15 ohms, which needs no further comment.

In explanation of such high bonding values, it is stated that in some cases earth clips were loose, or had been affixed to water pipes from which the paint had not been cleaned. From this, one gathers that the resistances were not tested when first made, and that the bonds had been a source of danger from the first day of their installation. But is it not clear that any protective system that is fundamentally dependent upon the exact carrying out of so many small details is bound to fail sooner or later; even if sound when first made, everything is against a bond remaining perfect under factory conditions.

Whatever the merits or demerits of solid earthing as a protective system, is it not handicapped from the start when reliance for its operation depends upon the continuity of steel tubes, lead sheaths, metal clips on water pipes, not on one only, but probably a hundred joints in series? To give earthing even a reasonable chance of success it should be treated as an important electrical circuit, and provided with its own copper conductor, independent of conduit bonding. Whether this protective conductor be housed inside the conduit or run outside it may be a matter for local decision, but the former would appear in the author's view, to be preferable.

One detects a reluctance to adopt earth leakage protection on the part of factory engineers — reading between the lines of the report. This is probably due, and there is evidence in the report, to the fact that far too large blocks of power are protected by this means, and which must result in serious outages with the occurrence of one earth fault. A description is given of one form of protection against leakage fitted to the main transformer; it is obvious that this must prove very unpopular with the factory owners, for the whole works may be shut down due to a minor fault.

Fire Dangers

Reasons for the subdivision of earth leakage protection have been discussed in this column recently, and will not be gone over again, but, in brief, even as each machine or motor has its own overload protection so should it have its own independent earth leakage protection. Surely it is equally important, and if the present concentration upon metal-clad gear and installations to some extent militates against this ideal, then now is the time to revise some of our equally metal-clad ideas. Heavy steel installations are hailed as being the perfect fire-preventer: these annual reports show beyond a shadow of doubt that with any slight defect in bond-

ing these systems become potential fire-raisers. Complete insulation for electrical circuits and gear remains the ideal; what difficulties exist, and they are not discounted, must be overcome. Where are the back-room boys of the installation industry?

A Welding Problem

In the interesting accounts given in the report concerning difficulties with earthing and earth return currents in connection with welders, some practical information can be extracted for the advocates of protective multiple earthing. One of the claims made for this protective system is that the neutral, being earthed at many points, is always at or near earth potential, but it does not seem to work out quite like that when the neutrals of welding transformers are earthed.

Quite clearly, unless Ohm's Law has been repealed, a low-potential neutral must mean that the current normally carried by the neutral is being distributed round, and is flowing over many primary non-electrical paths to the transformer neutral. It is not possible to keep a neutral line at earth potential if it has to carry current, and its potential above earth will obviously depend upon the resistance of the line and the current being carried on it—always assuming that the neutral earth is at earth potential, which it will not be under fault conditions. When a fault occurs, therefore, and as is exemplified in connection with welding experience, the neutral potential becomes that due to Ohm's Law in the conductor plus the rise above earth at the transformer due to fault. In other words, we should treat the neutral, whether earthed or not, as a live line.

What an unmitigated nuisance this earthing business is, but it will be agreed that now is the time to take stock and look round to see if we cannot do better. Many hundreds of thousands of houses are going to be built, and we have to decide if the additional socket outlets shall be fitted with earth protection, and if so, shall we continue our blind reliance upon conduit conductivity? If, as the annual report so clearly shows, the heavy installations found in factories cannot be relied upon to maintain a condition of safety, can we regard with any confidence the present proposals to rely upon a much lighter job to maintain safety in the home?

Domestic Accidents

Quite frankly, I should welcome any authoritative proposal that we should equip the new houses with two-pin sockets, but this is a remote possibility. Earthing protection dependent upon conduit continuity gives a false sense of security, and its absence would not unduly raise the accident risk—if at all. We must agree that the present incidence of electrical accidents in the home, as given in the report, are negligible, and yet the great majority of appliances used in the home are innocent of earthing, or of any other form of protection.

If we are agreed that earthing is necessary for full protection, then let us do the job properly, and provide a conductor that will not vary in resistance from day to day, nor set up increased fire risk as the price of removing a negligible shock risk. Stark economies will probably prevent the application of real earth leakage protection in the domestic sphere, but it can, and should, be properly applied to the factory installation.

Book Review

Luminous Tube Lighting. By HENRY A. MILLER (London: Newnes). Pp. viii + 143. 10s. 6d. net.

In this book the author explains the underlying principles of the luminous tube, touches upon the materials and equipment involved and describes each of the discharge tube light sources. Considerable space has been devoted to low-pressure tubes which are likely to be widely applied to decorative lighting in the future. The fluorescent lamp also has a chapter to itself. Many useful circuit diagrams and tables of lighting data relative to the various types of tubes in present day use are given. The book has been planned to enable electrical engineers and contractors to continue, in the light of new developments, practice where it was interrupted by the war, and they should find the information contained therein of considerable assistance.

BOOKS RECEIVED

Science Abstracts. Secs. A and B. Vol. 48. No. 567. March. Issued by the I.E.E. (London: Spon.). 3s. 6d. net.

Journal of the I.E.E. Vol. 92. Part I. (General). No. 55. July. (London: Spon). 5s. net.

"High Vacuum Technique." By J. Yarwood. 2nd Ed. Revised (London: Chapman and Hall). Pp. viii + 141. 12s. 6d. net.

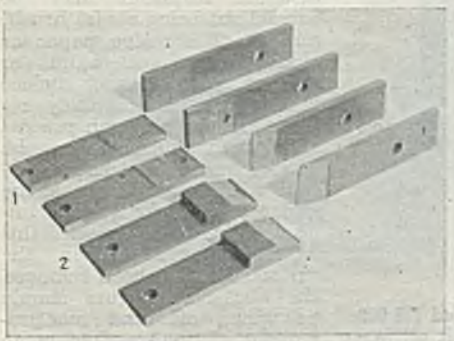
Journal of the I.E.E. Vol. 92 (August). Part I, No. 56 (General), 5s. net; Part II, No. 28 (Power Engineering), 7s. 6d. net. (London: Spon.)

"The Essential Work Order," by H. Samuels. Pp. 38. "Palmer's Private Companies." By J. Charlesworth. 39th Ed. Pp. vii + 100. (London: Stevens & Sons). 2s. 6d. each.

Bonding Thermo-Setting Plastics

Development of New Process

A DIFFICULTY in the fabrication of laminated or moulded products of the phenolic or urea types has been the lack of a cement which would give a strong, permanent bond without the necessity of using heat. This difficulty has now been



Figs. 1 and 2.—Typical failures with (1) dry lapping process; shear failing stresses, 650 and 575 lb./sq. in.; (2) with wet lapping process; shear failing stresses > 1 040 and > 1 030 lb./sq. in.

overcome by a simple technique worked out in the research and development laboratories of Bakelite Ltd. The method consists, briefly, in abrading the surface to be bonded in the presence of a solution of a special phenolic resin before applying the appropriate cold-setting cement and ensures that the joint is stronger than the material to be bonded.

Prior to the development of the company's "wet abrasion" process, joints which were sometimes sound were made by dry abrading the surfaces before cementing, but the joints were not always reliable. The advent of this new process has simplified the fabrication of phenolic and urea plastics products and offers great possibilities of extending their spheres of usefulness.

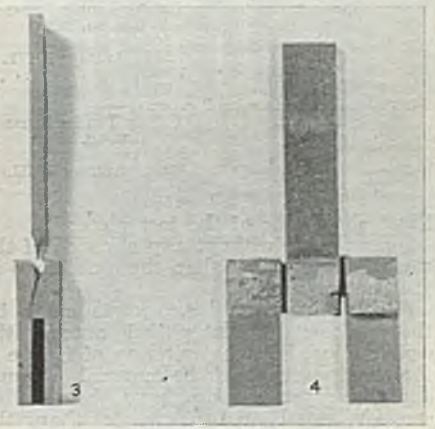
The wet abrasion process is eminently suitable for bonding phenolic or urea laminated sheet, mouldings, cast resins and impregnated wood, either to similar materials or to wood. It is impossible to give absolute figures for the bond strength which will be obtained with these materials, because the strength of lap joints is very largely dependent on the amount of overlap and the thickness of the material bonded, so that only a nominal failing shear stress can be quoted. In general, this decreases with increase in overlap, and increases with increase in thickness. For instance, a single lap shear joint with an overlap of $1\frac{1}{8}$ in. and a material thickness of $\frac{3}{16}$ in. will give an average failing stress of 1 000 lb./sq. in. A single lap test piece with an overlap of $\frac{9}{16}$ in. and a material thickness of $\frac{9}{32}$ in. will give an average failing stress of 2 500 lb./sq. in.

When single lap test pieces are used, a considerable amount of bending takes place, due to the eccentric loading. In order to reduce this a three-piece test piece can be used, but this again suffers from the defect that it is rarely possible to get even stress distribution. The illustrations show typical failures for various types of test pieces. Figs. 1 and 2 show the difference between dry lapping and wet, when the dimensions of the test piece are: overlap $1\frac{1}{8}$ in., thickness of material $\frac{3}{16}$ in. A three-piece test piece is shown in Fig. 3; dimensions, overlap $\frac{3}{4}$ in., thickness of material $\frac{3}{16}$ in.; and Fig. 4 shows a similar test piece where strips of aluminium foil have been inserted in the joint to give a gap of .003 in. Some figures for such joints are given below:—

TEST PIECE OF BAKELITE LAMINATED GRADE F.5581. 3 PIECES. OVERLAP $\frac{3}{4}$ IN., THICKNESS OF MATERIAL $\frac{3}{16}$ IN.

Gap.	Shear Strength.
Pressure Joint.	1 750 lb./sq. in.
.003 in.	1 700 ,,
.0055 in.	800 ,,
.013 in.	630 ,,
.035 in.	490 ,,

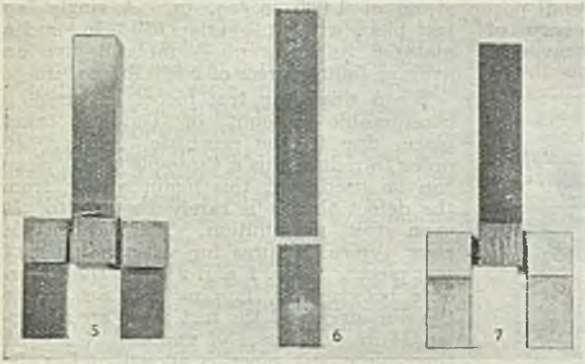
Gap joints should be avoided, however, since a failure often occurs because the cement has run out of the joint. Fig. 7



Figs. 3 and 4.—(Left) Pressure joint; shear strength > 1 600 lb./sq. in. (Right) Gap 0.003 in.; joint strength (shear) > 1 540 lb./sq. in.

shows another three-piece test piece, where the two outer surfaces are wood and the central portion is fabric laminated sheet. It will be seen that the failure is essentially a failure of the wood.

For all the above tests spring-loaded clamps were used to apply pressure. It is not necessary to use great pressure, and only sufficient should be applied to prevent the formation of thick films of adhesive in the joint.



Figs. 5, 6 and 7. — (Left) Unidirectional laminated (35 000 lb./sq. in. tensile), joint strength in shear > 2 070 lb./sq. in.; (Centre) butt joint gap 0.006 in., joint strength in tension 3 700 lb./sq. in.; (Right) wood/laminated bond, joint strength in shear 1 160 lb./sq. in.

In order to obtain some idea of the true value of the adhesion obtained, a series of tensile tests employing butt joints was carried out. Results of these tests on butt joints made with and without the use of the wet abrasion process are as follows :—

MATERIAL : BAKELITE LAMINATED SHEET F.5581.

Control Test (with dry abrasions)—

Specimens.	Failing Tensile Stress (lbs./sq. in.).	
1	1 360	
2	535	Average 1 171.
3	1 860	
4	930	

Tests (with "wet abrasion" process)—

Specimens.	Failing Tensile Stress (lbs./sq. in.).	
1	3 140	
2	4 200	Average 3 882.
3	3 640	
4	4 550	

Fig 6 shows one of the test pieces.

Joints made without any abrasion of the surfaces are weaker than those obtained in the control test.

When tested in shear, joints made by this process invariably fail outside the cement line, and the criterion of failure is the shear strength of the material. Joints, aged for seven months, have given failing stresses equal to or greater than the original figures.

Boiling tests have been carried out by immersing the joints in boiling water for three hours. The test pieces used were similar to those shown in Fig. 3, and a reduction in average failing stress from above 1 700 lb./sq. in. to 1 300 lb./sq. in. resulted. While this drop is considerable, the test is very severe, and probably the joint would recover most of its original strength when dried out.

In carrying out the process, the surfaces to be bonded are abraded in the presence of Bakelite activating solution J.11180. Abrasion may be carried out using a wire brush, scraper of abrasive paper or cloth, used by hand or mechanically. The surface film must be completely removed in the abrasion process and both surfaces to be bonded must be treated, except where wood is one of the surfaces, abrasion being unnecessary in the case of this latter material. When the surface film has been removed the abrasive mixture should be wiped off, and the prepared surfaces are then in an active condition, which will ensure a strong bond when they are finally cemented. Surfaces so treated will retain their activity for some weeks, but it is preferable to carry out the bonding within a week.

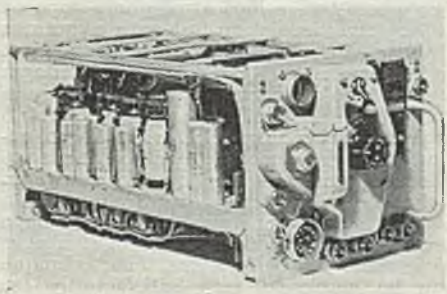
The actual bonding operations follow the normal technique employed with cold bonding processes. The process is particularly applicable to laminated plastics and to densified woods.

Centreless Grinding.—Under this title, Arthur Scrivener, Ltd., have published a comprehensive work divided into three sections, the first of which discusses at length the principles involved in centreless grinding, the broad classes of work for which the process is suitable, the surface finish, and the limits of accuracy which can be obtained. In the second section the design of centreless machines and their equipment is covered in considerable detail, with numerous illustrations of machines and parts. The third and largest section gives some hundreds of examples of actual work ground on such machines. These data are arranged on a uniform plan, and each example quoted embodies a photograph of the machine used, a dimensioned drawing of the part and the method of introduction between the wheels, followed by details relating to the material, the wheels used, extra equipment (where necessary), the actual operation carried out, tolerances, stock removal, and hourly production.

Manufacturers' War Record

Meeting Service Communication Requirements

ONE of the first firms to switch over to war work, E. K. Cole, Ltd., made important and substantial contributions to the development and production of radar and radio communication equipment for the Services. Some idea of the com-



The radar receiver unit of a Mark VII A.I. equipment fitted in night fighters for air interception

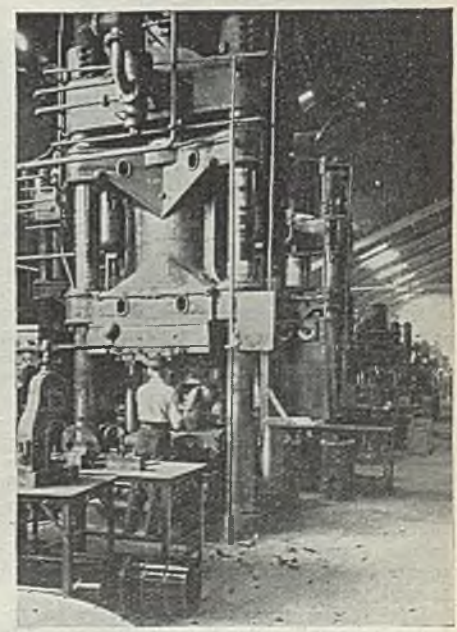
prehensiveness and magnitude of the company's undertaking may be gathered from the fact that radio equipment made by them was installed in approximately 70 000 tanks and mobile units, three in every four Lancaster bombers had Ekco radio instruments, and a large proportion of Lancaster and Lincoln aircraft had prefabricated wiring units, complete with plug-in junctions, distribution and main fuse boxes, made by the company's workpeople. This wiring system supplies every electrical device in an aircraft, from radio and radar to the heating of the pilot's suit.

The company were engaged on war contracts before the outbreak of hostilities, and at one time they were the only firm producing the air/ground station receiving equipment of the V.H.F. apparatus, which, in association with radar, enabled Fighter Command during the Battle of Britain, and subsequently, to speak to pilots of flying aircraft and give them directions for the interception of enemy bombers.

In August, 1939, the company transferred their secret radar work to Malmesbury, Wilts. The development and engineering section, under Mr. A. W. Martin, the chief engineer, whose work was largely devoted to the development of radar from the research to the production stage, was also moved to Malmesbury. When invasion threatened, the main works at Southend were evacuated to Aylesbury and Woking. Other factories were taken over at Aston Clinton and Glasgow. Then, this danger having passed, manufacture recommenced in the parent factory, which had to be re-equipped and make a new start.

Among the first tasks entrusted to the company were the engineering and development of an early type of radar air interception equipment, and another apparatus which became known as A.S.V. (air to surface vessel) to be used principally for locating convoys when radio silence had to be maintained. The latter was highly successful and achieved ranges of 40 to 60 miles on shipping. An improved model was designed and is still in operation. It enabled the Fleet Air Arm to locate enemy vessels in the worst weather. This equipment, it is claimed, formed the basis of the transmitter of the searchlight ground-air beam, of the most widely used searchlight radar equipment. Another adaptation gave warning for A.A. gun crews. For the purpose of practical tests to the A.S.V. set on ships passing through the estuary, Mr. Martin installed a secret laboratory in a café on Canvey Island.

Other radar sets developed and pro-



Moulding presses in the Ekco plastic division

duced by the company were the I.F.F. used by the Navy for identifying friend or foe; the A.I. Mark 4 and Mark 8, fitted to aircraft for night interception. Gee equipment, which will direct a bomber to within a quarter of a mile of its target over a distance of 300 miles and the H.2 S. which gives a picture of the ground target, were also manufactured.

Among the many radio sets made for the Services was the T 1154—R 1155, a general purposes transmitter and receiver used in bomber aircraft. The company were responsible for the development of the receiver, both electrically and mechanically, and worked in collaboration with the Marconi Wireless Telegraph Co., Ltd., on the transmitter. Of approximately 100 000 of these units produced, Ekco made nearly half. Another set, used with conspicuous success by the Fleet Air Arm in the Pacific, was the A.R. 5206.

Tested in the Dieppe Raid

Equipment for the Army included wireless set No. 19, which was installed in every tank and armoured vehicle. The Army wireless set, No. 46, of which the company are particularly proud, is of the man-pack type and was designed for beach landing operations under the most hazardous and exacting conditions. It was conceived by Ekco engineers and is very reliable and robust as well as completely waterproof. Working on fixed frequencies, which are crystal-controlled, it does not require tuning by the operator. For telephonic communication the operator uses a larynx microphone—an attachment fitted to the throat. The set was tested in the Dieppe raid, and as a result of its success a large production programme was proceeded with. Great numbers of sets were used on D-Day, and throughout the campaign.

Early in the war the company were asked by the Ministry of Aircraft Production and the Admiralty to manufacture special types of radio and radar valves, and a separate department was set up in the lamp division for this purpose. Here a considerable amount of valuable development work took place. Some of the types of valves developed by the company for radar were invented at the Admiralty Research Establishment by Dr. R. W. Sutton, who was formerly on the Ekco research staff. Many thousands of such valves, including klystrons, were manufactured. Among the millions of electric lamps supplied for Government departments by the lamp division were some of special types.

One of the problems that arose in relation to small radar transmitters was the production of a transformer of small size that would withstand the full pulse voltage of approximately 15 kV used on the magnetron. Mr. Martin, the chief engineer, and his staff spent many months evolving a new technique. In conjunction with George Spencer Moulton and Co., Ltd., they produced a transformer completely enclosed in a flexible neoprene case that is oil-filled. This type was found to be absolutely satisfactory. There were no failures at all; all the insulation requirements being amply met. The apparatus worked at 15 kV at an altitude of 40 000 ft., where the rarified atmosphere imposed a very rigid insulation test with clearances two to three times those necessary at ground pressure. One of the advantages of this type of construction is that because of the flexibility of the neoprene bag into which the windings are inserted, no expansion arrangements need be made as the neoprene will take up the change in volume of oil at temperature. Production is simple and economical, and there have not been any troubles with oil leakages after some years of service. The technique can be employed very satisfactorily for television and neon signs. It has been found that these miniature transformers, with 46 gauge wire, will stand 50 cycles of heat and humidity treatment as laid down in the W/T Board's specification K 110 whilst normal transformers using ordinary impregnation methods, will stand only 4 to 10 similar cycles.

Plastic Bombs

To solve another transformer problem where a low voltage winding had to have very high insulation from other windings, the winding was moulded into pure rubber in the form of a ring, and neoprene was moulded over this to give protection against brushing, or strong sunlight. This type of transformer is useful for rectifier heater windings, where a high difference of potential exists between the primary winding of the transformer and the heater windings for the rectifier. X-ray equipment is used to ensure that coils are central in the mouldings.

The plastics department has made moulded parts for almost every conceivable piece of war equipment. It turned out hundreds of thousands of plastic practice smoke bombs for the R.A.F. and gun-flash simulators for the Royal Artillery. The extensive plant is now turning out moulded cabinets for radio sets, table tops and other peace-time products.

The company is in the process of changing over to peace-time production and already radio sets, in limited quantities, for domestic use are being manufactured.

On an Ordnance map and a photograph taken from a Nazi aircraft, found in Germany, the Southend factory was clearly outlined in ink, but it was never bombed.

D.C. Supplies for Collieries

Effect of Lease-Lend Arrangements on Equipment

ONE feature of mining practice in this country during the war has been the introduction underground of a considerable

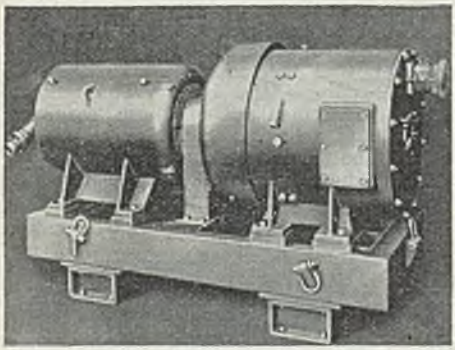


Fig. 1.—15 kW flameproof motor-generator set for battery-charging underground

amount of coal-face machinery and rubber-tyred battery vehicles requiring d.c. supplies. This material has been provided largely by the U.S.A. under Lease-Lend arrangements in order to increase coal output in the face of diminishing manpower resources and other difficulties. Ordinarily, British coal mines use only a.c. for distribution underground and it has therefore been necessary to produce suitable conversion equipment at short notice. The Ministry of Fuel and Power instructed the Metropolitan-Vickers Electrical Co., Ltd., to design such equipments and standardised on three sizes of motor-generator and appropriate control apparatus. Of these three sizes, two, 15 kW and 20 kW, were for battery-charging in connection with the trackless vehicles and the third, 75 kW, for d.c. coal-face machinery such as coal-cutters, drills and loaders. It was stipulated that these equipments should be flameproof throughout and capable of automatic operation with the minimum of attention.

The motor-generators were mounted on fabricated bedplates of ample strength to maintain alignment between the machines without any additional support in the form of foundation blocks. Each bedplate, moreover, is fitted with adjustable pads which enable the user to fit his own wheels, axles and bearing blocks, provided that the gauge of the track lies between 1 ft. 8 in. and 2 ft. 4 in. The control equipments similarly were mounted on bedplates to render them self-contained units.

In order to utilise the advantages in production speed to be obtained from the American equipments, it was found necessary to adopt the system of mining most commonly practised in the U.S.A. This entails the use of battery-driven trackless vehicles to transport the coal from the face to the loading points on the main trunk belts or haulages. Accordingly, for these vehicles battery-charging facilities were required. It was decided that the two sizes of equipment referred to above would meet all likely demands. They would have to be flameproof, suitable for manœuvring underground and simple to handle. Having regard to all the circumstances it was considered that charging on a modified constant voltage system would be the most practicable scheme; the more usual method of current control would have involved equipment too high in cost, weight and dimensions. The charging equipment was to be capable of charging two batteries in parallel, each battery consisting of two series banks of 24 lead-acid cells. Three battery capacities were concerned, viz., 330, 385, and 440 A-h. at the 6-hour rate of discharge. The 20 kW plant was designed specifically for the 440 A-h. size;

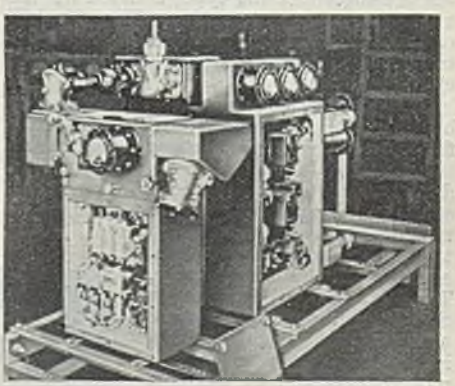


Fig. 2.—Flameproof control panel, with covers removed, for battery-charging, and mounted temporarily on supports

the 15 kW set for the first two sizes could handle the third occasionally but not as a continuous practice.

A 15 kW motor-generator set is illustrated in Fig. 1. It comprises a squirrel-cage motor driving, through flexible couplings, a shunt-wound generator, the whole being of flameproof construction and mounted on a common bedplate.

The overall dimensions are 6 ft. 10 in. length, 2 ft. 8 in. width and about 3 ft. in height. The driving motor is a totally-enclosed flameproof type squirrel-cage motor, wound for medium voltage three-phase, 50-cycle supply. Cable entry is made by a 100-A bolted plug and socket suitable for the reception of flexible, armoured, tough rubber-sheathed cable. Direct-on starting is used as discussed later. The generator is a totally-enclosed, fan-cooled, shunt-wound machine, and generating a maximum charging voltage of 132 V (2.75 V per cell) under the control of a voltage regulator. A mining type cable sealing box with armoured clamps of the pin-disconnecting type, is fitted for the outgoing armoured cable. The 20 kW charging equipment is slightly larger in size, but otherwise similar in type and characteristics.

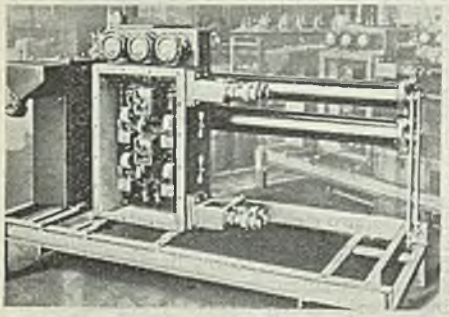


Fig. 3.—Another view of Fig. 2 showing d.c. panel and flameproof resistances

The control equipment is essentially based on the Metropolitan-Vickers' Co.'s flameproof designs of gate-end boxes and resistances. It consists of a contactor type direct-on starter and a d.c. charging panel, each in its own flameproof enclosure. A typical set is shown in Fig. 2 and 3, illustrating particularly the a.c. and d.c. panels respectively. The a.c. starter housing is divided into two separate compartments, the lower being seen with its cover removed. As will be evident, the starter consists of a triple-pole, air-break contactor with magnetic blow-out and arc-chutes. Over-current protection is provided by the oil-immersed, time-lag dash-pots underneath; undervoltage protection is inherent in the operating coil of the contactor. In the upper compartment is contained a triple-pole, interlocked, non-reversing isolator, and a moving iron ammeter is mounted on the front. The a.c. supply enters by mining-type sealing box arrangements similar to those already described for the d.c. generator.

The d.c. equipment is accommodated in an enclosure comprised of two main flameproof compartments. The charging panel proper is clearly exposed in Fig. 3 and comprises chiefly four d.c. line contactors, overload and interlocking relays, and two battery-charge timing relays, while two ammeters and a voltmeter are carried immediately above the box. The second main compartment of the unit contains the voltage regulator and also serves as the terminal board for the flameproof ballast resistances and the change-over links which provide the appropriate selection of resistance sections to suit the three sizes of battery involved.

Two items of this equipment require particular description to make clear the method of operation. The voltage regulator is of the moving-coil, vibrating carbon contact type in which a spring-loaded moving arm, pivoted on knife edges, carries the carbon contacts at one end and the moving coil at the other. Two fixed coils are connected in series with the moving coil and the "swamping" resistance across the generator terminals. The purpose of the swamping resistance is to reduce the effect of the resistance temperature coefficients of the three coils. At the regulated voltage the solenoid effect balances the spring pressure. The vibrating contacts are, of course, concerned with the shunt-field winding of the generator and serve to vary that field as required to maintain constant voltage. Accurate regulation is essential since a relatively small change in voltage from the generator becomes large in proportion to the effective charging factor—voltage across battery minus the back e.m.f. of the battery—and would

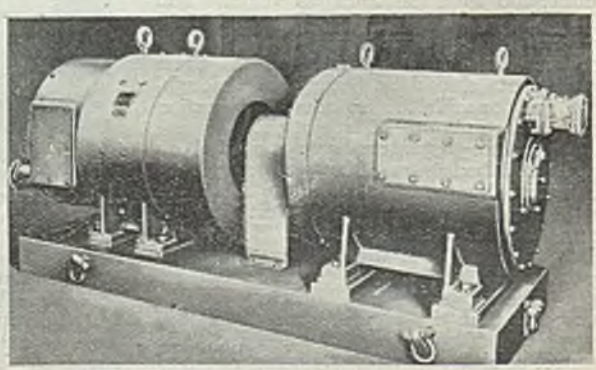


Fig. 4.—75 kW flameproof motor-generator to provide d.c. supply underground for general purposes

cause an unduly large change in current. This is particularly important during the "gassing" period at the end of the charge when the maintenance of the charging current within the limits specified by the battery manufacturers is imperative to ensure a satisfactory life for the battery. The battery charge timing relay (type MJV) consists of three parts, a voltage-measuring element, a mercury switch, and a small synchronous motor with graduated timing disc. The voltage measuring element is a hot-wire vacuum switch with its control circuit connected across the battery to be charged: it is not subject to contact bounce and has a delay action which prevents it responding to any momentary surges in voltage. When the battery has reached the predetermined voltage this hot wire switch closes the circuit for the synchronous motor and sets the timing gear in motion. At the end of the allotted period a cam on the timing disc shaft engages a peg on the mercury switch and tilts it, thus causing the line contactor to be tripped to open the charging circuit, on that particular battery.

Process of Charging

To summarise the operation of this equipment it may be helpful to trace the sequence of events during the process of charging. When the requisite adjustments have been made to suit conditions, the isolating switch is closed and energises a pilot circuit through a voltage transformer. On depressing the main "start" push-button, the line contactor closes and switches the driving motor on to the line. The generator voltage builds up and energises the voltage regulator and the d.c. control circuits. After plugging the battery into the panel, the "start" push button for that battery is depressed, operating the main contactor, and charging commences. As soon as the battery voltage reaches 112.8 (2.35 V per cell) the voltage element in the battery charge timing relay switches in the timing motor, which turns through gearing the timing disc. At the conclusion of the set period, the timing disc can tilt the mercury switch, thereby opening the main contactor and so disconnecting the battery from the charging supply. The corresponding connections for the other battery are duplicated and combined with the first in such a manner that either or both batteries can be charged, but that when both are cut out the driving motor is automatically tripped out and the set shut down.

For operating d.c. coal-face machinery units of 75 kW were deemed to be the most satisfactory. These sets also were required to be fully flameproof, with the additional requirement that earth-leakage protection was to be provided. The 75 kW motor-generators are of larger capacity than those for battery-charging and generate at 500 V, but are otherwise of the same general type with the exception that the generators are also fitted with slip-rings for use with a static balancer.

Control Equipment

For the a.c. motor the starters were already provided and were not included in the control units. The generator control apparatus consisted of a d.c. contactor type circuit-breaker housed in a flameproof enclosure and equipped with two over-current releases, earth-leakage relay and isolator. Under-voltage protection is of course derived from the operating coils of the contactor mounted on the same bedplate as the static balancer, of oil-immersed type, in a flameproof tank. The static balancer is connected across the slipring of the generator and its mid-point taken through an earth-leakage relay to earth. In the event of an earth occurring in the generator winding the currents in the two halves of the static balancer become unbalanced and operate the relay to trip out the driving motor and shut down the set.

E.A.W. Anniversary

THE 21st birthday celebrations of the Electrical Association for Women to be held in London on October 11 and 12, will take the form of an exhibition, a luncheon, a reception and a symposium of speeches. The exhibition which will be held at Dorland Hall, will be opened by the Duchess of Kent at 11 a.m. on October 11, and at 1 p.m. Sir Stafford Cripps, President of the Board of Trade, will speak at a luncheon to be given at the Connaught Rooms; admission to the exhibition on the first day will be by ticket only. In the evening, a reception will be held at Grosvenor House, Park Lane, during which a special display will be given by the E.L.M.A. Lighting Service Bureau. The proceedings on October 12, will open with a Council meeting at 10 a.m., at the association's headquarters at 20, Regent Street, followed at 2.30 p.m. by a symposium of speeches at the I.E.E.; the speakers will include Sir Robert Watson Watt, F.R.S., on "Women and Wireless," Mrs. Kathleen Lonsdale, F.R.S., on "A Woman Physicist Looks Back," and Sir Harry Railing, on "After the Scientist, the Engineer." The Dowager Lady Swaythling will be in the chair. The Women's Engineering Society, parent body of the E.A.W. is holding its annual conference on October 12 and 13, to coincide with the association's celebrations, when Miss M. M. Partridge will give a Presidential Address on "The Next Twenty-one Years."

Electricity Supply

Guildford.—The Electricity Committee has agreed to provide supply to Crist Hill Farm, Shamley Green.

Bexhill.—The Electricity Committee is to provide supply to the temporary housing estates at a cost of £1 985.

Walsall.—The Electricity Committee is to provide a 400 kVA transformer at a cost of £440 to give increased supply to Craham Firth Steel Products Ltd.

Swansea.—The Electricity Committee has purchased switchgear and transformers from the Ministry of Supply for £3 450, and authorised the Electrical Engineer to purchase other plant if advisable.

Kepier Power Station Protest.—The Durham R.C. intends to protest against the decision not to allow the building of a power station at Kepier by the North-Eastern Electric Supply Co., Ltd. A sub-committee has been formed to draw up a statement on the matter.

Brierfield (near Burnley).—The U.C. has decided to increase the tariff for electricity on the rateable value scale from ½d. to ¾d. per unit, owing to the advance in coal prices and the depletion of the undertaking's reserve fund. The increase will take effect from the end of the December quarter.

Dublin.—Plant for the completion of the Pollaphouca Falls scheme is now on the way from the manufacturers to Dublin. It is expected that the scheme will be in operation by the end of this year. This should give an annual output of about 300 000 000 units, or one-tenth of the Shannon's average output.

Eire.—The Electricity Supply Board, Dublin, has announced that because of the prolonged drought—one of the longest for a number of years— a crisis in electricity supply is developing. With the end of the drought the crisis will pass, but in the interval supply of current can be maintained only with the co-operation of consumers.

Marlow.—The Marlow and District Ratepayers' Association are protesting against a proposal of the U.D.C. to provide only electricity in the new houses they are proposing to erect. The association contends that both gas and electricity should be laid on to the houses, so that the tenants themselves may decide which service they require.

St. Pancras (London).—The Electricity Committee is to extend mains in various streets at a cost of £2 073 to supply premises estimated to yield an annual revenue of £729. The reduction of the flat charge for lighting, now 4d. per unit, by ½d. per unit for the winter period, a concession worth a total of £18 250 for the half-year, is recommended.

Aberdeen.—Following the recent appeal made by the Minister of Fuel and Power for curtailment of lighting, arrangements have been made to reduce street lighting in main thoroughfares to half, between midnight and dawn. The present peacetime standard of lighting will be retained in the principal streets, but in the rest of the streets, lighting will be equal to only one-third of the pre-war standard.

St. Pancras (London).—For the years 1939 to 1944 the profits of the electricity undertaking totalled £79 140. The Council has already set aside £20 000 as a working balance and agreed to allocate £30 000 for post-war developments. In making good damage by enemy action £13 980 has been expended. Thus there is a balance of £15 150 for allocation, and the Committee recommends that £15 000 be appropriated for the relief of the rates.

Wood Green (London).—At a meeting of the Housing Committee the Northmet Power Company intimated that the terms for supply to Portal type houses would be the all-in rate with a fixed charge of 10d. per week and ½d. per unit plus 12½ per cent. for all electricity consumed. The company asked if the Council would collect the weekly fixed charge with the rent subject to an allowance of 5 per cent. to cover the cost of collection. The Committee agreed to do so.

Croydon.—Inaugurating the construction of the new power station at Croydon on September 22, which, when completed, will be one of the largest in S.E. England, Mr. Shinwell, Minister of Fuel and Power, said among other things:—Electricity has made enormous strides in the past 25 years but we have failed to do as well as the United States or even Germany. Many schemes in contemplation at the beginning of the war had to be abandoned, otherwise we should have undoubtedly made greater progress. Now that we have disposed of the enemy we must turn our attention to the reconstruction of British industry and those public services of which electricity is one of the most important. It must be realised that we have much leeway to make up; nor should we overlook the many obstacles that stand in the way of speedy recovery. There will be a shortage of manpower for some years. There is a dearth of modern plant and we must settle the matter of priority. It is essential to provide ourselves with cheap power, otherwise our industrial prestige will decline, which in turn is bound to have an adverse effect on our standard of living.

Contracts Open

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

Wick B. C., September 29.—Electrical work in connection with the erection of twelve blocks of houses at Murchison Street, Wick. Specification from Mr. J. R. Ballantyne, 112, Bath Street, Glasgow; deposit, £2 2s.

Warrington Electricity Department, October 1.—Twelve months' supply of e.h.t. and l.t. paper and lead-covered and other cables. Particulars from Mr. N. T. Smith, Electricity Works, Warrington; deposit, £1 1s.

Grimsby T.C., October 3.—Supply of two transformers for sub-stations (Spec. 431); l.p. switchgear for sub-station (Spec. 432); e.h.p. switchgear for sub-station (Spec. 433); and 28 000 yds. e.h.p. and l.p. cable (Spec. 434). Specifications from Mr. G. W. Parker, Electricity Works, Moss Road, Grimsby.

Salford T.C., October 3. — Supply of 6 500/400 V, three-phase, 50 cycle, oil-immersed power transformers. Specifications from the City Electrical Engineer, Electricity Department, Frederick Road, Salford 6.

Birmingham Electric Supply Department, October 4.—Supply, delivery and erection of 132 kV double-circuit steel tower overhead transmission lines, approximately 19 miles; deposit, £2. Particulars from Mr. F. W. Lawton, 14, Dale End, Birmingham, 4.

Bradford T.C., October 5.—Provision of 6.6 kV overhead distribution line and underground cable to Scholebrook Farm, Tong (Contract C.36). Particulars from Mr. T. H. Carr, Electricity Department, 97, Bolton Road, Bradford.

Walsall Electricity Supply Committee, October 5.—Supply of meters, conduits, troughing tiles, bonding clamps, feeder pillars and sub-station panels, underground link to boxes and covers and transformers. Particulars from Mr. E. A. Newburn, Upper Bridge Street, Walsall.

Redcar T.C., October 6.—Supply, laying and jointing of e.h.t. and associated pilot cables. Particulars from the Borough Electrical Engineer, Electricity Offices, 112, High Street, Redcar.

Woolwich B.C., October 9.—Supply, delivery and erection of one 750 kW Diesel alternator and four 30 MVA outdoor reactors. Specifications from the Borough Electrical Engineer, Electric House, Powis Street, Woolwich, S.E.18; deposit, £1 1s.

Manchester Public Health Committee, October 10.—Electric heating installation at the Dr. Garrett Memorial Home, Conway. Specification from the City Architect, Town Hall, Manchester; deposit, £1 1s.

North of Scotland Hydro-electric Board, October 15.—Supply, delivery and erection of 132 000 V transmission lines. Specification from Mr. T. Lawrie, 16, Rothsay Terrace, Edinburgh, 3; deposit, £5 5s.

Stone (Staffs.) Electricity Department, October 15.—Supplies of underground main and overhead line materials. Particulars from Mr. C. Scholefield, 56, High Street, Stone, Staffs.

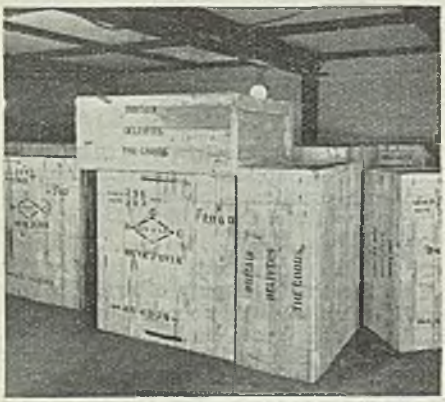
Overseas

Eire Electricity Supply Board, December 14.—Civil construction work in connection with the hydro-electric development of the River Erne, Co.Donegal, including, (1) Power development at Cathaleen's Falls, for installation of about 40 000 kW; (2) power development at Cliff for installation of 10 000 kW. Particulars from Mr. P. J. Dempsey, Electricity Supply Board, 60/62, Upper Mount Street, Dublin; deposit, £21.

Allocation of War Factories.—In addition to those mentioned in THE ELECTRICIAN on June 8 and 15, the allocation is announced of 24 Government factories with a total area of about 4 000 000 sq. ft. for civilian production. When adapted, these factories will provide employment for nearly 20 000 people. The Ministry of Aircraft Production factory at Walton, Liverpool, has been allocated jointly to D. Napier and Sons, Ltd., and the English Electric Co., Ltd., for the production of aero engines and electrical equipment. Production and storage area of the factory is 1 110 000 sq. ft. Other factories have been allotted to A. Reyrolle and Co., Ltd., at North Seaton, Ashington and Hebburn-on-Tyne, for the production of electrical equipment; Savage and Parsons, Ltd., at Watford by-Pass, for electrical equipment; British Electric Meters, Ltd., at Bangor, for household electricity meters; the British Thomson-Houston Co., Ltd., at Newcastle-under Lyme, for electrical appliances; Ferranti, Ltd., at Edinburgh, for radio sets; James Howden, Ltd., at Glasgow for kitchen equipment and light engineering; Brown and Adam (Engineers), Ltd., at Glasgow for household equipment; Air Conditioning and Engineering, Ltd., at Tandragee, N. Ireland, for cooling and heating appliances.

Industrial Information

Export of Hoover Cleaners.—Hoover cleaners are being exported to bring currency to this country. This is one of the reasons why supplies are still short on the



Consignment of Hoover cleaners ready for despatch to Iceland

market. The above illustration features a consignment packed and ready for shipping. Shipments have already been sent from the Perivale factory to Switzerland, Australia, South Africa and Iceland.

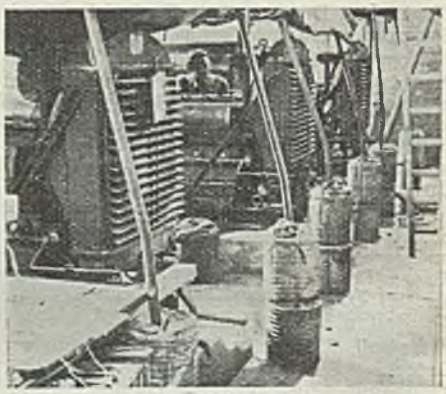
Further Relaxations in Export Control.—Export licences will no longer be required for a very large number of items. Electrical goods have been reduced to two items, viz., lead acid accumulators and cooking and heating appliances.

Wash-boilers and Cookers.—Trans-Heat Co., Ltd., who proposo taking over the premises of the North West Engineering Co., at Fleetwood, will employ over 200 workpeople in the manufacture of electrical domestic appliances, such as wash-boilers and cookers, in addition to vitreous enamel ware.

D.C. Plant for Crack Detection.—We are asked to state that the Type W.A. d.c. impulse magnetising equipment for crack detection, produced by the Equipment and Engineering Co., Ltd., and described in our issue of July 27, incorporated the Wesalite rectifier, manufactured by the Westinghouse Brake and Signal Co., Ltd.

Accumulator Acid.—The Minister of Supply has issued a Direction (Direction No. 4) under the Control of Sulphuric Acid (No. 2) Order, 1940, providing new maximum prices for all sulphuric acid of strengths between 136° TW. at 60° F. and 25 per centum free SO_3 content. Copies of the Direction which comes into force on October 1, may be obtained from the Stationery Office, price 1d.

Wesel Repeater Station.—A key-point in the Army's communication system in Germany to-day is the Royal Signals repeater station at Wesel-on-the-Rhine. The telephone exchange and almost all of its equipment had been damaged beyond repair, and it was necessary, therefore, to start afresh in another building. German underground cables, with a ring system providing alternative routing by-passing Wesel, were found, and, after same 14 days, carrier telephone systems were in operation back to Venlo, and 50 trunk circuits were established in all. Power had to be provided on the spot, and for the purpose three 15 kVA Lister Diesel generators were lined up outside the building because there was no room inside. These engines were kept in operation while the Royal Signals built the power house round them. An innovation at Wesel is that the Army carrier telephone systems have been specially adapted by the Royal Signals to work on 14-pair underground cable which has been specially jointed to make this possible. With very careful balancing and testing it has been possible to work both



Three 15 kVA Lister Diesel generators at Wesel repeater station

2-wire and 4-wire systems on this cable. Facilities now exist for 60 to 70 through carrier circuits and upwards of 100 carrier and/or cable circuits.

Trade with Netherlands.—Those provisions of the Trading with the Enemy Act, 1939, and the Custodian Order, 1939, which remained in force after the liberation of the Netherlands, now cease to apply in respect of money and property accruing on or after September 10 to persons resi-

dent in that territory. Money which had become due before September 10, but has not yet been paid or held to the order of the Custodian, remains payable to the Custodian. Similarly, property in the United Kingdom which before September 10 was subject to report to the Custodian remains property to which Article 4 of the Trading with the Enemy (Custodian) Order, 1939, still applies and must not be parted with or dealt with without the consent of the Board of Trade. The obstacles in the way of trading with persons in the Netherlands which arose out of the Trading with the Enemy legislation have now been removed. Banking channels between the two countries are now restored subject to the operation of the Defence (Finance) Regulations, about which any persons intending to have transactions with the Netherlands should consult their bankers. The actual undertaking of commercial transactions must depend on the availability of the necessary physical facilities, e.g., supply of goods, transport, etc.

Trade Relations with Australia

The Development of Secondary Industries in the Commonwealth

SOME aspects of British trade relations with Australia and the development of secondary industries in the Commonwealth were discussed by a representative of THE ELECTRICIAN with Mr. R. Alan Crook, chairman of the electrical branch of the Sydney division of the Institution of Engineers, Australia, and managing director of Alan Crook Electrical Co., Pty., Ltd., who is visiting electrical companies represented by his firm in Australia and others desirous of developing an export business to that continent.

After serving with the Australian Flying Corps in the 1914-18 war, Mr. Crook received part of his training with the Metropolitan Vickers Electrical Co., Ltd., at Trafford Park, and twenty years ago he left their switchgear sales department to return to Australia.

Australia, he said, was very British and wanted to deal with Great Britain, despite what had appeared in some newspapers. Furthermore, in the electrical industry, the mother country had a big advantage in that most of the Australian standards were based on British standards, and the frequency was 50 cycles as against the American standard of 60. One thing that must be appreciated by British manufacturers, however, was that Australia had developed her secondary industries enormously, and having done so there was no turning back. Change and development could not be avoided and the best thing that the British electrical industry could do was to recognise it as an established fact and either open branches in Australia or have a working arrangement with existing firms there in the manufacture of apparatus or parts that could be made economically in that country. Australia needed most from the United Kingdom power station equipment, high tension cables, electrical instruments and relays.

A point constantly being made in support of Australian manufactures, added Mr. Crook, was that it was a matter of national security. Had they not had those secondary industries they would have have been in a terrible plight during the war when other sources of supply were cut off. Fractional H.P. motors were not made to any great extent in Australia before the war, but they were made in very large numbers for war purposes and would continue to be made for peace-time applications.

In the matter of domestic electric appliances, Australia was self-sufficient except for certain specialised items. The domestic radio field was also well catered for. All the parts, with the exception of certain valves were made in Australia, and during the war they had made radio apparatus and radar for the Services.

As to the immediate future trade prospects, Mr. Crook said one of the problems was that in this country and in Australia, the Government was committed to full employment, and under present conditions full employment in Australia would mean the development of secondary industries. On the other hand, Great Britain had to increase her exports and consequently British manufacturers were not inclined to encourage manufacture in Australia. One thing that Britain needed more than anything else in regard to overseas trade was a more progressive, almost aggressive, sales policy. The days when business would come to Britain because products were British, which was synonymous with quality, were gone.

Questioned as to the extent of American penetration into Australian markets, Mr. Crook said Australia bought practically no heavy power plant from America. American companies had been established, there were American holdings in Australian companies and there were many instances where American firms had granted licences to Australian firms to make goods. His own firm held a couple of such licences; they imported a few parts and made the rest.

Company News

NEWALL ENGINEERING CO., LTD.—Intm. on ord. 10%, less tax (same).

GLOBE TELEGRAPH AND TRUST.—Qtrly. intm. on ord. 1% (same).

ALTRINCHAM ELECTRIC SUPPLY CO., LTD.—Intm. on ord. 5% and defd. 10%, less tax (same).

MIDLAND COUNTIES ELECTRIC SUPPLY CO., LTD.—Intm. on ord. 3% less tax (same), payable Oct. 18.

LINLEY ENGINEERING CO., LTD.—Fst. and fin. div. 10% (same), and bonus 2½% (5%), mkg. 12½% (15%) less tax.

ASSOCIATED FIRE ALARMS LTD.—Fst. and final div. 3% (same). Net pft. to June 30, £396 (£369).

A. REYROLLE AND CO., LTD.—Dirs. have declared interim dividend of 5%, less tax, on ord. stock, payable Oct. 2, to holders registered Sept. 15.

BARCELONA TRACTION, LIGHT AND POWER CO., LTD.—It is reported that co. has now called separate meetgs. of holders of the cons. 6½% prior lien and 5½% fst. mort. bonds for Oct. 19.

TUNGSTEN MANUFACTURING, LTD.—Pft. to Sept. 30, after deprecn. of £503 (£574) was £1 315 (£1 913). To tax res. £800 (£1 000). Dirs. recommend half-yr.'s div. on pref. to Sept. 30, 1934, absorbg. £569 net (£1 139). Fwd. £2 277 (£2 568).

DUBILIER CONDENSER CO. (1925) LTD.—Div. on ord for year ended Mar. 31, 20% (10%). Net pft. is stated as £19 917, (£25 682), after providg. £18 000 (£13 000) for inc. tax. Carry-fwd. is £22 895 (£25 675).

GLENFIELD AND KENNEDY LTD.—Extra-ord. mtg. has bn. called for Oct. 12, at Kilmarnock, to sanction an increase in the authorised cap. to £1 000 000 by the creatn. of an additional 250 000 £1 ord. shs.

MID-WALES ELECTRIC POWER CO., LTD.—Divs. receivable from subsid. co. for 1944 £1 372, plus inc. tax recovered £225, trans. fees £1 and £819 brot. in. Deduct fees, sundry exes. and int. on 4½% deb., there remains £841 carried fwd.

AVELING-BARFORD, LTD.—Tdg. pft. to Mar. 31, £102 209 (£91 346 after E.P.T.), plus £5 000 E.P.T. recoverable. To dirs.' fees £900 (same), war dmge. ins. £783 (£1 306), inc.-tax £51 270 (£46 286), pref. div. £4 812 (same), ord. intm. 5% net £12 500 (same), fin. 5% net £12 500 (same), again mkg. 10% tax free, gen. res. £20 000 (£15 000), fwd. £48 863 (£44 419).

TELEPHONE RENTALS LTD.—Divs. from subsids. for yr to May 31 £136 600 (same), int., etc., £10 413 (£10 205), mkg. £147 013 (£146 805); deduct admin. exes. £5 219 (£5 213), dirs' fees £2 000 (same), leavg. net pft., £139 794 (£138 851, after int. payable £741). To res. £5 000 (same), div. 10% (same) £40 000 (£41 080), fwd. £32 924 (£33 537).

DE LA RUE EXTRUSIONS.—Another De La Rue subsid. has been reg. under the above title, as a private co. with a cap. of £50 000 in 5 000 shs. of £1 each. The objects are to carry on the business of manufacturers of and dealers in plastic articles and substances (whether produced by extrusion or otherwise), including moulding materials, moulded goods, electrical and insulating goods and materials.

BRITISH COLUMBIA ELECTRIC POWER.—(subsid. of Brit. Columbia Power Corpn.)—Net rev. for 1944, £397 754 (£398 028), to int. on 4¼% perp. consd. deb. £118 497 (same), to pref. div. £72 000 (same), fin. div. on prefd. ord. 2% (same), mkg. 5% (same) £72 000 fin. on defd. ord. 3¼% (3¾%), mkg. 6¼% (6¾%) £150 381 (£162 412), add exch. credit £14 925 (same), fwd. £1 974 (£2 173).

EAST AFRICAN POWER AND LIGHT CO.—Operatg. and other receipts in 1944 increased by £17 127 to £179 227. Deprecn. of loose assets, fees and exes. £22 130 (£20 556), inc. tax £10 946 (£7 341), and gen. deprecn. £44 484 (£46 796), leavg. net pft. £101 667, £14 260 increase. Pref. and ord. divs. absorb £21 000 and £52 937 as before, and £10 000 to res. (same). Carry-fwd. is £17 729 higher at £54 632.

TILLING-STEVENS, LTD. — Increase in trading pft. on yr. to Mar. 31, £39 390 (£36 458). Sundry income of £508 (£75) brings pft. to £39 898 (£36 533). Dirs.' fees again take £1 200, W.D.C. £952 (£1 478), bank interest nil (£1 400). and deprecn. £21 488 (£21 590), leavg. net pft. of £16 258. With £48 443 brot. in, plus £10 000 (£41 325) tax provn. for previous yrs. not now required, available blce. is £74 701 (£109 007). Carry-fwd. is £15 694 higher at £64 137.

PETER BROTHERHOOD, LTD.—Tradg. pft. to Mar. 31 £78 763 (£91 970). To chairman's and dirs.' fees £1 372 (same), tax £43 500 (£44 817), war risks ins. £681 (£1 247), net pft. £33 210 (£44 534). Brot. in £139 687, mkg. avail. blce. £172 897 (£175 725). To special repairs and renewals £10 000 (same), off A.R.P. nil (£3 000), war damage (part II) prems. nil (£1 000), pref. div. £4 538 (same), intm. ord. div. 8% (same) £7 000. fin. 12% (same) £10 500 fwd. £140 859.

VENNER TIME SWITCHES LTD.—Trdg. pft. 1944 £30 779 (£89 483), plus other inc. £375 (£250). After deprecn. £18 539 (£25 181), etc., net pft. £5 128 (£56 342) added to £4 000 (nil) transf. from war

contin. res. and £15 733 (£15 656) brot. in. To inc. tax (Sch. A) and N.D.C. £2 545 (£5 665), prov. inc. tax on current pfts. nil (£31 300), war contin. res. nil (£10 000), pref. div. £1 200 (same), ord. div. 10% (15%) £5 400 (£16 200), fwd. £15 716.

Lisbon Electric Tramways Ltd.—Accts. for 1944 show receipts at £1 270 496 (£102 904 increase). With int. etc., £15 993 (£13 748), rev. total is £1 286 488 (£1 181 339). Exes., taxatn. and maintce. £1 047 538 (£975 393), dirs.' fees £4 000 (same), to Municipality of Lisbon £98 920 (£91 009), cost under lease from Cia. Carris de Ferro de Lisboa £2 203 (£2 199) and trans. to gen. and deprecn. res. £55 000 (same), leavg. net blce. £78 827 (£53 738). Cost of pref. div. is £12 766, ord. int. £23 776 and fin. £23 776 (all same). Fwd. £41 449 (£22 940).

South Western Bell Telephone Co.—This co. has registered with the Security and Exchange Commission $75 millions (£18 750 000) of 40-year 2¾% debs. due Oct. 1, 1985. The issue is to be sold at competitive bidding. The co. plans to use the proceeds to retire $30 millions (£7 500 000) outstanding first and refundg. mort. 3% bonds series "C" due July 1, 1968, on Jan. 1 next at 104% and accrued int. and to redeem $45 millions (£11 250 000) first and refundg. mort. 3½% bonds series "B" due Dec. 1, 1964, on June 1, 1946, at 105% and accrued int.

Pye, Ltd.—1944 tradg. pft., less prov. for defd. and E.P.T. £122 982 (£117 306). To dirs.' fees £450 (same), deprecn. £6 725 (£7 946), leaving £115 807 £108 910), plus £116 834 (£107 824) brot. in and res. of subsid. cos. no longer reqd. £33 706 (nil), mkg. avail. blce. £266 407 (£216 734). Div. 25% on defd. ord. £23 150 (same), partic. div. of 2%, mkg. 10% on prefd. ord. (same), to employees' active service fund £2 000 (same), pens. fund £5 000 (nil), gen. res. £33 766 (nil), taxn. other than E.P.T. £65 000 (same), war dam. contribtn. £408 (£750), fwd. £129 583.

Company Meetings

Vactric, Ltd.—At the annual meeting held in London on September 11, Sir Frederick Whyte, the chairman, said that in accordance with their expectations the trading profit was lower as a result of a continuous decline in the requirements of Government Departments, and the transitions from war to peace-time production. By careful management the cash position had materially improved. The company's co-operation with the Board of Trade had enabled them to lease on favourable terms a factory in a former "distressed area" in Scotland where production of vacuum cleaners had commenced. It was expected that this production would reach a substantial volume in the near future, a large percentage of which would be available for the export trade. In addition to this factory, another and larger one would be built shortly and should be ready for occupation early next year. This would provide the company with one of the most modern and best equipped factories for the manufacture of a complete range of domestic appliances.

British Vacuum Cleaner and Engineering Co., Ltd.—The forty-first annual meeting was held at Leatherhead, Surrey, on Sept. 12. Mr. H. C. Booth, chairman, presided, and said the company's activities during the war years had covered a very wide range, both mechanical and electrical. On the electrical side the company had co-operated with the service departments in important development work and had played no insignificant part in radiolocation equipment for the Navy submarine detection apparatus, etc. The company had also made a substantial contribution to the requirements of the Air Ministry for various types of electric motors, rotary converters and generators, etc. Apart from the big volume of war production, the company had supplied a considerable amount of vacuum cleaner apparatus for Service use on ships and in aircraft, and most of the famous battleships had been equipped with B.V.C. boiler sooting plant. The company was now in the course of returning to peace-time production, and though the transition period was necessarily difficult, they approached the future with confidence.

Pye, Ltd.—At the annual meeting held in London on September 20, Sir Thomas A. Polsen, the chairman, said that the financial position of the company was stronger than ever it had been and though it might be a long while yet before all the obstacles which stood in the way of their getting back to full peace-time production were removed, they had not the slightest cause for any misgivings as to the future.

Lisbon Electric Tramways Ltd.—The annual meeting was held in London on September 26. In the statement circulated with the report and accounts, Sir Alexander Roger, the acting chairman, said that the full tramway service was maintained throughout the year. The number of passengers carried on the company's system in 1944 exceeded 200 millions, this being an increase of 14 millions over the previous year and 80 millions over the last pre-war year. Notwithstanding this great increase which had resulted in an increase in revenue of £105 149, the greater part of this was offset by an increase of £80 060 in the working expenses.

Commercial Information

Satisfactions

ELECTRIC JOINERY WORKS LTD., Southampton.—Sat'n. Aug. 13, of mort. reg. Apr. 21, 1939.

NIGERIAN ELECTRICITY SUPPLY CORPORATION LTD., London, E.C. — Sat'n. Sept. 6, of deb. stk. reg. Aug. 31, 1933, to the extent of £13 622.

County Court Judgments

NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does no. 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.*

GREENAWAY, Reginald G., Rosedale, St. Aidans Road, St. George, Bristol, electrician. £10 12s. July 11.

LITHERLAND, Wm., 40, Hannah Street, Collyhurst, Manchester, electric fitter. £16 4s. 6d. July 31.

RILEY, Louis, 113, Old Lane, Hr. Openshaw, Manchester, electrical worker. £20 1s. 1d. Apr. 24.

TREVOR, Roach, 68, Charlotte Street, W.1, electrician. £14 5s. 10d. July 26.

HICKS, E. (male), Longthorpe, Northampton. £14 13s. 4d. July 27.

NEWBERY, R. S. (male), 59, Wilford Road, Nottingham, radio engineer. £50 2s. 6d. July 19.

NEWTON, Albt. W., 10, Prince of Wales Road, Sutton, radio and electrical engineer. £15 15s. 1d. Aug. 1.

Application for Discharge

TOSSWILL, Frank Oliver, 60, Wodeland Avenue, Guildford, and lately carrying on business at 15, Portsmouth Road, Guildford. Electrical engineer. Date of hearing, Oct. 25, 1945, 11.15 a.m., at The County Court, The Guildhall, Guildford, Surrey.

Coming Events

Friday, September 28 (To-day).

INSTITUTE OF WELDING (E. SCOTLAND BRANCH).—Heriot Watt College, Edinburgh. "Welding, Past, Present and Future," A. Stephenson and D. Llewelly. *7.30 p.m.*

Saturday, September 29.

INSTITUTE OF WELDING (E. COUNTIES BRANCH).—Visit to Welding Research Laboratory, Cambridge. *2.30 p.m.*

A.M.E. AND M.E., S. WALES BRANCH.—Cardiff. Presidential address. *6.30 p.m.*

Monday, October 1.

I.E.E., N.E. CENTRE.—Institution of Mechanical Engineers, Newcastle-on-Tyne. "Tanks and Tank Devices, 1939-45," Sir Claude D. Gibb. *6 p.m.*——I.E.E., S. MIDLAND CENTRE, RADIO GROUP.—Birmingham. Chairman's address. "Atomic Structure in Relation to Chemical Reactions and Transmutations," A. Brookes. *6 p.m.*——I.E.E., MERSEY AND N. WALES CENTRE.—Liverpool. Chairman's address. "Staff Functions and Finance in Expanding Manufacturing Companies," J. O. Knowles. *6 p.m.*

Tuesday, October 2.

I.E.E., N.W. CENTRE.—Manchester. Chairman's inaugural address, J. L. Miller. *6.30 p.m.*

COVENTRY ELECTRIC CLUB.—"Flameproof Gear," R. Court.

INSTITUTE OF WELDING.—Liverpool. "Welding Shop Lay-out." W. A. Roy.

Wednesday, October 3.

JUNIOR INSTITUTION OF ENGINEERS, MIDLAND SECTION.—Birmingham. Annual general meeting. *6.30 p.m.*

I.E.E., N.E. CENTRE, TEES-SIDE SUB-CENTRE.—Middlesbrough. Inaugural address by J. B. Lancaster. *6 p.m.*

Thursday, October 4.

I.E.E.—London, W.C.2. Inaugural address, P. Dunsheath. *5.30 p.m.*

Friday, October 5.

JUNIOR INSTITUTION OF ENGINEERS.—London, S.W.1. Discussion Groups. Research Circle. *6.30 p.m.*

Saturday, October 6.

I.E.E., N.W. STUDENTS' SECTION.—Manchester. Luncheon, *1.15 p.m.*, followed by chairman's address, "The Place of the Gas Turbine in Future Electricity Generation," B. V. Poulston, *2.30 p.m.*——I.E.E., LONDON STUDENTS' SECTION.—Visit to Barking Power Station. *2 p.m.*

Metal Prices

		Monday, Price.	Sept. 24. Inc.	Dec.
Copper—				
Best Selected (nom.)	per ton	£60 10 0	—	—
Electro Wirebars ...	„	£62 0 0	—	—
H.C. Wires, basis ...	per lb.	9 7/16d.	—	—
Sheet	„	11 1/16d.	—	—
Phosphor Bronze—				
Wire(Telephone)basis	„	1s. 0 7/16d.		—
Brass (60/40)—				
Rod, basis	„	—	—	—
Sheet „	„	—	—	—
Wire „	„	11¼d.	—	—
Iron and Steel—				
Pig Iron (E. Coast Hematite No. 1)...	per ton	£7 13 6	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ...	„	£28 5 0	—	—
Mild Steel Tape (Cable Armouring) basis 0.04 in. ...	„	£20 0 0	—	—
Galvanised Steel Wire No. 8 S.W.G. ...	„	£26 0 0	—	—
Lead Pig—				
English	„	£31 10 0	—	—
Foreign or Colonial	„	£30 0 0	—	—
Tin—				
Ingot (minimum of 99.9% purity) ...	„	£303 10 0	—	—
Wire, basis... ...	per lb.	3s. 10d.	—	—
Aluminium Ingots ...	per ton	£35 0 0	—	—
Spelter...	„	£31 5 0	—	—
Mercury (spot) Warehouse ...	... per bott.	£69 15 0	—	—

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

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