

THE ELECTRICIAN

Vol. GXXXV. No. 3516. Friday, October 19, 1945.

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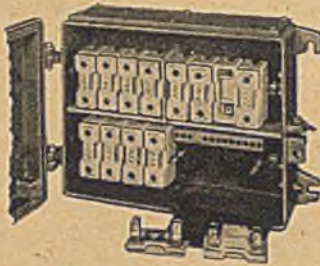
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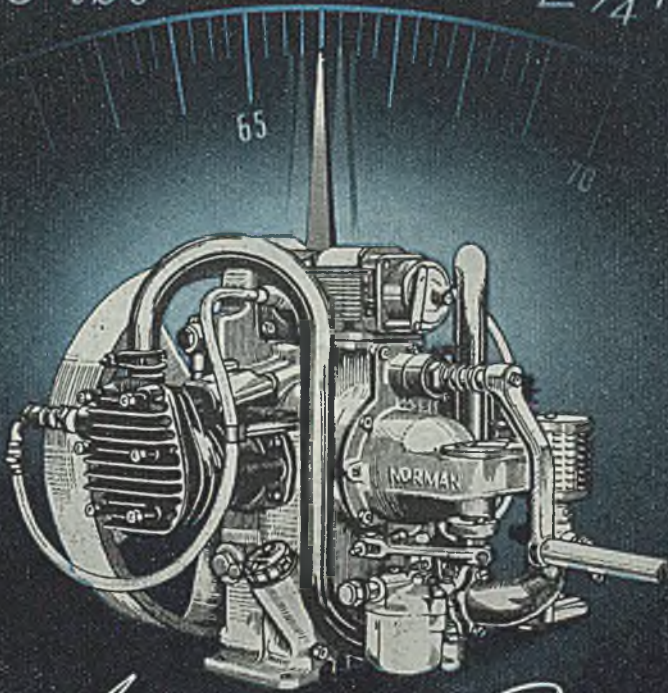


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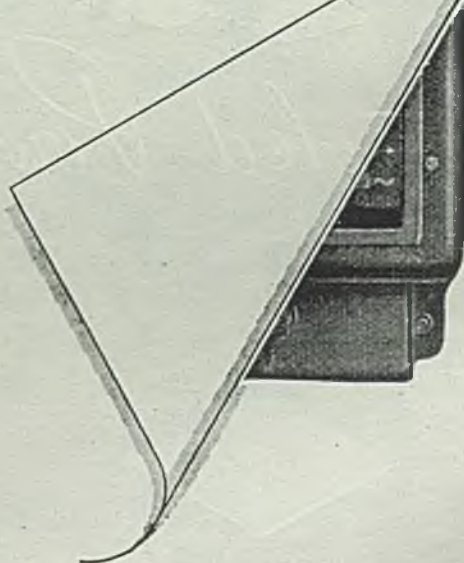
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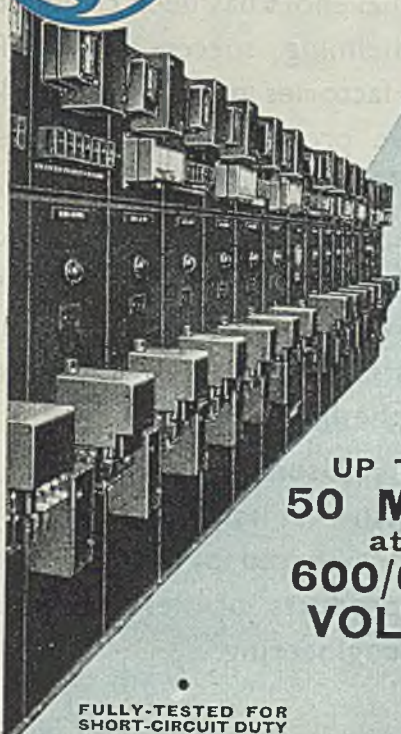


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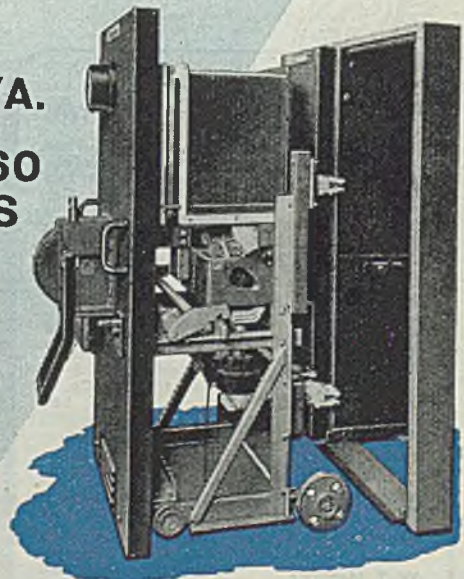
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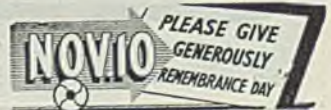


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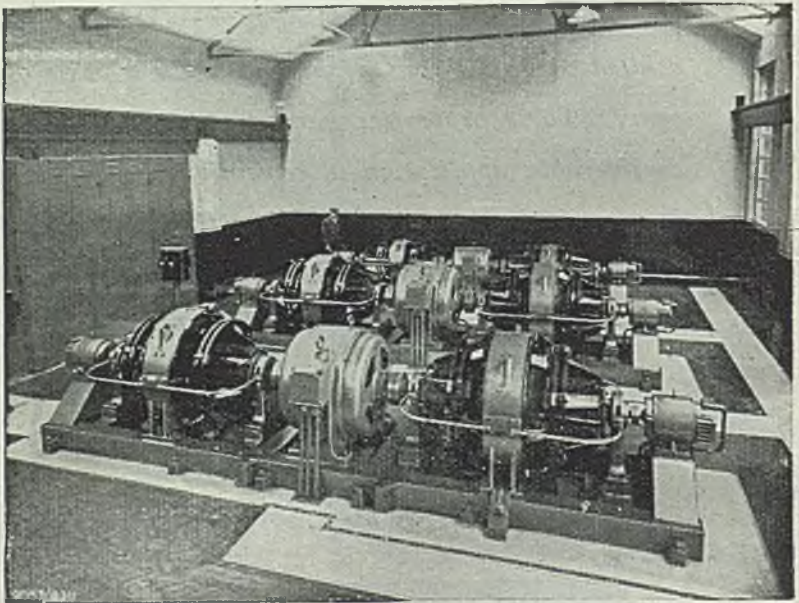
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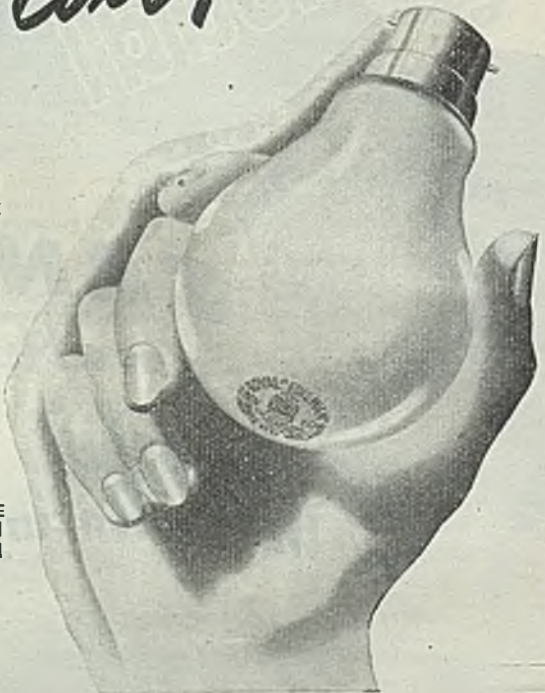
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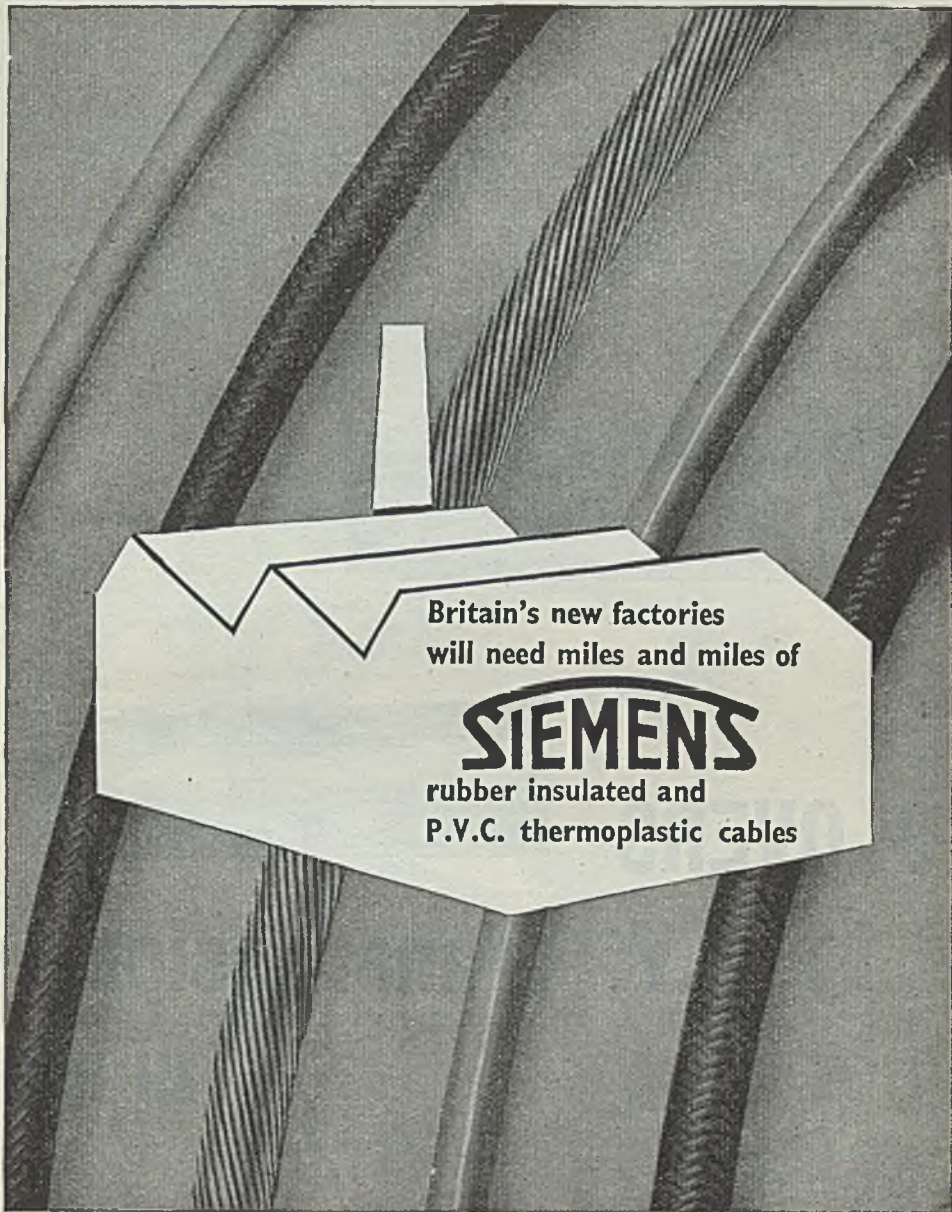
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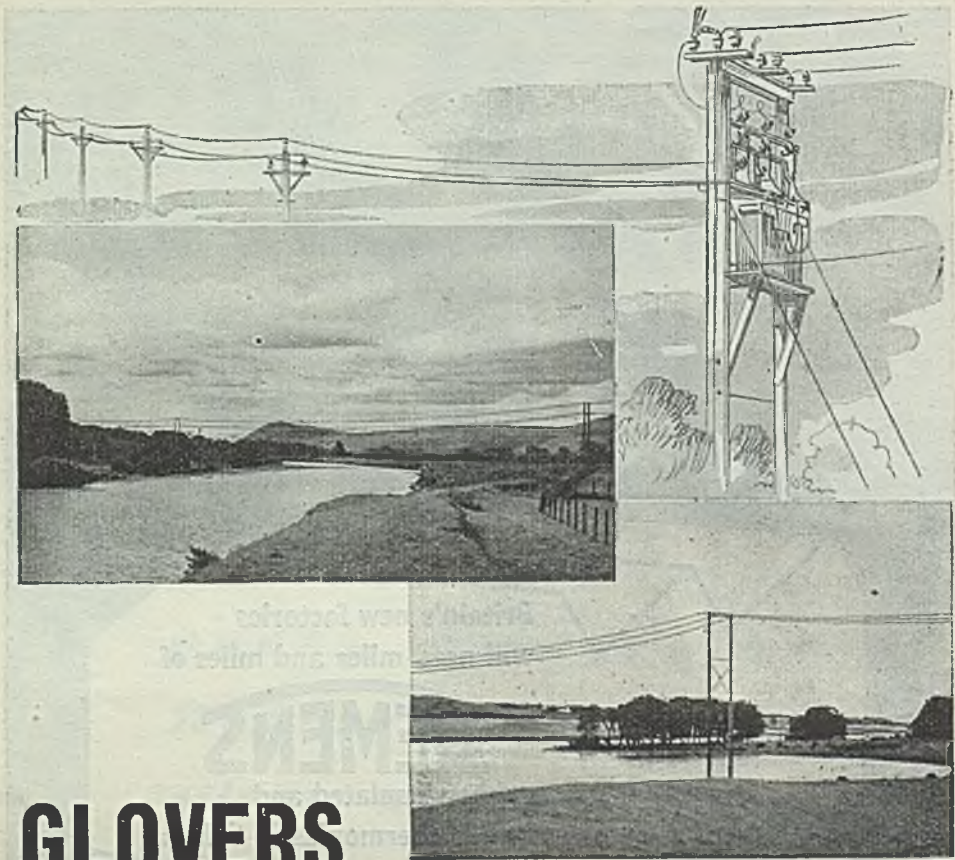
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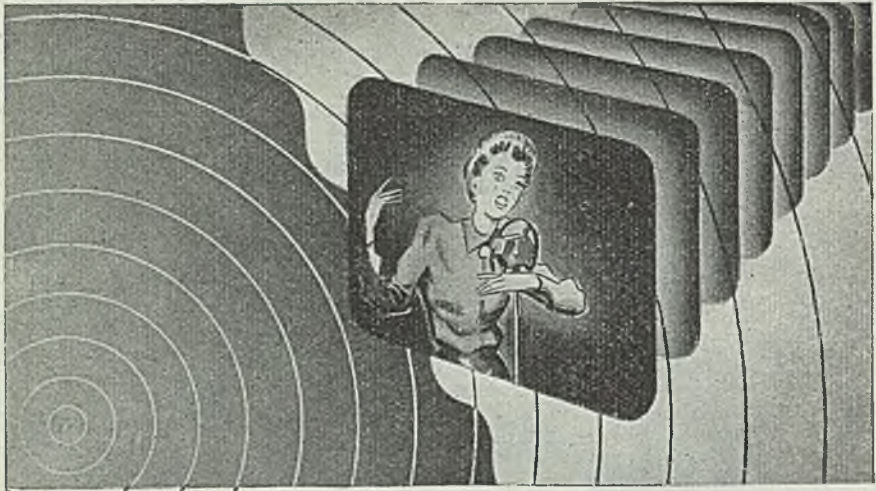
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None of the situations advertised in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 or 40 inclusive, unless he or she is excepted from the provisions of the Control of Engagement Order, 1945,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

SITUATIONS VACANT

**BOROUGH OF LEYTON.
ELECTRICITY DEPARTMENT.**

Appointment of Electrical Fitter.

APPLICATIONS are invited for the position of Electrical Fitter. The rate of pay will be in accordance with the Schedule of the District Council (No. 10), London Area, Electricity Supply Industry, which at the present time is 2s. 0d. per hour plus War Bonus of 6d. per hour. Forty-seven hours will constitute a normal week's work.

Applicants should have had experience in the manufacture, erection and maintenance of E.H.T. switchgear. Experience in an Electricity Supply Central Station will be considered an additional advantage.

The successful applicant will be required to pass a medical examination by the Council's Medical Officer of Health, and the appointment will be subject to the provisions of the Local Government Superannuation Act, 1937.

Applications, in candidate's own handwriting, stating age, experience, position with regard to National Service, and when able to take up duties, accompanied by copies of two recent testimonials, to be sent to the Borough Electrical Engineer and Manager, Electricity Offices, Cathall Road, Leytonstone, E.11, not later than first post on Friday, 26th October, 1945.

Canvassing in any form will be a disqualification. The Ministry of Labour and National Service have given permission under the Control of Engagement Order, 1945, for the advertising of this vacancy (E.D. 629a).

D. J. OSBORNE,
Town Clerk.

Town Hall, Leyton, E.10.
12th October, 1945.

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.

VACANCY occurs on editorial staff of a leading electrical engineering journal for enthusiastic worker with a good general knowledge of electrical industry, and desire to enter journalism. Previous journalistic experience unnecessary. Applications treated in confidence.—Box L.Q.E., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

FIRM of electrical engineers and contractors shortly opening business in the South Scottish area invite applications from electricians and wire-men experienced in the highest grade domestic and industrial installations. Permanent positions with good prospects and conditions are offered to suitable applicants over 51 years of age or Class "A" Servicemen. Men expecting release from the Services in the near future are particularly invited to apply. All applications will be considered and acknowledged.—Reply, giving full particulars of age, training and experience, and when disengaged, to Box No. 144, Phillips Advertising Ltd., 15, Wilton Road, London, S.W.1.

SITUATIONS VACANT

CITY OF BRADFORD ELECTRICITY DEPARTMENT.

SUB-STATIONS MAINTENANCE ENGINEER.

APPLICATIONS are invited by the City of Bradford Electricity Department for the appointment of a Sub-Stations Maintenance Engineer.

Candidates must have had a sound technical training and experience in the operation and maintenance of manually and automatically-operated converting plant (both rotary and rectifier type), 6.6 kV and 33 kV switchgear and transformers, with automatic voltage control.

The salary and conditions will be in accordance with the N.J.B. Agreement, the present salary being £295 per annum (Class H, Grade 10).

The selected candidate will be required to pass a medical examination and contribute to a Superannuation Scheme under the provisions of the Local Government Superannuation Act, 1937.

Applications, stating age and giving full particulars of training and experience, are to be endorsed "Sub-Stations Maintenance Engineer," and must reach the undersigned not later than Tuesday, the 6th November, 1945.

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

T. H. CARR, A.M.Inst.C.E., M.I.Mech.E.,
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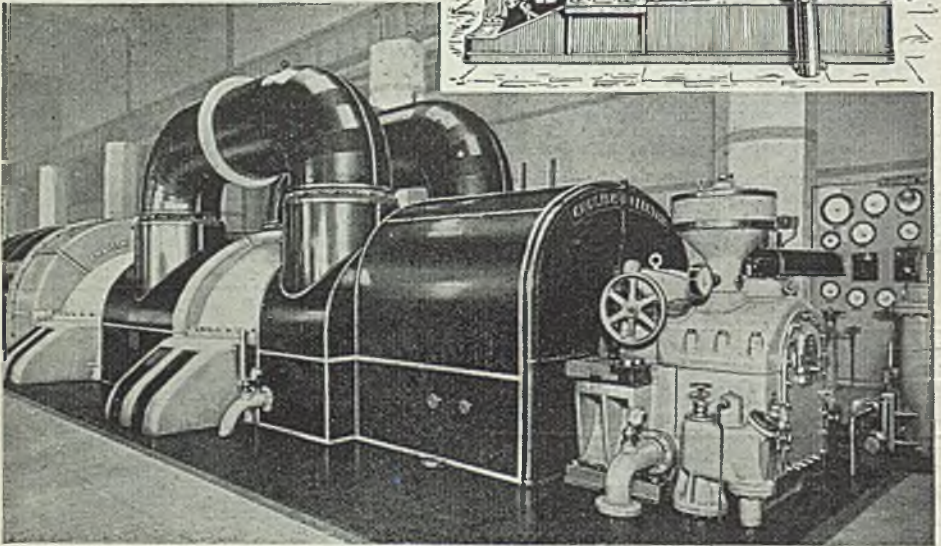
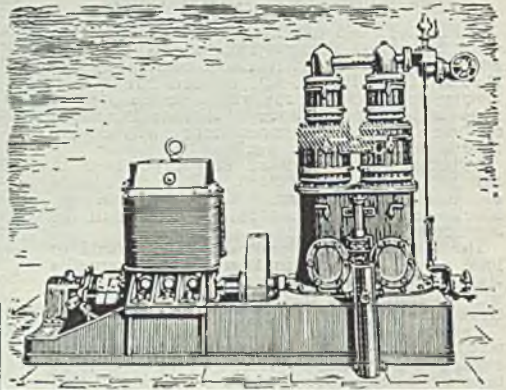
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difficult to anticipate those needs, or is lacking the machinery through which the consumer can give voice to his requirements; other consumers, content with their lot, are inclined to resent any attempt to enlarge their interest in electrical development. In other words, while there is among consumers an enthusiasm for electricity, there is no downright demand for its application to every possible use in the home, nor for its introduction in substitution for every other form of service.

A Users' Association?

THE truth of the old saying that those who pay the piper call the tune, is as much applicable to the electrical industry as any, and the remarks made by MR FORBES JACKSON in his Chairman's Address, before the I.E.E. Installations Section, last week, are, therefore, worthy of special notice. It is a fact, as we have said many times before, that the prosperity of the industry is dependent, ultimately, upon the satisfaction of its consumers, and its objective should be, if it is not already, the best possible service, with the most convenient, efficient and reliable equipment. The Chairman of the Installations Section is this year representative of one of those consumers—to the tune of over 45 million kWh per annum—and his view is that the industry has so far failed to give adequate recognition to the partnership which should exist between it and those he represents.

There is no possible doubt that before the generating capacity problem was presented to the industry by the Government, electrical expansion in the domestic field was making appreciable headway. Some of this development, but by no means all, was due to the springing-up between the wars of large block dwellings, new housing estates, new street lighting and so on, as a result of the activities of speculative and other builders. The load thus formed was more or less presented to the supply industry for development and the amount of electrification which is evident in the average home in these areas, makes one wonder whether or not more might have been done. New connections were, it is appreciated, hotly contested by rival fuel interests; there was not, in all cases, sufficient copper in the roads to allow of fuller development; while the household income would not, in every case, permit of higher current consumption—all good, but still not altogether unanswerable arguments in support of things as they are.

While some will agree with that view and others disapprove, it is a fact that the average consumer appears to be disinterested in making known his wants, while the supply industry—without question anxious to do its best—finds it

The chief criticism levelled against the industry by Mr. FORBES JACKSON is a present tendency to ignore the consumer except in so far as he can be persuaded to consume; meaning that not sufficient

attention has yet been given to persuading him or her to use electricity for purposes other than building up the load, and too often is the consumer, in the Installation Chairman's view, excluded from the deliberations of the industry where the interests of the public are concerned. In connection with the latter, a suggestion is made in the address that there should be formed an organisation representative of consumers, so that contact with existing organisations might be made, and the views of the former be presented to the industry for consideration. Provided that the organisation included in its membership a fair percentage of consumers who, like Mr. FORBES JACKSON, were also electrical engineers and had some knowledge of what they were talking, the formation of such a body might prove beneficial to both parties; if on the other hand, the organisation lacked within its membership sufficient informed opinion to guide it along the channel of practicability, it would be more a hindrance than an asset.

Future Development Methods

THE industry is now operating in a strictly limited sphere of potential development, and while other fuel interests are equally handicapped, the opportunity is presented for considering in what way the further popularisation of electricity can be brought about. The methods employed before 1939 had their value, as was shown by the advances made at the time; the methods to be used in the future, still not yet determined in detail, may possibly have to be wider in their scope than formerly, and a more intimate contact with the consumer, as envisaged by the proposed association, might quite reasonably be one of the best approaches to the problem. The feminine interest as represented by the E.A.W., is making its voice heard with advantage to both the housewife and the industry, and the same spirit behind an electrical consumers' organisation might be equally beneficial.

Man in Society

THOSE who failed to listen to the B.B.C. Home Service programme on Monday, to hear the voice of LORD FORRESTER, chairman of Enfield Cables Ltd., speaking in the popular series of debates entitled "Man in Society," missed an enjoyable half hour. In brief,

a medical psychologist accused employers of having neglected the human factor in industry and produced evidence of the sort of changes in working conditions which psychologists have recommended for some time; Lord FORRESTER and Mr. WILFRED BROWN, with Sir DAVID MAXWELL FYFE in the chair, put the case for the employers. Any debate to which Lord FORRESTER was a contributor would be expected to be lively and to the point, and Monday's example was no exception. His references to conditions in the electrical industry and the spirit which permeates all ranks were well put over, and showed deep study of the subject. The debate was indicative of careful preparation by the speakers, and in Lord FORRESTER the electrical industry had a worthy champion.

Weather and Electric Power Systems

WEATHER conditions have an important influence on the generation, transmission and distribution of electric power, the effects of which were discussed at a meeting of the I.E.E. yesterday, Thursday. The meeting was held jointly with the Royal Meteorological Society and the principal speakers were Messrs. J. S. FORREST, N. W. GRIMMITT, A. J. DRUMMOND, and Wing Comdr. R. M. POULTER. In general, weather effects power station systems in two ways; it causes variations in the load on the plant, and it may under abnormal conditions cause damage to equipment and an interruption of supply. Examination of these circumstances was made at the I.E.E. meeting yesterday and we hope in our next issue to present a comprehensive review of the results.

Working Parties for Industry

WHILE the working parties for industry, announced by Sir STAFFORD CRIPPS in the House of Commons, on Monday, do not presumably apply to the electrical industry and other forms of engineering, it is interesting to note that among the chairmen appointed to the various parties is Miss CAROLINE HASLETT, who will assume the responsibility for the hosiery trade. A brief hint of some new interest to attract the attention of the E.A.W. director was heard at the birthday celebrations of the association last week, but the nature of secret has been well guarded. The appointment will not, we understand, deprive the electrical industry of the ser-

ices of Miss HASLETT, for this is by no means the first time she has accepted responsibility in a dual capacity, but on the other hand, it may do much to assist electrical penetration into a trade which is in such need of expanding its exports. With her knowledge of electrical methods, coupled with her ability to get things done, we may rest assured that where electrical efficiency has not already been established, it will not be long before it is.

Tax Relief for Engineering

THE promise of Budget news on Tuesday next, gives special interest to a statement on the current financial problems of the engineering industry which has been submitted by the E.I.A. to the Chancellor of the Exchequer. In this it is suggested that the time has come when an entirely new conception of industrial taxation should be designed to ensure a continuous and adequate inflow of fresh capital and to stimulate drive and initiative. The engineering industry, says the statement, should be told now of the facilities that will be forthcoming by way of credit and Government provision of factories and machinery; of the extent to which it will be relieved from terminal and transitional losses; of the date on which E.P.T. credits will be available and the conditions attached thereto; of the method in which depreciation will be dealt with and of any plan for tax remission in the next two to three years. As far as taxation is concerned, it is urged that the most obvious relief in the direct taxation of industry would be a reduction of the standard rate of income tax. It is pointed out, too, that in the computation of taxable profits, difficulty is likely to arise in connection with un-ascertained contractual losses and devaluation of redundant stocks; reserves against these, it is suggested, should be allowed.

Overseas Trade

THE time lag in the release of the figures for British overseas trade is gradually being reduced, though the information made available is scanty in detail. Last month the figures for the first half of 1945 were published in much the same form as before the war, with detailed information with respect to individual items; the figures for July and August, however, are comprehensive, and much of the interest to be found in

estimating probable demands in types of electrical equipment is gone until the Board of Trade resumes publication in the pre-war fashion. Electrical exports for July and August last, at £1 332 758 and £1 350 653, respectively, were exclusive of the figures for such shipments as generators, motors, transformers, etc., and the values do not, therefore, represent any more than part of the figures; this is particularly the case when it is appreciated that exports of these heavy machinery goods have in the past usually accounted for a substantial percentage of the total shipments. Electrical import figures, as published for July and August, suffer from the same disadvantage, for, at £1 912 201 and £2 130 689, respectively, the totals convey little information without the details which go to make them. Too much reliance, must not in any case, be placed on the month to month movement of the figures as indicating significant changes, as imports, for example, may be affected by shipping and supply conditions, and exports by the varying amount of machinery and equipment sent to the liberated countries.

Telling the Farmer

ADDRESSING the Technical Development Conference of the Wiltshire War Agricultural Committee, at Devizes, last week, Mr. J. C. LESLIE, agricultural adviser to Edmundsons Electricity Corporation, told the farmer in his own language, of the difficulties attendant upon taking electricity supplies to the majority of farms, either quickly or at prices which the farmer would regard as economic; he explained in simple words the operation of the grid tariff, and left not one in doubt of the corporation's intention and desire to make electricity supply available to as many as is reasonably possible. Mr. LESLIE, whose association with agricultural work covers twenty-five or more years, asked for some kind of insurance from the farming community that, once supply was made available it would be used for agricultural purposes, and not as is often the case for domestic applications only. The uses to which electricity may be put on the farm are too well known to our readers to need recording, but in Mr. LESLIE'S address was sown good seed which the whole industry will watch with interest.

E.A.W. 21st Anniversary

Sir Stafford Cripps on Women's Influence in Design

THE chief guest at the 21st birthday luncheon of the E.A.W. in London, on October 11, was Sir Stafford Cripps, President of the Board of Trade, who, in proposing the appropriate toast, and after referring to the purposes and objects of the association, said that while we all wanted to attain the highest standard of living possible, such standard should not be judged by a cost-of-living index but by the happiness in the home.

Electricity and Citizenship

The originators of the E.A.W. saw in electricity a universal servant of the housewife, which could be employed at low cost provided those responsible for its availability understood the housewife's needs and the housewife understood its possibilities. It was of little use to ask women to become intelligent citizens—as, in fact, was done when they were given the vote—if, at the same time, conditions persisted which made it physically impossible for them either to educate themselves in citizenship or to take part in democratic assemblies and processes. If, therefore, through the activities of the E.A.W., could be spread the use of convenient forms of power and heat in the home, women would have free time to interest themselves in outside affairs. This meant education of the housewife in the possibilities that electricity offered, and to further this cause the association had built up throughout the country groups of women who were not skilled electrical engineers but intelligent appreciators of what was possible by means of introducing electricity into the home.

Another aspect of such educational work was that it gave women an introduction to the electrical industry and it was his hope that such work would interest more and more young women, with a view to their taking part in the affairs of the industry.

During the war millions of womenfolk had become acquainted in factories with modern materials and processes. They had learnt something about fatigue-saving methods and he believed that they would want some of those materials and methods applied to their domestic problems. He hoped, too, that they had learnt something of the difference between rubbish and well-made and lasting domestic appliances.

One thing learnt during the war was the need for the closest liaison between the users and suppliers, so it was essential that such a body as the E.A.W. should study the problem of domestic equipment and

advise the manufacturers upon the best way of meeting the housewife's needs. Design had three aspects, mechanical and electrical perfection; convenience of use; and external appearance. The first was the affair of the technician, but the second and third were essentially matters in which the user should speak with a loud and insistent voice.

We had long had a reputation in this country for the soundness and solidity of our mechanical and electrical construction, indeed, sometimes complaint had been made that we erred on the side of oversolidity for articles which were not really required to last so long. But as regards convenience and appearance, the dictates of the technician and production engineer had too often been obeyed. In the result, we had not produced such attractive or convenient articles as our rivals in other countries, and it was hoped that the E.A.W. would continue to apply its pressure to get from manufacturers articles which it considered attractive from the housewife's point of view as opposed to that of the production engineer.

We had need in this country to build up as big an export trade as possible. What the E.A.W. considered good, convenient and attractive for the British housewife would, too, appeal to housewives abroad.

The task of electrification in the home—not of mansions and luxury flats, but of ordinary modest homes throughout the country—had hardly yet begun. With a tremendous new programme of housebuilding before us it was a great opportunity to introduce the electric servant into all of them. Though the association had laboured with success for 21 years there was still a great task ahead.

Tribute to Industry's Support

Miss C. Haslett, director, in reply first acknowledged the tributes paid by Sir Stafford Cripps, and then thanked the British Electrical Development Association for the "birthday gift" of the First Women's Electrical Exhibition which they had arranged in the E.A.W.'s honour. She mentioned that during the 21 years of the association's growth the organisation owed much to the men whose belief in their work had made it possible, first among whom was Sir Andrew Duncan, then chairman of the Central Board. The Electricity Commission, the Institution of Electrical Engineers and other electrical organisations had given support and encouragement, and among names especially

remembered were Dr. S. Z. de Ferranti, Col. Crompton, Sir John Snell and Lord Hirst of Witton.

Miss Haslett went on to say that now the association was grown up it could look back to its beginnings with pride; it could look back to a precocious childhood with a Spartan upbringing—apart from the few who spoiled the infant and who, consequently held a special place in its heart. If in growing up one had the privilege of making experiments, maturity gave the right to express opinions based on one's own experience. The original conviction of the necessity for relating scientific development to women and giving women a share in that development had been strengthened as the years went by, and even more so by present conditions. The women of the country were physically fatigued at the end of the war, while mentally they were more alert. The electrical industry had in its hand a great gift which would ameliorate the lot of the women of Britain by giving them labour-saving homes and surroundings. The provision of well-designed, well-equipped homes was a social problem which the electrical engineer had to consider, apart from his pre-occupation with electrical development as such. It was a platitude that a nation's status was determined by that of its

women, but in electricity was a force which could enable the women of Britain to show the greatness in peace which had world-wide recognition in war.

In the evening of the same day the association held a reception at the Grosvenor House, London, when a large attendance taxed the ball-room to capacity. During the evening, at 9 p.m. to be precise, the lights were lowered and on to the ballroom floor was wheeled an illuminated three-tier birthday cake, made from ingredients contributed by the association members. After a brief speech outlining the work of the association and paying tribute to Miss Haslett, the president, the Dowager Lady Swaythling, cut the cake, simultaneous with which ritual a display of special lighting, arranged by the E.L.M.A., was switched into circuit. This included a replica in tubular lighting of the E.A.W. monogram, a stroboscope designed to give appropriate birthday greetings, a "city of light," and rotating fluorescent tubes.

The President then called upon Mrs. M. B. Jackson, supported by Mrs. Rendell-Baker, to make a presentation to Miss Haslett, which was accepted by the latter with some emotion.

Women's Electrical Exhibition

E.D.A. Birthday Gift to the E.A.W.—Features to Look For

THE diverse fields of activity in which women and electricity were employed during the war are depicted with striking effect at the first women's electrical exhibition which was opened by the Duchess of Kent at Dorland Hall, London, on October 11. It was organised by the British Electrical Development Association in celebration of the 21st birthday of the Electrical Association for Women and as a tribute to the eight million British women mobilised for war; and there is an interesting pictorial and factual record of outstanding events in the history of the E.A.W., its growth and phases of its work directed towards the electrical education of women and the extension of the use of electricity

in the home. The trend of development in kitchen planning and in electric domestic appliances is indicated by models.

Unobtrusively light blue and gold are the predominating colours of the setting of a well-planned display, the framework for which is constructed of light welded steel tubing, while silvered steel mesh enhances the lighting effects at certain aspects.

The part women played in the Services, in Civil Defence, in hospitals, in the factories and in the home during the war is depicted by means of photographic and printed panels, while in separate bays in the main hall members of the W.R.N.S., A.T.S., W.A.A.F., Women's Land Army, Civil Defence, factory



The Duchess of Kent signing the E.A.W. visitors' book. Also in the picture is Miss Caroline Haslett

workers, telegraphists and nurses, show and demonstrate equipment they helped to make, operated and maintained. Accompanying a British magnetic mine, is a firing unit combining both magnetic and acoustic operation.

Prominent amongst the exhibits is an upright cooker with Perspex casing



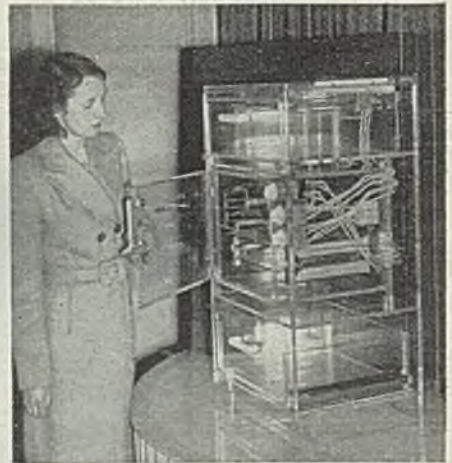
The model dining-kitchen, showing buffet-type electric cooker on the right

through which can be seen the wiring system, the working of the switches and elements and thermostatic control, as well as the internal fittings; it is, of course, intended for display purposes only, and it is not suggested that Perspex will be used for working cookers. The plastic case is not cemented, but all the parts are precision-machined and dovetailed together, thus establishing a new method of construction for Perspex. The pins and screws are of stainless steel.

Partly dividing the hall from the adjoining section is a wrought ornamental grill of extruded aluminium with side panels of Perspex in which are carved designs representing, in progressive stages, the history of lighting in the home, from the rushlight to the electric lamp. These are shown in bright relief by illumination passing through the plastic from fluorescent tubes in the framework.

A model dining-kitchen, planned in the light of contemporary architectural development and embodying the latest electrical equipment, is of special interest. Decorated in a warm sunshine yellow and pale blue, it shows how attractive such an arrangement can be. Plastic is largely employed. The working counter and splash boards are in blue Perspex, cupboards have transparent Perspex roller fronts, the floor is covered with grease-proof plastic, and the curtains are of plastic material. A new American type of washing machine—the Bendix home laun-

dry, by Appliances Ltd., driven by a $\frac{1}{2}$ H.P. motor—fills itself with hot water from the domestic supply, washes the clothes, triple rinses them and damp-dries them, empties, cleans and shuts itself off. It carries a 10 lb. load of laundry, which is placed through a glazed watertight door in the front, into a cylinder which rotates at high speed. There is no agitator, but the cylinder has four smooth baffles, and, as it rotates, these tumble the articles through the water and fling the dirt out of the meshes of the material. Next to the washer is a drying cupboard in the bottom of which are two heating elements with a total loading of 300 W and a three-heat switch, giving a quarter, half or full heat. A Prestcold refrigerator on view with the motor in the top, has a capacity of 3 cu.-ft. There is a Moffatt buffet type of cooker, the oven of which has thermostatic control and a drop-down door; over the grill and hot cupboard are three semi-radiant hot plates; in the wall above the cooker is a Ventaxia exhaust fan; over the working counter are two socket outlets, for kettle, iron, or other small appliances. In a cupboard by the sink is a U.D.B. electric water heater, and on the left of the sink is an electric towel drier. On the opposite counter top are an electric plate warmer and a coffee percolator. The light screen dividing the kitchen from the dining area incorporates a glass china cupboard, opening from either side. A cupboard recessed in the wall of the din-

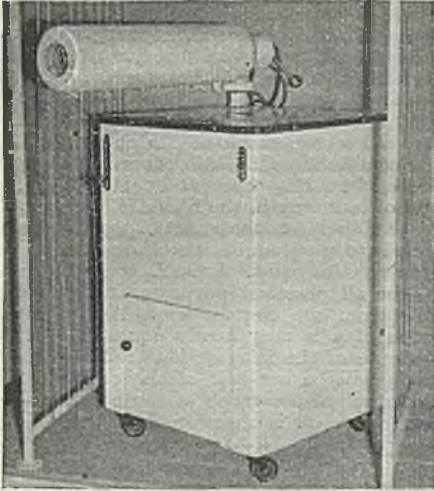


A new upright model electric cooker with Perspex casing to show the wiring

ing area, near the door contains a compact service unit and meter.

Among other exhibits in this section are an English Electric upright cooker with a four-heat switch, giving high, medium,

low and simmering heat for one of the hot-plates; a Jackson 91 J model cooker; a Hotpoint washing machine with a safety detachable wringer and an ironing attachment; when not in use the wringer can be stowed away in a cupboard under the washer; the ironing attachment is placed in the same position on top of the washer



A washing machine with an attachment for ironing clothes, by the Hotpoint Electric Appliance Co., Ltd.

as shown in the picture, and the laundry is passed between the roller and a polished metal plate. An attractive English Electric washing machine, in cream colour and stainless steel, with a safety wringer, is a prototype which should be in production early in the new year. Both these washers take hot water from the domestic supply.

On the Mezzanine floor, upstairs, are the post-war development bays, representing schools, health clinics, catering establishments, kitchen planning and home lighting—all of particular interest to women. Different lighting installations are demonstrated in miniature models of rooms, and there are models of the four E.D.A. kitchens, which have been exhibited in London and the provinces. For a nursery school the heating recommended is by convection, the model displayed being the Thermovent 2 kW heater in a Bakelite cabinet that has the appearance of a radio receiver. For other schools heating methods shown are by guarded tubular heaters affixed to a wall, and wall radiators filled with low-expansion oil, sealed and heated by an electric immersion heater of 1 kW loading. These latter are made by the Hotpoint Electric Appliance Co., Ltd.

In a horticultural section there are an Electrocut heater, giving dry or humid heat, an Electrocut radiator for green houses, and a soil heater by the General Electric Co., Ltd.

Electric fires, vacuum cleaners, water heaters and other small appliances of various types are also on view.

Among those present at the opening of the exhibition were Lord Brabazon of Tara, president of the E.D.A., who presided, Lady Swaythling (president of the E.A.W.), Earl Lytton (a vice-president of the E.D.A.), Sir John Kennedy (Electricity Commission), Mr. F. Newey (chairman of the E.D.A.) and Captain J. M. Donaldson (chairman of the E.D.A. Exhibition Committee).

The ceremony took place in the cinema, and the Duchess of Kent, received a bouquet of roses and orchids from Sally Bentham, the granddaughter of Mrs. Bentham, chairman of the E.A.W. 1939/42.

Lord Brabazon spoke of the valuable work carried out by the E.A.W. which had taken electricity to women in a remarkable way. After referring to women's work during the war, he said he hoped many would take up electrical careers and so perpetuate the noble work they had already done.

The Duchess of Kent said the achievements of women during the war, whether in the Services, Civil Defence, hospitals, industry, or on the land had not been excelled by the women of any other country, or in any period of history. Theirs had been a splendid effort without which we might not have triumphed over adversity. In their work many women had to rely upon electricity for operating their machines and became skilled technicians. That knowledge could be adapted to peacetime uses. The Electrical Association for Women since its foundation had stood for the electrical education of women and particularly of the woman in the home who by knowing how to plan her work and by using labour-saving appliances could make her housework a part-time pleasure instead of a full-time burden.

Among others who co-operated in the exhibition were the following: The Electricity Commissioners, the C.E.B., the G.P.O., the B.B.C., the E.L.M.A., the B.E.A.M.A., the C.M.A., the London Power Co., Edmundsons Electricity Corporation, Chester electricity department, Norwich electricity department, the Electro-Medical Association, Bullers, Ltd., Bendix Home Appliances, Neon Lights, Ltd., E.K. Cole, Ltd., Electrocut, Ltd., Elton, Ltd., Moffatt, Ltd., Unity Heaters, Ltd., Murphy Radio, Ltd., Venner Time Switches, Ltd., Easco Electric Services, the Institute of Ray Therapy, Philips Radio, Ltd., the Telephone and Electric Maintenance Co., and Cable and Wireless, Ltd.

Three-Phase Power Factor Graph

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

WHEN the power in a three-phase balanced load is measured by the two-wattmeter method, then, denoting the readings of the lagging and the leading instruments by W_1 and W_2 respectively,

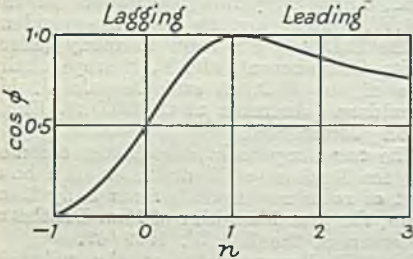


Fig. 1.

$W_1 + W_2$ is the power in the load, $\sqrt{3}(W_2 - W_1)$ the lagging VAR, and $2\sqrt{(W_1^2 - W_1W_2 + W_2^2)}$ the voltamperes.

Thus, denoting the ratio $\frac{W_1}{W_2}$ by n , the power factor of the load is given by the formula

$$\cos \phi = \frac{1+n}{2\sqrt{(1-n+n^2)}}$$

From this formula a graph can be drawn whereby, having calculated the ratio n , can read off the required value of the power factor directly. The general form of this graph is shown in Fig. 1. The horizontal line corresponding to $\cos \phi = \frac{1}{2}$ is an asymptote to the graph extended indefinitely to the right. As the value of $\cos \phi$ given by the

formula is unchanged if $\frac{1}{n}$ is substituted for n ,

the reciprocal ratio $\frac{1}{n} = \frac{W_2}{W_1}$ can be used when n is greater than 1, so that, for practical purposes, the only part of the graph required is that corresponding to values of n between -1 and $+1$.

The power factor graph can be drawn by assigning values to n and calculating corresponding values of $\cos \phi$ in the usual way. If, however, the scales of n and $\cos \phi$ are the same, that is, if the part of the graph required is contained in a rectangle 2 units by 1 unit, the graph can be drawn much more rapidly and with greater accuracy by the geometrical method shown in Fig. 2. Here $ABCD$ is the circumscribing rectangle. AH is a line through A at an angle of 30° to AB , OL_1D is a quadrant of a circle of radius BD equal to unity, with B as centre. If N is a point on the horizontal axis of ordinates corresponding to an assigned value of n , negative in the case shown, then $AN=1+n$ and $BN=1-n$. The ordinate NL from N to the line AH is therefore $(1+n)/\sqrt{3}$, so that if L and B are joined, the

tangent of the angle DBL is equal to $\sqrt{3} \times \frac{1-n}{1+n}$, and this angle is equal to the value of ϕ corresponding to n . Thus, if the intersection of the line BL with the circle OL_1D is projected horizontally on the ordinate NL as shown to give a point P , then P is a point on the graph, for NP is equal to $\cos \phi$.

It can be seen that for $n=+1$, the tangent to the graph at the point D is the horizontal line CD . Moreover, as the perpendicular, BL_1 from B on AH is $\frac{1}{2} AB$ and of unit length, the line AH is tangential to the circle at the point L_1 which corresponds to $n=\frac{1}{2}$, and is also tangential to the graph at this point. From L_1 to D the graph is, for all practical purposes, indistinguishable from the circular arc. Again, if the value of n is very nearly equal to -1 , the ordinate of the intersection of BL with the circle will be one-half of the ordinate NL . The slope of the graph at the point, $n=-1$ and $\cos \phi=0$, is therefore half that of the line AH and is equal to $1/2\sqrt{3}$. If BK is one-half of BH , then the line AK is the tangent to the graph at the point A .

The slope of the graph at the point corresponding to $n=0$ and $\cos \phi=\frac{1}{2}$ can be deduced geometrically, but it is simpler to

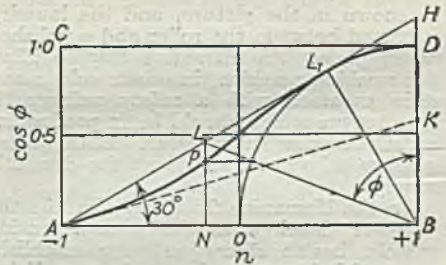


Fig. 2.

calculate it algebraically. For very small values of n we can neglect n^2 in the formula, so that, very approximately

$$\cos \phi = \frac{1+n}{2\sqrt{(1-n)}} = \frac{1}{2} \times \frac{1+n}{1-\frac{1}{2}n} = \frac{1}{2} \left(1 + \frac{3n}{2} \right) = \frac{1}{2} + \frac{3n}{4}$$

This shows that the slope of the graph at the point $n=0$, $\cos \phi=\frac{1}{2}$ is $\frac{3}{4}$, and a straight line with this slope through the point will be a tangent to the graph there.

Having fixed the points on the graph corresponding to values of n , equal to -1 , 0 , $\frac{1}{2}$, and 1 , and having drawn parts of the tangents at these points, the geometrical construction can be used to fix a few more points.

Tributes to Women's Work

Symposium of Papers at E.A.W. Conference

ON October 12, a large gathering at the Institution of Electrical Engineers heard three addresses on various aspects of women's work. The meeting, held in connection with the E.A.W. 21st anniversary celebrations, was presided over by Mrs. M. B. Jackson, who will shortly be vacating office as chairman of the association. It was explained that Lady Swaythling (president) and Miss Haslett (director) were absent from the opening of the meeting owing to the fact that they were in attendance at the exhibition which was that afternoon visited by Queen Mary.

Women and Wireless

The first speaker, Sir Robert Watson-Watt, F.R.S., referring to "Women and Wireless" said that before the war, he had come to the conclusion that radar equipment could be better operated by women than by men, and three selected women who were trained as the first radar operators in the world, became the basis for the subsequent specialised section of the W.A.A.F., for radar operation during the war.

The W.A.A.F., at one time and another had 11 000 technically qualified women engaged in its radar and radio efforts and together with 2 500 radio telegraphists and telephonists, they contributed very largely to the success of air operations; the Royal Navy trained 600 or 700; the A.T.S. still more; while in civil life the B.B.C. employed some 600 women.

All this, said Sir Robert, was gratifying history but on its 21st birthday, the E.A.W. was looking forward to the immediate and remoter future. His personal opinion was that no administration, no industrial organisation and no public utility service which had had an opportunity of benefiting from the work of women in wireless, would be so foolish as to deny itself the maintenance of at least a nucleus of that women's corps which had so distinguished itself in the past six years. It would, however, be a dis-service to suggest that there was employment for any large proportion of the tens of thousands he had referred to.

As to the remoter future, what was the reason for the absence in the field of radio of women research workers of the pioneer class? The answer was, he believed, in our national education and the abominable poorness of our education of girls. The education of boys was bad enough, but the education of a girl who was to take her place in a century when the use of atomic

energy indicated the enormous range of mechanisation which had been going on—and was to expand still further—was even worse. Mathematics in schools must be made to look useful. He presented himself as a sample of a shockingly bad student in pure mathematics who, by a transformation overnight became even a medallist when the subject became applied mathematics. Physics and chemistry should be removed from the stage of being a tax on the memory, into the curriculum for the post-primary girl. He asked the association to add to its many aims that of making girls fit subjects to live in an electrified and technical world.

Dr. Kathleen Lonsdale, F.R.S., the next speaker took as her subject, "A Woman Physicist Looks Back" and gave a brief survey of developments since the work of Galvani. Coming to quite recent times, she said that owing to the latest developments the next war would be nothing short of suicide. For the last 22 years she had had the privilege of working, not only in the building where Faraday worked but, for part of the time, on the very spot where he stood and used apparatus not very different from that of to-day.

Sir Harry Railing, who took as his subject, "The Link between Science and Practical Engineering," said the scientist looked on his work primarily as exploration. He sought to discover new knowledge. The engineer, on the other hand, considered it his task to solve the practical problems.

Harnessing Engineering and Science

Both the scientist and the engineer had his own proper and necessary outlook on his work but there was a considerable gap between them; unless this gap was effectively and quickly filled, progress suffered. Much of our industrial development since the war of 1914-18 had been due to the growth of appreciation that the forging of this link must not be left to chance but must be carefully organised. The more thorough and efficient the engineering organisation for actual production in the factory, the greater the need for men who understood and respected the outlook of both the scientist and the engineer; the greater the need for men to interpret the proposals of science on the one hand and the aspirations of production on the other, into new products or equipment incorporating the genius of both.

However brilliant the research work of our university scientists, or their contribu-

tions to scientific knowledge, their efforts would produce no industrial results unless there were in industry those who understood their work and who had the vision to see the way the discoveries could be used.

Links in Chain of Progress

Having dealt with some of the fundamentals of the relationship between the scientist and the engineer, he explained how in modern times we tried to forge that relationship and thus produce practical results with the minimum time lag. First, fundamental theories had to be interpreted by scientists in industry in order that they might be applied successfully on a practical scale. Then, more careful and often outstanding scientific and engineering research had to be carried out on preliminary models made for purposes of experiment and measurement. The early models were the "functional" prototypes and they were followed by more advanced models which began to assume some of the characteristics of the final product. A number of further stages of prototypes were tried before the new article passed to the factory for commercial production.

The factory itself could not adequately deal with these developments, and the firms which had successfully accomplished such pioneer work had, almost without exception, evolved a section of their organisations whose special function it was to cover this elaborate link in the industrial engineering chain.

Whilst it was easy to think of objects to which such attention might be given, the problem was which to choose. It was necessary to ask not only whether the goal was desirable and likely to be attained, but whether the benefit obtained, and the number sharing the benefit would justify the effort entailed.

As an example of the point he was making, viz., how the engineer followed the scientist, he chose the fluorescent lamp which, he said, bid fair to cause an even greater revolution in electric lighting than did the introduction of the gasfilled metal filament lamp some 30 years ago. But simple as the fluorescent lamp might appear to-day, it embodied a wealth of research by scientists, both past and present, and years of industrial development work by industrial research workers and engineers who transformed the early crude laboratory experimental models into the standard manufactured article of the present time. Before the fluorescent lamp could be made, the scientists had first to discover how to produce an electric discharge, original work on which was done as far back as 1700. But this discovery

by itself would never have produced a lamp for inside illumination because of its low efficiency, unsuitable colour and the very high voltage required for its operation. It was in 1866 that the original work on adding colour to the light of the discharge tube was done by Becquerel. The fundamental conditions were then ready for the industrial research worker to play his part. The first experimental fluorescent lamp was produced by coating the outside of a discharge tube with luminescent material. The experiment was successful but from an engineering and practical point of view the lamp was a failure, first because the external coating did not stand up to what was required of it, and secondly, because the luminescent materials available at that time did not possess a high luminous efficiency.

A second lamp was later produced with the luminescent material on the inside of the tube. This proved to be a great improvement and although the disadvantage of using luminescent material of low efficiency still persisted, fluorescent tubes, known as neon signs, were successfully produced for advertising purposes.

In 1935, a new fact emerged. New materials were discovered in an industrial research organisation in this country which not only gave a high luminous efficiency but retained their brightness for longer periods without increasing electricity consumption. The development of these new materials represented a great step forward and they were now being used in discharge tubes all over the world. Thus the stage was reached where the industrial research worker had produced a fluorescent lamp giving any colour required, including a light indistinguishable from daylight. Then followed a period of intensive investigation by industrial research workers and engineers, and finally a lamp which would operate direct from the ordinary house lighting mains was produced.

Natural Function of the E.A.W.

Engineers in the electrical industry, continued Sir Harry, liked to think they had an important mission, that of bringing the advantages of electrical science to the service of the community—and they also liked to think they fulfilled that duty efficiently. To do this, however, it was necessary to be fully alive to the thoughts and requirements of those whom they served, and it was equally helpful if they, in turn, had some understanding of the problems and methods of industry. The members of the E.A.W., were the natural interpreters in both directions and the industry was grateful to them for fulfilling this double function.

Consumers' Viewpoint

I.E.E. Installations Section Chairman's Address

THE new chairman of the I.E.E. Installations Section, Mr. Forbes Jackson, took for the subject of his Address before the members in London on October 11, "A Consumer's Views and Experiences."

He sometimes wondered, he said, if the great and prosperous electrical industry, which had every reason to be proud of itself and its achievements, did not tend to overlook the fact that it had a silent partner—the ordinary consumer, the man



Mr. Forbes Jackson

who paid for everything. Without him the other partners, the supplier, manufacturer and contractor, could not survive. He (the Chairman), was a consumer in his own home, but, apart from that, it was his job to be a consumer on a large and varied scale. He was a professional consumer, with no commercial interests in supply, manufacture or contracting. As the Electrical Engineer of a local government authority (the London County Council) his job was to purchase electricity and electrical installations for almost every purpose. In that capacity he dealt with approximately 1 000 schools, 150 hospitals, offices, workshops, pumping stations, fire stations, public and school-meal kitchens, etc. a total of about 5 000 premises in over 100 supply areas. There were, in fact, few applications of electricity of which they had not some examples. They were not suppliers of electricity, yet their annual consumption of 45 million kWh exceeded the output of the majority of statutory undertakers. In addition, they had had to arrange for supplies, provide electrical installations for and give general supervision to 100 000 small houses and flats which, he supposed, accounted for another 20 to 30 million kWh per annum.

That the industry failed to recognise the consumer as a partner in its enterprise was very evident if one turned over the pages of any electrical journal or THE ELECTRICAL BLUE BOOK. There were associations of electrical people for every sort of trade purpose, known familiarly to them by a multitude of combinations of initial letters, and, so far as he could discover, not one which

existed purely for the benefit of the consumer and very few which even consulted him at any time.

Although the supply industry undoubtedly had the interests of the consumer in mind, he found it difficult to believe that this was the compelling force behind its enterprise. It would indeed be expecting too much to ask the three active partners to put the interests of the sleeping partner above their own, and, since they did not admit him to their deliberations, he did not think it unfair to say that they did not really know what he wanted and that they took no steps to find out, other than to measure their success in terms of the number of units sold.

In any case, should they accept figures of increasing total output as evidence that, from the consumer's point of view all was well? The supply industry wanted to sell the greatest number of units. The consumer wanted to buy the smallest number of units which would give him the service he needed. The supply industry was therefore much more likely to be interested in a cooker, water-heater or even a fire, than in one of the labour-saving devices which might, nevertheless, mean more to the comfort and amenities of the consumer. The electrical industry had, he thought, concentrated too exclusively on the heavier-current appliances. They helped to fill in the load curves, they increased output, they were cheap to make and the consumer liked them. A washing machine should be as essential to a family as a vacuum cleaner. Other countries were not so backward. A fairly recent report of the Ontario Hydro-Electric Commission showed that 52 per cent. of their consumers had washing machines as against 30 per cent. cookers, 20 per cent. water heaters and 18 per cent. refrigerators. Incidentally, all had irons and 62 per cent. had toasters.

Kitchen Planning Eclipsing Other Needs

Meanwhile, the supply industries, both gas and electric, were concentrating on kitchen planning, and engineers, architects, house planners and even cabinet ministers were joining in the fun of arranging and rearranging cooker, water heater, refrigerator and sink. There were other rooms in the house besides the kitchen, and other processes at least as important as adding heat to food or extracting it therefrom.

So far, in the average urban home, the only things electricity was doing that could not be done reasonably well before its advent, were lighting, radio, ironing and

vacuum cleaning, although the latter had never come well within the range of the smaller incomes. Electric labour-saving in productive industry had developed to a high pitch. Had we really put our best brains to work on the problem of labour-saving in domestic industry?

He could hardly omit the very important subject of the diversity of tariffs. They all knew that there were so many apparent variations in tariffs as to bring ridicule to the industry and confusion to its consumers. He did not expect to pay the same price in rural and urban areas, for he knew that the cost of giving the supply must be different. But he saw no reason why, in London, for the same sort of load, he should have different forms of tariff and pay different prices to two adjacent municipal undertakers. Electricity supplies in London were now fifty years old. Surely by now they should have attained something like uniformity of prices!

The Most Urgent Task

He suggested that this was the most urgent task which confronted the "alphabetical" associations. It would do away with the major part of the external criticism of the industry.

He was sure that, if electricity undertakers were consumers as well as suppliers, they would have scrapped all their non-standard systems years ago. As it was, they seemed to be raising again the issue of whether they were really working for 230, 240 or 250 volts. Speaking for the consumers, and he should think this time for the manufacturers and contractors also, his vote would be to concentrate on 230 volts and get on with it.

If the industry succeeded in its apparent intention of securing a very large proportion of the domestic heating processes, would it still be able to offer the same terms? Was domestic electricity now being sold at bargain prices which could not be repeated if it became the major load on the system? These were things which housing planners would like to know.

On the manufacturing side, the consumer had grounds for satisfaction as well as for disappointment. Before the war interfered there was a wide choice of fires, cookers, water-heaters, radio sets, lighting fittings, kettles, of good quality and reasonable price. The real labour savers, i.e., washing machines, floor polishers, mixers, washing-up machines, were available, at a price, to those who knew and were prepared to experiment. There was not enough demand to encourage economic production, and it seemed to be nobody's business to instruct the consumer so that a demand should arise.

The manufacturers had not put them-

selves in the consumer's place and tried to find out what was the best they could do for him. Their reply was that if the consumer created the demand the manufacturers would respond. Were they sure that even if the consumer asked for something he would be allowed to have it?

Let plugs and sockets illustrate his point. The Study Committee, after much patient inquiry, recommended the adoption of a new standard 3-kW all-purpose fused plug. They had been supported in this by the Codes of Practice Committee, by the Electrical Contractors' Association, by an overwhelming vote of the supply undertaking by the E.D.A., by the I.M.E.A., in fact, by practically every user. What was the answer of the manufacturers to the users' unanimous plea? With two notable exceptions, they declined to do anything about it. They appeared, in fact, determined to prevent the user having what he wanted. Every experienced installation engineer had long since realised that a fused plug to use in multiple on a single circuit would be a most useful accessory. He believed it had come to stay and, if the B.S.I. or the B.E.A.M.A. would not at present give it their blessing, he hoped that the user side of the industry would make it their business to see that no artificial barriers were erected against its use and development.

A Consumers' Right

He would like to see the contractors' share of the enterprise increase, and he saw no reason why he should not assist both himself and the consumer, by advising on, and selling, the labour-saving appliances which every one else seemed to have neglected.

He thought not only that consumers had a right to express their views, but also that industry would gain if it listened to them. Contact between the individual undertaker and his consumer was not of itself sufficient. The industry had elected to govern itself by associations working at different levels, and he suggested that, somehow or other, the opinion of the consumer should be given due weight at those levels. How was that to be done, since the consumers were unorganised and consequently inarticulate?

Within the institution, and within the Installations Section, there must be a number of engineers who, like himself, were primarily consumers. As a very small step in the right direction, it might be possible, without elaborate organising, for those people to stand a little closer together, as a consumer group. He could see several ways in which such a group could give expression to its views.

Electrification or Extinction?

Address by the President of the A.S.E.E.

IN the course of his second presidential address before the Association of Supervising Electrical Engineers, in London on Tuesday, Mr. E. R. Wilkinson dealt with the part which electricity had to play in the urgent task which confronted us—the



Mr. E. R. Wilkinson

task, not of a mere return to pre-war conditions, but of a progressive and integrated concentration of all our national will-power and resources; the task of obtaining and maintaining national prosperity and a high standard of living, in a world which, by the stress of war, had learned in the last six years lessons of mechanisation and productivity which

otherwise might have taken several decades.

His recent visit to the United States, he said, had given him the opportunity to view our post-war problems in a perspective which might otherwise have been impossible, and it was his firm conviction that, in the years which lay ahead, principles and theories, however lofty, must take second place to the watchword: "Coats off, sleeves up, and down to brass tacks." It was to the chemist and engineer that we must look, rather than to the politician or the visionary planner.

Comparing the situation to-day with that at the close of the last war, when power was only really freely available in the coal-field areas of the country and when the application of electricity to the needs of industry was stultified by high prices and by a medley of technical systems, it might be said that electricity was as widely available as piped water supply, and when the full story of this war came to be told, it would be found that immense strides had been made in the adaptation and control of electricity for industrial purposes. The situation in the electrical field to-day might be said to have reached as revolutionary a turning point as that when the isolated and haphazard discovery of individual new elements was directed into a conscious and organised search for the missing numbers in the atomic series. What was needed was an exacting and co-ordinated scrutiny of all industrial processes, to see that at every point in the industrial chain, electricity was

used in substitution for manual labour, if to do so held out the prospect of even a fractional gain in productive efficiency.

It was a significant commentary on our insular attitude to such matters that whereas, before the war, the United States took a complete census of manufacturing industries every second year, our own censuses of production were only at five-year intervals. The last British census was taken in 1935, but by a singular lapse, no information was then collected as to the horsepower equipment of industry, and so the last official ascertainment dated back to so long ago as 1930. The appointment by the Government of a committee to consider the problems involved in an annual census was a welcome indication of a fuller appreciation of the need for complete and up-to-date information, if our problems were to be tackled on a comprehensive and co-ordinated basis.

No one would suggest that the proportion of electrical equipment driven by private generators in this country should be the same as in America, where large-scale private water-power plants were practicable to supply the needs of the timber,

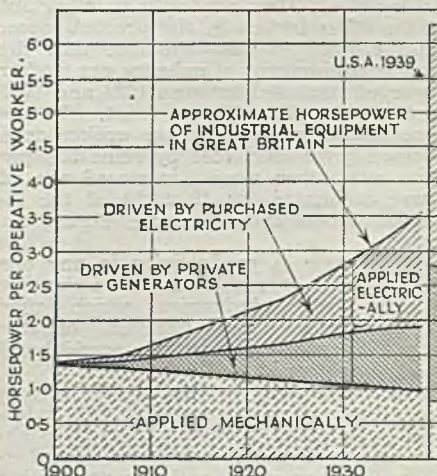


Chart showing comparative H.P. of industrial equipment in Great Britain and U.S.A.

wood pulp, and electro-chemical industries. Differences in the characteristics of the industries of the two countries naturally affected the comparability of any series of figures of average horse-power equip-

ment per worker. But the recent disclosures of the Cotton Board Committee, for instance, showed that even for comparable industries, the scale of equipment in British industry was far below its counterpart on the other side of the Atlantic. A survey of the position made by trade showed that in point of fact the textile industries of this country were not so badly off relative to America as were some of our other important industries. By applying the 1939 American scale of equipment to each of the comparable industries in this country on the probable scale of post-war employment, we could obtain at least an approximation of our own needs. An overall total of something like 25 million horse-power of electric motors was required in the factory trades of this country alone, apart altogether from the requirements of the extractive industries, before the American scale of utilisation in comparable industries was approached.

An Urgent Task

Here was the task that confronted the industrial engineer. It meant, broadly, that the horse-power equipment of our industries had to be doubled before we attained the increased productivity which was so vital to our national future. It was a race against time no less urgent than our war effort after Dunkirk. It must be the keystone of our policy of national reconstruction. How relatively unimportant all the other factors in the problem were, could be gauged from the fact that the energy requirements of industry per worker employed increased between 1924 and 1935 by something like 35½ per cent. In the same period, net output per worker on a common price level rose by some 37½ per cent. In other words, increased use of power accounted for 19/20ths of the increased productivity achieved during the period.

An increase in productivity in any one industry, must react to the advantage of the other industries which used its products. The question of the inter-relation of our industries would be of great importance.

Any increase in productive efficiency in the cotton spinning and weaving industries would react favourably upon an extensive range of other industries. Furthermore, at every stage, coal was used either directly or in the form of electricity.

If it were possible to follow every raw material through the industrial chain, and to calculate the corresponding quantity of fuel utilised at each stage in its treatment, we should have a much clearer idea than was possible at present of the importance of fuel in manufacturing costs. In a country like Great Britain, where coal

was the most important of our raw materials, it was difficult to exaggerate the influence which any real advance in productive efficiency in the coal mining industry would have on the whole range of our manufactures. The whole process of obtaining increased productivity in the manufacturing industries of Great Britain depended first and foremost on the securing of that productive efficiency in the coal mining industry itself. Whereas in pre-war years Great Britain was producing coal more cheaply than America (at the par rate of exchange), between 1938 and 1943 the pithead price in this country increased by no less than 68 per cent., while the similar price in the United States advanced by only 37 per cent. For the year 1944, the price in Great Britain rose again to 94 per cent. above the 1938 level. The cost of coal delivered to the public generating stations associated with the grid, upon which our manufacturing industries now so largely depended for their power supplies, was, even before the war, rising more rapidly than the general increase in price at the pithead, and since the majority of the war-time increases in price had been by way of flat rate increases per ton, the disparity had been continued. The price to grid stations in 1944 was no less than 165 per cent. above the price which obtained in 1935, and it was common knowledge that the quality of the fuel received had sharply deteriorated.

Electrification as the Answer

At the 1935 census, the cost of fuel and power to the factory industries of Great Britain represented about 5½ per cent. of the net output value of their products, i.e., the value added by their own efforts to the cost of the raw materials and power used. Any relative increase in that cost must have a decidedly adverse effect upon our overseas competitive position. It was not too much to say that the whole programme of re-equipment of our industries to secure the essential increase in productive efficiency was in jeopardy unless the totally disproportionate increase in the costs of coal production was overcome. The coal-mining industry was, in fact, the supreme example of the possibility, by concentration on the securing of the highest possible technical efficiency, of obtaining a much higher productivity, and consequent lower price of product without sacrificing the standard of living of the employed workers. The report of the Reid Committee had pointed the way, and with coal mining, as with so many of our other basic industries, it was no exaggeration to say that in the difficult years that lay ahead, the plain issue was electrification or extraction.

Plastics Notes

By JAMES TAYLOR, B.Sc., F.R.I.C.

By some mischance the article which appeared under this heading in *THE ELECTRICIAN* of October 5, should have been published following the publication of the details below. In considering the particulars with respect to this plastics series, reference to the October 5 issue should therefore, follow the reading of the article below in order that a better understanding may be arrived at.

Cellulose Nitrate Plastics (Celluloid).—

Celluloid has been described at the "Granddad of Plastics" and this title is perfectly correct as celluloid can certainly claim to be the first and oldest plastic.

It is usually claimed in the United States that celluloid was invented by two brothers named Hyatt, about 75 years ago. As a matter of fact a Birmingham man named Alexander Parkes took out a British Patent in 1864, covering the addition of camphor to nitro-cellulose to produce celluloid. However, he was a man of many activities and he did not find time to develop his patent. In the year 1877 the British Xylonite Co. was formed to develop Parkes' patent and, with very little fundamental change, the process is being worked to this day. Credit, however, must be given to the Hyatt brothers for first commercial manufacture because they had a factory running in America as early as 1870.

A little digression on nomenclature may be appropriate here. Celluloid is the registered trade mark of the Celluloid Corporation of America and should, therefore, be applied only to products manufactured by them or their licencees. Xylonite is the registered trade mark of the British Xylonite Co. Ltd., and is the only brand manufactured in this country. However, as is often the case, a trade name has become the generic name and celluloid is loosely used to describe all materials consisting of nitro-cellulose or cellulose-nitrate which has been plasticised with camphor. In American literature the word Pyroxylin is frequently used to describe nitro-cellulose materials. This is necessary in America to safeguard the rights of the Celluloid Corporation to the word "celluloid."

To manufacture celluloid, cotton linters are nitrated with a mixture of nitric and sulphuric acids, the excess acid is removed by washing, and cellulose-nitrate pulp is separated by centrifuging. This pulp is treated with alcohol and camphor and kneaded, rolled and then calendered into sheets and made into blocks. If desired a

dyestuff or pigment may be added to give colour, and by mixing different coloured celluloids, varigated or mottled material may be produced. Alternatively, it may be left colourless and transparent. In passing it may be mentioned that either natural or synthetic camphor may be used for its manufacture.

Commercially, celluloid is available in sheets up to 55 ins. x 24 ins. varying in thickness from 0.004 to 1½ in. It is also available as rods and tubes. Sheet material is produced by slicing from blocks and then hanging up to season. Rod and tube are extruded by forcing the material under heat and pressure through a nozzle or die. Rods and tubes are seasoned in the same way as sheets. Sometimes rods are made by cutting from blocks but this is wasteful and is not usually adopted unless special configurations of sheet are called for.

The main physical and electrical properties of celluloid are as follows: Specific gravity, 1.35 (unpigmented), 1.35 to 1.8 (pigmented); tensile strength, 5 000-7 000 lb./sq.in.; impact strength, 2.0-4.0; volume resistivity, 10¹⁰-10¹¹ ohms. cms.; dielectric strength, 300-780 V per mil.

Comparison of these figures with those already quoted for the thermosetting plastics shows that its tensile strength is about the same, its impact strength is about ten times as high, its specific gravity is about the same, its volume resistivity is slightly lower, as also is its dielectric strength. It may be mentioned that its resistance to water is very good, not so much as compared with thermosetting plastics, but compared with other thermo-plastic materials.

An Over-rated Danger

On account of its nitro-cellulose content celluloid is readily inflammable but, despite this, it finds, considerable technical application. The danger of celluloid on account of fire risk is, however, over-rated.

Another interesting property of celluloid is its resistance to dilute acids such as sulphuric acid. It will resist more or less indefinitely the action of sulphuric acid up to 30 per cent. strength and consequently it finds a considerable outlet for the manufacture of accumulator cases, etc. It should be mentioned that strong solutions of sulphuric acid will attack celluloid and, for that reason, concentrated sulphuric acid should never be added to a celluloid accumulator, when the acid of which has dropped below strength. The strong acid

and distilled water should be mixed before pouring into the accumulator.

Unlike most plastic materials, celluloid cannot be moulded. Any attempt to mould it will probably result in an explosion. It can, however, be readily shaped. That is to say, a sheet of celluloid is heated to render it soft, it is placed round a wooden former and then held in position by bands, clamps or another former, allowed to cool and then lifted clear of the former.

It can be drilled, sawn or cut with ordinary tools and machines, provided certain elementary precautions are taken to avoid risk of fire. Shavings should not be allowed to accumulate near the work but should be deposited in a covered bin or covered by water. A jet of water should always play upon the part being cut or drilled. All cutters should be kept sharp, as blunt tools are liable to throw sparks and, of course, all naked lights should be prohibited.

Accumulator Cases

The main use of celluloid in the electrical industry is, as has been indicated above, in the making of accumulator cases. Compared with glass accumulators they are lighter in weight and, on account of the high impact strength of celluloid, they will withstand considerable rough usage without fracturing. On account of the fact that celluloid softens at about 60°C. they are not however, generally suitable for use where high working temperatures are likely to be encountered.

Celluloid is soluble in a number of organic solvents, such as acetone, ethyl-acetate, amyl-acetate, etc., and these solvents may, therefore, be used for cementing celluloid to celluloid. This property has been made use of in recent years in building up various complex forms in celluloid.

Celluloid is used frequently in windows of optical and electrical equipment. It is perfectly transparent, is much lighter in weight than glass and is much more non-fragile. It can be printed upon and can therefore be used where the "window" is required to carry a graduated scale of some sort.

The other applications of celluloid do not concern the electrical industry, but a list of them is given as a matter of interest and in the hope that they may give ideas to some readers. Amongst the applications may be mentioned combs, tooth brush handles, collars, lids and covers, safety glass interlayers, covers for wooden shoe heels, covers for golf shafts, etc., dental plates, umbrella handles, mathematical instruments, map covers, labels and show cards, knife and tool handles, ornaments, trays, fountain pen barrels, and, of course, fancy goods and toys generally. A recent

development has been for the heads of hammers and mallets, which were required to be resilient and for which rubber was no longer available.

Cellulose Acetate Plastics.— Cellulose-acetate, as such, was first of all produced about 1860 by two chemists, Schutzenberger and Naudin, but it was not until the 1914 war that cellulose acetate made any advance commercially, and then it was mainly for coating wings of aircraft parts. Between the two wars considerable technical development was made and cellulose acetate, besides being used for aircraft dopes, became available as film, as artificial silk, in sheet form and as a moulding material. During the last war it again found outlet in aircraft as sheet, as mouldings, as dope and in windows. Owing to war-time demands, its use for the manufacture of artificial silk decreased.

Cellulose-acetate is manufactured from cotton linters by acetylation, with acetic acid and acetic anhydride, together with sulphuric acid. In this respect the process is somewhat similar to that used for the manufacture of cellulose-nitrate. Sometimes diluents such as benzene, toluene or carbon tetrachloride are added. This process yields cellulose-acetate as a syrup, from which a white powder or flaked material is obtained by precipitation in water. This is made up into a dough with organic solvents and plasticisers, worked on hot rolls and made into sheets or blocks. Here again, the similarity to the process for the production of celluloid will be appreciated.

Commercially, the sheet material is available in sheets up to 56 in. x 24 in., in thickness ranging from 0.004 in. to 1½ in. Like celluloid, it is also available in rods and tubes. Rods are usually from 0.060 in. diameter to 2½ in. and the average length is 52 in. Tubes are made in varying wall thicknesses and in internal diameters from 0.039 in. to 6 in. or slightly more.

As an alternative to making sheet, rod or tube, the dough, consisting of a mixture of plasticiser and cellulose-acetate, may be calendered into sheets or any convenient shape, broken and fed through a disintegrator to produce granules. These granules are used as a moulding powder.

Manufacture of Film

To manufacture film a solution of cellulose-acetate with plasticisers in a suitable solvent is allowed to drop slowly on a slow moving endless belt. This belt passes through a carefully controlled drying chamber, where the solvent is driven off, being recovered for use again, and the dry film is wound off on reels from the far end. The most elaborate precautions have to be taken to exclude dust and other foreign materials.

For purposes of comparison the main physical and electrical properties of cellulose acetate plastics are set down below:

	Sheet 1.3 (mean)	Moulded Material 1.3 (mean)
Specific Gravity.		
Tensile strength, lb./sq. in ...	4 000/5 000	3 000/4 000
Impact strength	1.5-2.5	.7-2.5
Volume resistivity ohms. cms. ...	10 ¹⁰ -10 ¹²	10 ¹⁰ -10 ¹²
Dielectric strength V per mil. ...	350-400	350-400

It will be noticed that the properties of the sheet and moulded forms are about the same, except for the tensile and impact strengths. The variation is accounted for

by the different handling during manufacture of the two types of material. It will also be noticed that the above figures are roughly comparable with those quoted for celluloid. The main difference between the two materials lies in the fact that cellulose acetate is not highly inflammable, although it can be made to burn, and also cellulose acetate does not withstand water like celluloid. In fact, it is rather hygroscopic. In 24 hours celluloid will absorb only from 1 to 3 per cent. of water, whereas, under the same conditions, cellulose acetate will absorb as much as 2 to 7 per cent.

It is proposed later to review the methods of shaping cellulose acetate sheet and to describe the processes of moulding the moulding powders.

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. E. Tanner has resigned from the board of the Enfield Cable Works, Ltd.

Mr. W. S. Poole has resigned his seat on the board of the Atlas Electric and General Trust, Ltd.

Councillor A. W. Miller, principal of Messrs. Miller, electricians, is the Mayor-elect of Aberystwyth.

Mr. R. W. Field, illuminations engineer, Blackpool Corporation, who reaches the retiring age next month, is to remain in the service for another year.

Mr. L. Buckingham, who is leaving Switchgear and Equipment, Ltd., after 13 years' service, has been presented with an attache case and a technical dictionary.

Miss Caroline Haslett, director of the E.A.W., who is adviser to the Ministry of Labour on women's training, has been appointed chairman of the Working Committee for the hosiery industry set up by the Board of Trade.

Mr. S. E. Harvey-Barnes has resumed his duties as a director and electrical manager of Gothic Electrical Supplies, Ltd. For the last six years he has been in the R.A.F., on the fighter operation side of Fighter Command.

Mr. William S. Thain, formerly joint manager of the Dundee branch of Thomson and Brown Brothers, Ltd., with whom he had been associated for over 30 years, has been appointed general manager of Wood and Cairns Ltd., Edinburgh.

The Ministry of Aircraft Production announces that, following the introduction of the simplified control procedure for light metals, **Mr. G. W. Lacey** has relinquished his appointment as Controller of Light Metals in order to rejoin the British Alu-

minium Co., Ltd. He is succeeded by **Mr. C. G. McAuliffe**.

Mr. William Bird, managing director of the Engineering and Lighting Equipment Co., Ltd., is to become Mayor of St. Albans for the second time. He held the office in 1934. The Mayoress-elect is a director and secretary of the same company.

Mr. G. E. Turner, assistant station engineer to the Blackburn electricity undertaking, is retiring on superannuation on November 27, after 43 years' service. The Electricity Committee has placed on record appreciation of his services.

After 45 years' service with Bruce Peebles and Co., Ltd., Edinburgh, **Mr. George Happer**, chief inspector, has retired. Acknowledgment of his work was made at a gathering of employees of the firm, at which **Mr. J. W. Rodger**, managing director, presided.

Mr. V. Younger, clerk to Harrow Council since 1934, has been appointed assistant to **Mr. C. W. Hayward**, managing director of Electric and General Industrial Trusts, Ltd., to assist in the company's general issuing business, and conversion from war to peace of its industrial interests.

While a prisoner in Germany, **Mr. Joseph Lannon**, of the Clitheroe electricity department, received his papers for the third year examination in electrical engineering of the Lancashire and Cheshire Institutes. His studies in the prison camp won him his certificate. He began his training at Blackburn Technical College.

Preston's Mayor-elect is **Ald H. E. Rhodes**, who, for 17 years, has been chairman of the Electricity Committee. An old official of the Steam Engine Makers' Association and later of the A.E.U., he

has served as chairman of North Lancashire Manpower Board, and now has a staff appointment with Aberdare Cables, Ltd.

After 40 years with the North-Eastern Electric Supply Co., Ltd., **Mr. Percy T. Forth** has retired. For the past 22 years he has been in charge of the firm's undertaking in the Crook area. He was formerly superintendent of the Priestman power station at Blaydon, and afterwards resident engineer of the Bankfoot and Bowden Close power stations at Crook.

Major C. A. J. Martin has been released from the Army and has resumed his position with Crompton Parkinson, Ltd. as sales manager for fractional H.P. motors. For the war years, Major Martin served with the Royal Engineers on bomb disposal activities and was awarded the George Cross in 1943. In the 1914-18 war, he served with the R.G.A. and gained the M.C.

Mr. B. C. Westall, chairman of Thomas De La Rue and Co., and **Mr. Cyril Ashton**, vice-chairman of that company, have joined the board of Thomas Potterton (Heating Engineers), Ltd. **Mr. Leopold Friedman** has been appointed managing director, **Mr. T. F. C. Potterton** will continue to act as chairman, and **Mr. A. B. Potterton** as vice-chairman.

The Council of the Institute of Welding have awarded the Sir William J. Larke Medal for 1945, together with a first prize of £50, to **Mr. W. K. B. Marshall**, for a paper entitled "The Fabrication of Aircraft Fuel Tanks in Aluminium Alloy Containing 3 per cent. Magnesium." Mr. Marshall is a metallurgist on the staff of the Aluminium Plant and Vessel Co., Ltd.

Professor G. I. Finch, F.R.S., has left by air to carry the greetings of the Royal Society on behalf of the men of science of Great Britain to their colleagues in Belgium and Holland. The purpose of his visit is to renew and re-establish scientific contacts and to see what help can be given by British science towards the rehabilitation of science and scientific education in those two countries.

Major W. Gordon Martin, R.A., has been released from military service, and is taking up his appointment as area manager for Scotland, for A. Reyrolle and Co., Ltd. Mobilised in August, 1939, Major Martin served for a period in the Scottish Command. He has spent the last three and a half years in S.E.A.C. His father, the late Mr. David Martin, represented Reyrolle in Scotland for over thirty years.

Mr. Percy C. Philpot, manager of the radio and electrical department of Stockall Marples and Co., Ltd., who has been with the company since 1922, has been elected to the board. **Mr. D. E. Moss**, the pre-

war North London representative for the radio and electrical section of the firm has recently been demobilised and will be taking up his duties again about the middle of this month.

The Lord President of the Council has appointed **Professor H. Munro Fox, F.R.S.**, **Professor I. M. Heilbron, F.R.S.**, and **Dr. C. C. Paterson, F.R.S.**, to be members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research from October 1, 1945. Professor A. V. Hill, Sir Felix Pole and Sir Robert Robinson retired from the Council on completion of their terms of office on September 30.

After 14 years' service as director of the Federation of British Industries, **Sir Guy Locock** has resigned, but has agreed to continue in office until his successor is installed. The appointment of **Mr. N. V. Kipping** as director general is announced to take effect as early in the New Year as his release from Government duties can be arranged. During the war, Mr. Kipping was head of the regional organisation of the Ministry of Production. Before joining the Ministry Mr. Kipping was works manager of Standard Telephones and Cables, Ltd.

The Council of the Association of Electrical Machinery Traders have appointed a technical committee to offer advice and guidance upon individual problems, preferably of a general nature in their application. The committee comprises:—Messrs. H. W. Cole (Milo Engineering Works), E. H. Crook or Mr. T. A. Atkinson (Dynamo and Motor Repairs, Ltd.), F. H. K. Dearlove (Fyfe, Wilson and Co., Ltd.), E. J. Ferguson (Britannia Manufacturing Co., Ltd.), R. H. Gill (the Midland Dynamo Co., Ltd.), G. H. Holding (Newman Industries, Ltd.), R. C. Hull (Universal Electrical Co.), W. E. Lawton (Industrial Electrical Co., Ltd., chairman).

Col. H. J. Wellingham, who has been Press liaison officer for Cable and Wireless, Ltd., since February, 1944, has been promoted manager of their London branches. He will take over his new appointment on December 1, when **Rear-Admiral George P. Thomson**, who has been Director of the Press Censorship Division, Ministry of Information, during the war, joins the company to undertake Press liaison duties. Col. Wellingham is an engineer by profession. He joined the Western Telegraph Co.—now merged into Cable and Wireless, Ltd.—in 1924. After working in the company's training schools at Madeira and in London, he was appointed in 1934 assistant to the divisional manager, United Kingdom. In February, 1944, after serving with the R.E.M.E. in the Tunisian campaign, he was seconded from the Army

to establish the newly-created Press liaison office for Cable and Wireless, Ltd.;

The vacancy in the chairmanship of the Midland Regional Board for Industry has been filled by the appointment of **Mr. W. H. Stokes**, a divisional organiser of the A.E.U.

The Minister of Works has appointed the following Regional Directors:—Mr. William Mathieson (Leeds), Major-General H. B. W. Hughes (Nottingham), Brigadier Rawdon Briggs (Cambridge), Brigadier G. B. Gifford Hull (London), Major-General G. L. S. Hawkins (Reading), Captain C. A. H. Kitchener (Bristol), Dr. D. J. Roberts (Cardiff), Brigadier H. N. North (Birmingham), Mr. Stewart Owlter (Manchester), Mr. S. J. Egerton Banks (Turbridge Wells). These appointments follow the announcement of August 24, that the Minister of Works had decided to strengthen the existing regional organisation of the Ministry by the appointment of regional directors who will be generally responsible for all aspects of the Ministry's work in their regions.

A former South African correspondent of THE ELECTRICIAN, **Lt.-Col. E. F. Rendell**, is the system operation engineer of the Victoria Falls and Transvaal Power Co., Ltd., in South Africa. He served in the Great War with the Royal Engineers, and was awarded the M.C., twice mentioned in dispatches and made a Cavalier of the Order of Avis of Portugal. In 1939 he was appointed Deputy Director of Recruiting for the Union Defence Force and later served as a staff officer in the Middle East. On his return to the Union he was elected Mayor of Germiston, a position which he has held since 1942, and in addition is an honorary member of the staff of the Union Directorate of Demobilisation. Lt.-Col. Rendell served his apprenticeship with the Bolton, Lancashire, Corporation and, before going to South Africa, was for five years on the staff of the Newcastle Electric Supply Co. He is a past president of the South African Institute of Electrical Engineers and also a past president of the South African Associated Scientific and Technical Societies.

The following elections have been made by the Board of the Institute of Physics:—

Fellows: C. C. Addison, G. L. J. Bailey, C. Baker, G. W. Brindley, J. Cates, B. M. Crowther, T. A. Eames, W. F. Floyd, L. L. Fox, A. F. A. Harper, H. H. Hopkins, R. G. Horner, J. L. Houghton, J. D. Huffington, N. Kurti, J. M. A. Lenihan, J. Mazur, L. McPherson, C. A. Meek, H. Motz, H. Pelzer, S. Rees-Jones, M. O. Robins, A. Schofield, W. J. O. Scott, J. L. Tearle, A. I. Vangeen, J. B. Warren, A. G. White, Associates: D. L. Allan, H. Arthur, A. H. Berry, J. B. Birks, F. J. Bradshaw, H. M. Bristow, C. K. Brown, J. W. Collins, D. C. Davies, E. G. Dunstan, M. Evans, W. F. Fielding, T. M. Flett, H. Henderson, G. F. Hodsman, J. L. Hopkins, J. H. Jaffe, J. W. John, R. H. Kay, R. D. Lowde, G. M.

Michie, R. L. Morgan, J. Newton, C. A. Norman, K. J. Pascoe, G. Peirson, L. H. Pinkess, F. Y. Poynton, G. E. Pringle, R. R. Ray, J. T. Richmond, F. R. Speke, A. Stambberger, V. F. G. Tull, D. Walker, M. S. Wills, A. S. Wiltshire.

Eleven subscribers and fourteen students were also admitted.

Obituary

Mr. Harry England, a director of the Lancashire United Transport and Power Co., Ltd., and South Lancashire Transport Co., aged 75.

Mr. P. D. Coates, formerly chief electrical engineer at Bank Hall Collieries, Burnley, and also, at one time, to the executors of Col. Hargreaves, Ltd., aged 60 years.

Mr. Alfred George Cooper, electrical engineer and manager to Thornton Cleveleys Council since its inception in 1926, on October 11, aged 73 years. Mr. Cooper had carried on owing to staff shortage since the war.

Mr. C. A. Petty, London manager of the fractional horse-power motors department of the General Electric Co., Ltd., on October 9. He had been in the service of the company for 42 years. The funeral took place at Brighton Borough Crematorium on October 13.

Mr. Charles Edward Fairburn, chief mechanical and electrical engineer of the London Midland and Scottish Railway Co., on October 12. Born in Bradford in 1887, he was educated at Bradford Grammar School. He won a mathematical scholarship at Brasenose in 1905, and at Oxford had a distinguished career, gaining first classes both in Mathematical Moderations and in the Final Honour School. He was elected to a senior Hulme Exhibition in 1908 and was the first man to take the new School of Engineering at Oxford, getting another first class. After spending three years as a pupil in the Derby locomotive works of the Midland Railway, in 1912 he joined the railway department of Messrs. Siemens' dynamo works and got his first experience of railway electrification in the design and erection of the first 1 500 V overhead line in this country, between Newport and Shildon, for the North Eastern Railway. From 1919 to 1926 Fairburn was busy organising a department of the English Electric Co., Ltd., to deal with railway electrification, and he then became general manager of the Preston and Stafford works of the company, and in 1931 their chief engineer. In 1934 he became chief electrical engineer of the L.M.S. Railway, and in 1938 deputy chief mechanical engineer, with special responsibility for the locomotive and carriage and wagon shops. He succeeded Sir William Stanier as chief mechanical and electrical engineer in 1944.

Electricity in South Africa

The Problem of Pretoria's Growing Demands

THE Pretoria City Council's electricity undertaking will undoubtedly be required to meet a continuously expanding demand for supplies, apart from the requirements of possible schemes for post-war reconstruction and development. The City Electrical Engineer proposes, therefore, to plan future extensions on the basis of the average rate of growth of the undertaking prior to and during the war. In such planning a high degree of flexibility can be allowed to meet divergencies from the estimated trend as a result of post-war reconstruction schemes. Between 1927 and 1939 the average rate of increase was 13.6 per cent. per annum, and in 1939 the maximum half-hour load was 28 300 kW. Between 1940 and 1944 the average rate of increase was 15 per cent., with the 1944 demand estimated at 57 500 kW. In 1943 the maximum half-hour load was 52 100 kW. It is estimated that from 1945 to 1950 the average rate of increase will be 14 per cent. per annum, and that the 1950 demand will be 125 000 kW maximum half-hour load.

The City Electrical Engineer has summarised the position as follows: Present safe capacity, including 20 000 kW standby supply from the Victoria Falls Power Co., 62 500 kW. Safe capacity, including 20 000 kW standby supply from the V.F.P., when extensions now in hand are completed, 95 000 kW. It is clear, therefore, from an examination of the future estimated loads, that steps need to be taken to augment the supply by 1949.

Meeting Anticipated Demands

In accordance with the programme outlined by the Council's consulting engineers, Messrs. Merz and McLellan, in a comprehensive report submitted to the Council in June, 1940, the next stage in the development of the undertaking is the construction of a new power station with an ultimate installed capacity of 200 000 kW on a site adjacent to the existing plant. The first stage of construction, comprising two machines having a maximum continuous rating of 25 000 kW and four boilers, will need to be in commission by 1949, followed by the second and third stages, each comprising one machine and two boilers of similar rating, at intervals of approximately three years. An alternative method of meeting the demands anticipated in 1949 and subsequent years, is by taking a bulk supply from the Rand system. Whether or not this would be a more economical procedure than the erection of a new power station must depend

on the terms on which such a supply would be available. At present it is cheaper to generate electricity in Pretoria than somewhere in the vicinity of the Vaal River and transmit to Pretoria. If the British authorities do not in the very near future sanction the manufacture of the turbo-alternators required for the extensions now in progress, the Council may again be forced into the position of arranging an augmented supply from the Witwatersrand.

Shortage of Cooker Fuses

The shortage of new electric cooker fuses of the screw-in type has necessitated the use of re-wired "blown" fuses in some parts of South Africa. Certain electrical contractors carry out this re-wiring satisfactorily, but others are supplying a fitting in which a very short piece of fuse wire is soldered externally between the end contact pad and the brass screw barrel. As a measure of safety, and in the consumers' interests, the Durban municipal electricity department has issued through the Town Clerk a warning against this type of cooker fuse.

The Durban electric tramways and trolley bus services have been showing deficits for a number of years, and during the war period these have had a consistent rising tendency to the 1944 estimate of £96 931. Since the war running costs have been increased by rising wages and higher prices for materials and equipment, without any increase in fares to offset this. Suggestions have been made for increasing the fares, and if these are adopted it is anticipated that the annual deficit will be halved.

Dr. G. W. Bond, chief chemist of the Electricity Supply Commission, recently published a paper on ground water supplies in the Union with special reference to their treatment for technical purposes. He noted that so far as power production is concerned, ground water is being utilised all over the Union as boiler feed "make-up", and for condenser cooling water in the case of turbo-alternator steam plant, or in the water jackets of oil engine electric plant. Consequently the nature of the water and possible improvement of chemical treatment became a matter of great importance.

The Dominion Government proposes to establish a water supply commission on the lines of the Electricity Supply Commission, and this has aroused widespread interest in the South African power industry. Dr. Bond's work is likely to prove of value if the proposal is adopted.

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.

Alloa T.C., October 24.—Electrical work in connection with the erection of 20 Swedish timber houses at Hutton Park. Specifications from the Burgh Architect, Municipal Buildings, Alloa.

Kirkcaldy T.C., October 25.—Electrical work in connection with the erection of 50 Swedish prefabricated houses. Particulars from the Burgh Engineer's office, East Fergus Place, Kirkcaldy.

Hackney B.C., October 26.—Supply and delivery of six 500 kVA transformers. Specification from the Borough Electrical Engineer, 18/24, Lower Clapton Road, E.5.

Manchester Electricity Department, October 26.—Supply, delivery and erection of ventilating plants for No. 2 boiler house, Stuart Street generating station (Spec. No. 839). Particulars from Mr. R. A. S. Thwaites, Electricity Department, Town Hall, Manchester; deposit, £1 ls.

Gainsborough U.D.C., October 29.—Supply and delivery of one 500 kVA 3-phase static transformer. Specification from the Electrical Engineer, 6, Lord Street, Gainsborough.

Burnley Education Committee, October 31.—Supply of equipment for Burnley Technical College, in connection with the establishment of a new electrical engineering laboratory. Details from the Direc-

tor of Education, Education Offices, Burnley.

Sheffield Electricity Department, November 5.—Supply and delivery of one 20 MVA, 33/11 kV, 3-phase, double-wound, self-cooled transformer. Contract No. 706. Specification from Mr. John R. Struthers, Commercial Street, Sheffield; deposit, £2 2s.

North of Scotland Hydro-electric Board, November 6.—Supply, delivery and erection of 11 000 V distribution lines in connection with Distribution Scheme No. 2. Specification from Mr. T. Lawrie, 16, Rothesay Terrace, Edinburgh, 3; deposit, £2 2s.

Overseas

State Electricity Commission of Queensland, December 10.—Supply, delivery, erection, and setting to work of 7 500 kV and 750 kW steam turbo-alternators, accessories, and evaporating plant at Wide Bay Regional Electricity Board, Maryborough; Capricornia Regional Electricity Board, Rockhampton; and Townsville Regional Electricity Board. Tender forms from the Agent-General for Queensland, Queensland Government Offices, 409-410, Strand, London, W.C.2.

Eire Electricity Supply Board, January 28.—Supply, delivery and erection of the hydro-electric generating plant at Cathleen's Fall and Cliff stations on the River Erne. Particulars from the Chief Design Engineer, Electricity Supply Board, 26, Lower Fitzwilliam Street, Dublin, C.18, deposit, £5 5s.

News in Brief

Appointment Vacant.—Applications are invited by Bradford electricity department for the post of sub-station maintenance engineer.

Social Item.—The "Austin Low" challenge cup for bowls has been won by the St. Helen's Cable Co., Slough, who defeated Sunningdale in the final.

Torquay Floodlighting.—The Publicity Committee has made provision for an expenditure of £757 for the reinstatement of the floodlighting of Rock Walk.

Arbroath Street Lighting.—The T.C. has decided that street lighting in its new Carnegie Road housing scheme should be by electricity. Electricity is already being used for the domestic lighting of the scheme.

Overhead Line Damage.—The Douglas (I.o.M.) Electricity Committee reports that

as the result of a recent storm a tree was blown across the overhead lines and the supply to 12 consumers was interrupted.

Henley Housing Exhibition.—Those participating in a housing and town planning exhibition at Henley-on-Thames included the British Thomson-Houston Co., Ltd., the Wessex Electricity Co., and the Yorktown (Camberley) and District Gas and Electricity Co.

I.E.E. Benevolent Fund.—Members, friends and business firms will be glad to know that as a result of the recent appeal by the Mersey and North Wales Centre of the Institution of Electrical Engineers, the sum of £150 has been collected and handed over to the Benevolent Fund of the institution. The Chairman and Committee wish to thank all donors for their generous support.

Lamp Sales Publicity

Details of Further Widespread Advertising Campaigns

EKCO lamp publicity has been planned to give stockists the widest measure of support within present restrictions. Many dealers will have seen the large painted Ekco lamp posters which are appearing on prominent selected sites in key towns throughout the country, and this publicity is being supported by Press advertisements in national magazines, and so on.

Although paper regulations prohibit the production of normal display material, Ekco will shortly have available a number of sales aids including posters, window bills and window stickers. All are in full colours, and although they have been printed on reclaimed paper little is lost in this unusual method of reproduction. Literature and price cards for dealers' use are available and public literature will be re-introduced as soon as regulations permit. Ekco are prepared to help dealers on a 50/50 basis with the cost of local news-

vertising campaign in support of their stockists. Extensive use is being made of poster advertising, and specially selected



A new Ekco crown poster

paper advertising and a range of colourful cinema slides is available. These slides, incorporating dealers' names and addresses, will be prepared free of charge if required.

Although handicapped by paper regulations, etc., Ensign Lamps, Ltd., of Preston, are launching a widespread public ad-



An Ensign lamp sales-aid, or window sticker (top) and below window bill in colours

sites are being taken throughout the country.

The range of sales aids which will shortly be available, includes posters, window corner pieces, window bills and stickers. These are all newly designed and are printed in full colours on reclaimed paper. Supplies are limited, but there should be enough for all Ensign stockists to make effective displays. Public leaflets will be re-introduced when regulations permit. In the meantime new price lists and price cards are available for dealers' use. Colourful cinema slides, incorporating dealers' names and addresses, will be supplied, free of charge, on request.

Counter Measures.—In a leaflet distributed to members, the N.E.C.T.A. points out that a high percentage of the retail trade in electrical goods of all kinds is done over the counters of the great departmental stores and multiple shops, and declares that the time has come for counter measures. The electrical contractor must get out of badly sited business premises, employ trained salesmen, and learn the art of window and counter display.

Electricity Supply

Lowestoft.—The Electricity Committee has obtained sanction to borrow £17 138 for supply to housing estates.

Glasgow.—The Cleansing Committee is to electrify the Kelvinhaugh works at a cost of £2 300.

Torquay.—The Baths Committee is to instal another motor for the filtration plant at the baths at a cost of £325, plus wiring.

Torquay.—Sanction to borrow £1 200 for the maintenance of the supply to the village of Ipplepen, is being sought by the Electricity Committee.

Chesterfield.—The Electricity Committee is to provide another transformer and switchgear at Sheffield Road sub-station at a cost of £530.

West Hartlepool.—Application is being made to the Electricity Commissioners by the T.C., to borrow £26 462 for electricity developments.

Watford.—Sanction to borrow £2 614 for supply to the Bushey Hall estate has been obtained by the Electricity Committee, and sanction is being sought to borrow £10 000 for sub-stations and distribution plant.

Torquay.—The Electricity Committee is raising no objection to the application of the Teignmouth Electric Lighting Co. Ltd. for a fringe order to supply in the parish of Teigngrace.

Dunblane.—The Dunblane and District Electricity Supply Co. intends to transfer its undertaking to the Grampian Electricity Supply Co. The T.C. has an option to acquire the undertaking, and has agreed to discuss the matter further.

Cardiff.—The Electricity Committee has asked a sub-committee to consider a proposal by the Electrical Engineer that a limited hire-purchase scheme for cookers and wash-boilers should be restarted on revised terms.

Watford.—The Electricity Committee has agreed to a proposal of the Northmet Power Co. for a fringe order extension to enable the company to afford supply to 70 houses to be erected by the Elstree R.D.C.

Lichfield.—The Corporation Electricity Committee has obtained sanction to borrow £2 617 for extensions to the Freehold Estate, and reports that the West Midlands Joint Electricity Authority has agreed to apply for sanction to the erection of the second main feeder.

Lowestoft.—To facilitate housing estate development the Housing Committee has arranged for the electricity department to replace overhead lines with underground cables at a cost of about £600, the cost to be divided between the two departments.

Watford.—The Electricity Committee is being asked by the R.D.C. to fix the charges at the same rates as those prevailing in the borough having regard to the fact that the Corporation has enjoyed a complete monopoly in certain parts of the rural area for several years past. The Committee is to go into the matter.

Fleetwood.—Concern about the financial position of the undertaking was expressed at a recent meeting of the Electricity Committee. It was stated that every 1s. rise in the price of coal cost the undertaking £1 000 per year. The Committee has deferred consideration of tariffs.

Chesterfield.—The Electricity Committee has obtained sanction to afford additional supply to the pumping station at Whispering Well, and is to proceed with the requisite works at a cost of £1 700. The Corporation is seeking an order to provide supply for all public and private purposes in the urban district of Staveley and several parishes.

Basingstoke.—A petition against increased charges for electricity made by the Corporation has, after full consideration of all the circumstances, including the financial position of the electricity undertaking, been rejected by the Electricity Commissioners, who have instructed the Corporation that they may proceed with their proposals.

Barrow-in-Furness.—The Electricity Committee is to provide supply to Hazel Hall Farm, Torver, at a cost of £133, and to the Greengate estate at £3 000. The Committee is seeking sanction to borrow £18 178 for the provision of supply to various farms and estates, £5 000 for mains and services, and £5 000 for apparatus for hire.

Liverpool.—The Electric Power and Lighting Committee has received the consent of the Commissioners for the borrowing of £350 000 in connection with extensions to the electric supply distribution system. The Committee has sanctioned the provision of additional cables and switchgear in connection with the supply of electricity to the factory at Speke, of the Dunlop Rubber Co. Ltd.

Liffey Electrical Scheme.—The Eireann Government has given its approval to plans submitted to it for the construction, at an estimated cost of £315 000, of a reservoir and power station on the Liffey, between Celbridge and Lucan. This proposed plant will form part of the Liffey hydro-electrical scheme. It is proposed to flood over 151 acres of land, and when completed the station will have a capacity of 4 000 kW.

Stirling.—The T.C. has approved a recommendation made by the Electricity

Committee, to negotiate for the purchase of the electricity sub-station and plant at Goosecroft laid down by the Air Ministry, the price not to exceed £700. This would enable a.c. to be supplied to new premises being erected in the district and to consumers in the centre of the town. Application is to be made to the Electricity Commissioners for permission to change over the supply to a.c.

Durham.—The R.C. has forwarded to the Ministries of Town and Country Planning, Fuel and Power, and Health and to the Lord Privy Seal, a statement outlining its views on the plan for a power station at Kepier which was rejected by the Ministry of Town and Country Planning. The Council's statement referred to the need for electric power in the mid-Durham area and said this was universally admitted; the East Durham Joint Planning Committee was prepared to zone an area, including the power station site, for industrial purposes; the opinions of popularly elected bodies should not be set aside in deference to the wishes of the Council for the Preservation of Rural England and the Society for the Preservation of Durham.

Erne Scheme Approved.—The Eireann Minister for Industry and Commerce has issued an order approving the scheme for the hydro-electric development of the River Erne. The cost of the work, including compensation for lands acquired, will amount to about £3 115 000. Two

power stations will be built between Ballyshannon and Belleek, with a generating capacity of 50 000 kW, and an output of approximately 200 000 000 units per year. The construction of two reservoirs will require the flooding of 960 acres of land.

Maidenhead.—In view of anomalies in existing tariffs resulting from the increased cost of coal on the one hand, and the higher consumption of electricity on the other, the Corporation is introducing as from the next meter reading, revised tariffs for prepayment meter and industrial consumers. This means a reduction to prepayment meter consumers, placing them virtually on the same tariff as quarterly consumers, with a charge of 4s. a year to cover the increased cost of providing pre-payment meters.

Chesterfield.—In view of the likelihood of a general demand for the installation of welding plants in small workshops and garages, the Committee agreed to the proposal of the Electrical Engineer to adopt the following tariff: £1 per annum per kVA of the continuous rating of the plant, the running charge at present applicable to small power consumers, namely, first 1 000 kWh per quarter, 1½d. per kWh and second 1 000 kWh per quarter 1d. per kWh. All additional consumptions 1d. per kWh. This tariff is subject to power factor connection devices being installed by the consumer so that the overall power factor shall not be less than 0.8.

I.E.E. London Students

For his Chairman's Address before the I.E.E. London Student's Section on Monday, Mr. H. Shorland chose "Tuning Forks" as his subject. After referring to the age of the tuning fork and the fact that forks could, up to about 1919, be made to operate at frequencies below about 200 c.p.s., the Chairman went on to explain that following the development of the triode valve, frequencies of 1 000 c.p.s. were obtained. Since then, development had been rapid. In 1919, Dr. Eccles applied the triode valve as a method of maintaining a tuning fork in vibration and the principle he used still remained unchanged. Later, Dr. Dye, with a fork he had designed himself, investigated the principal cause of instability, and forks of this design had been in use many years.

The Q factor of a typical tuning fork was approximately 2 500, and though low, compared with a crystal, was higher than any tuned circuit designed for use at a similar frequency, and when incorporated in a valve oscillator, gave much higher frequency stability.

Mr. Shorland then dealt with types of amplifiers, the effect of temperature, the control of temperature, the effect of pressure, driving coils, and ageing.

Apart from its obvious applications as a standard audio-frequency source for accurate bridge measurements, etc., the tuning fork, it was explained, was used, amongst other things, in connection with facsimile (picture) telegraphy, and for synchronisation purposes on long-distance telegraph circuits. It had been employed to control the frequency of a radio transmitter. The tuning fork was equivalent to a very selective series resonant circuit. It could, therefore, be used to suppress unwanted frequencies in a circuit, i.e., a filter, suppressing all but a very narrow band of frequencies near its natural frequency. A condenser-resistor network, known as a compensating network, was connected between input and output, its function being to apply to the output of the filter fork a voltage equal and opposite to the voltage produced in the output by direct coupling of the driving coils. Greater selectivity was obtained.

Industrial Information

Electric Locomotives for Egypt.—The English Electric Co., Ltd., is to supply 27 Diesel electric locomotives to the Egyptian State Railways. The contract was obtained in face of strong opposition from Sweden.

Change of Name.—The name of E. Harriott and Co., Ltd., has been changed to Box-Carton, Ltd. The company specialises in the manufacture of packaging for the electrical industry.

Meat Hedgehog.—Under this intriguing title a recipe for a tasty dish is given in this month's "Cheerful Rationing" card issued by the E.A.W. Sardine "cigarettes," also recommended, form a savory tit-bit. In addition to a dozen recipes, there are home and fuel hints.

Production and Engineering.—The principal features for this month's bulletin deal with the clearance of factories, moisture-vapour proofing, a double-sampling inspection scheme, slat conveyors and elevators, interrupted apprenticeships, and attachments for artificial arins.

B.I.P. Tools.—British Industrial Plastics has formed a £100 000 private company, with the title of B.I.P. Tools, to acquire the business carried on by it in its factory at Tyburn Road, Birmingham. This company will manufacture moulds, dies, jigs, tools, presses and engineering equipment for use in the plastics or other industries.

Alteration of Address.—Enfield Cables, Ltd., announce that their Leeds branch office and stores have removed to larger premises at 28, York Place, Leeds, in view of the considerable increase in demand for the company's products in that area. The telephone number remains as before: Leeds 25902.

Marconi Instruments, Ltd.—In order to provide sales and service facilities in the area not possible during the war years, Marconi Instruments, Ltd., have established a northern office at 30, Albion Street, Hull (telephone: Hull 16144), with Mr. D. J. Taylor, northern representative, in charge.

B.E.A.M.A. Contract Price Adjustment Formulae.—For purposes of calculating variations in (a) rates of pay, the rate of pay for adult male labour at October 13 shall be deemed to be 95s.; (b) costs of material, the index figure for intermediate products last published by the Board of Trade on October 13, is 182.5 and is the figure for the month of September, 1945.

Disposal of Surplus Machine Tools.—The Machine Tool Control announce a special sale of Government surplus machine tools at the Ministry of Supply store, the Royal Ordnance Factory, Burghfield, near Reading, Berks., commencing on Wednes-

day, October 24. Machines on offer may be inspected on and after that date and the usual facilities for purchasers to obtain the services of the approved merchants will be available.

Leaving War-Time Address.—Thermoelectrics, Ltd., have acquired new premises and will shortly be moving from their war-time address at Wimbledon to Chapel Works, Church Street, Hampton-on-Thames. The London office of the company will be at Southampton House, 317, High Holborn, W.C.1.

Engineering Students' Association.—The newly-formed Scottish Engineering Students' Association, with headquarters at Glasgow, opened its 1945-46 session on October 11. Membership is limited to members of recognised technical institutions and societies, who are under 30 years of age.

Change of Name.—The Southern Ignition Co., Ltd., 190, Thornton Road, Croydon, has changed its name to Max Electric Co., Ltd. The company dropped ignition work some years ago, and the management feels that the new name will be more suitable in view of the firm's activities as electric motor and electrical appliance manufacturers and repairers. The direction of the company and of the sister company, Max-Arc Welders, Ltd., remains in the hands of Mr. P. S. Jackson.

Switchgear.—An attractive booklet illustrating various types of switchgear manufactured by the company, has been issued by Dorman and Smith, Ltd. Switchboards supplied for over twenty different purposes are shown. These were for hospitals, power stations, shipping, oil refineries, munition factories, laboratories, chemical works, a spinning mill, substations, for engine testing, industry, collieries, theatres, radio and so on.

Osram Bulletin.—The current issue of the Osram Bulletin and G.E.C. Progress Sheet contains articles on "The Reinstatement of Full Street Lighting" by D. A. Hart; "Electricity and Clean Milk Production" by F. E. Rowland; and "The Problem of Drawing Office Lighting" by M. W. Peirce. Among other matters dealt with is the manufacture of radio frequency cables with a solid polythene dielectric, and others constructed in such a way that air forms the major part of the dielectric.

The Future Coventry.—In connection with the exhibition commemorating the 600th anniversary of the granting of the charter of incorporation to the "Men of Coventry," the Coventry Corporation has published an attractive illustrated booklet introducing

some of the many proposals and suggestions which have been put forward for the future of the city. It is suggested that industries, such as those electrically operated, which can be clean and housed in buildings of pleasing design, might be arranged in suitable groups around the town for the convenience of the workpeople.

Unification of Engineering Standards.—The Conference on the Unification of Engineering Standards, held under the auspices of the Combined Production and Resources Board at Ottawa, adjourned last week-end, after a two-week session which brought together engineers of the United States, the United Kingdom and Canada. During the course of the discussions, which included screw threads, pipe threads, drawing practice, metrology, and limits and fits, a solid basis for agreement was reached on many aspects of these highly technical problems. The fundamental differences between British and American screw threads forms, which caused tremendous production and supply difficulties during the war, were resolved to the point where the delegates were prepared to return to their respective countries with a specification for a basis thread form that would provide a unified standard for all countries employing the inch system.

Purchase Tax on Dynamo Lamps.—In view of the difficulties experienced by retailers in passing on the tax when selling automobile and cycle dynamo lamps to the public, especially now that private cars can again be used, the E.L.M.A. has obtained agreement with the Central Price Regulation Committee that the tax chargeable to the public may be passed on in round pence per lamp in accordance with the schedule shown below. This simplification will come into operation on October 20:—

When List Price is over	and does not exceed	Amount Chargeable to the Public for Purchase Tax.
s. d.	s. d.	s. d.
5	9	1½
9	11	2
11	1 2	3
1 2	1 7	4
1 7	2 1	5
2 1	2 6	6
2 6	2 11	7
2 11	3 2	8
3 2	3 6	9
3 6	3 11	10
3 11	4 6	11
4 6	5 0	1 0

The tax as charged to retailers remains unchanged and is worked out on the basis of 22 per cent. of the total list value of the invoice. This figure is strictly net, i.e., subject to no deductions, except that any fraction of a penny is ignored in the

final calculation. Retailers will continue to charge tax at 22 per cent. when selling to trade users entitled to discount. In all cases the tax must be passed on in full.

Simplex - Creda Development.—A £200 000 expenditure programme on new equipment, to establish their Simplex-Creda electrical appliances works at Oldbury, near Birmingham, on a basis of the highest productive efficiency, is announced by the Tube Investments group of engineering industries, one of the largest producers of electric fires, cookers and water heaters in the country. Mr. A. G. E. Briggs, formerly Deputy Steel Controller, and recently elected to the board of Tube Investments Ltd., with the appointment of assistant managing director, is in charge of the developments, which will not interrupt existing production. The plan will result in an increased supply for the home market.

Overseas Trade

THE overseas trade figures for July and August, published by the Board of Trade, show that British exports in those months averaged £34 500 000. Compared with the 1938 average, the value of exports in August was only £3 000 000 lower, but the fall in the volume exceeded 50 per cent. In July the imports were of the total value of £97 751 371, compared with £108 338 209 in 1944, and £122 499 772 in 1943. For August the figures were £99 289 521, compared with £113 648 246 in 1944 and £107 000 453 in 1943. The total value of United Kingdom goods exported for each of the two months was: July, £32 500 264, against £17 052 648 in 1944 and £23 946 582 in 1943; August, £36 522 653, against £13 915 620 in 1944 and £22 436 709 in 1943.

The value of electrical goods and apparatus imported in July was £1 912 201, compared with £1 748 204 in July last year. For August the figure was £2 130 689, against £2 046 908 in August last year. For 1938 the monthly average was £258 900. For the eight months ended August 31 the value of electrical goods and apparatus imported was £17 081 985, compared with £12 894 020 in 1944 and £2 071 203 for two-thirds of 1938. Electrical goods and apparatus to the value of £1 332 758 were exported in July, compared with £744 938 in 1944. For August the figure was £1 350 653, against £703 510 in 1944. The monthly average for 1938 was £1 119 200. For the eight months ended August 31 the value of electrical goods and apparatus exported was £8 758 753, compared with £8 779 472 in 1944 and £8 953 603 for two-thirds of 1938.

Sydney Electricity Supply

Big Increase in Cooker Sales—Extensions of Plant

THE report of the general manager, Mr. D. J. Nolan, of the electricity undertaking of the Sydney County Council, New South Wales, for the year 1944, records that, in spite of labour shortages, increased costs and difficulties in securing adequate supplies of suitable coal, the Council was able to carry on without experiencing financial loss and without increasing charges to its consumers. In fact, reductions were made in the rates charged to consumers taking supply under the resident rate, the primary charge per kWh being reduced from 5d. to 4½d. and the maximum average price per kWh being fixed at 3d.

Compared with the total sold in 1943, sales of energy to the public increased by 1.127 per cent. to 867 069 917 kWh. Increases were recorded in bulk supply and street lighting sales. These were attributable to the restoration of normal lighting conditions. There was a small increase in sales for domestic purposes, while sales for commercial and industrial purposes showed slight decreases. The decreases were due to restrictions imposed on the use of commercial lighting and to the curtailment of certain industrial activities. Although there was an increase in the total sales of energy there was a decrease in the revenue derived from those sales, due mainly to the reduction made in charges to residence rate consumers. Compared with the figure for 1943, the gross income for the year increased by £26 019 to £4 123 499, while the total revenue expenditure was £4 073 115, an increase of £186 531.

Up to December 31, 1944, the capital expenditure amounted to £24 972 063. Against this a depreciation reserve of £9 856 904 had been provided, leaving a net value of all fixed assets at £15 115 159. Loan indebtedness at December, 1944, was £15 922 822, a decrease of £27 941 over the corresponding figure at December 31, 1943.

Output of Stations

During the year electricity amounting to 1 043 859 500 kWh was generated at the Council's Pymont and Bunnerong power stations, and 893 466 523 kWh were sold. (This figure includes 26 396 606 kWh sold under the inter-system operation agreements). The average cost per kWh of the total sold was 1.094d., and the average price received for each kWh sold was 1.087d. Other income received was equivalent to .021d. per kWh sold, making the total average price received from all sources of income 1.108d. The number of con-

sumers increased during the year from 275 424 to 276 464.

The steady progress made in the use of electric heating apparatus for factory processes was continued, the former methods used being supplemented by the application of the infra-red radiation. In the commercial cooking field, increased application by the public of the advantages of electricity was shown by the quantity of apparatus sold by the Council for use in canteens, restaurants, cafes, hospitals and so on. The sales in that direction exceeded the highest figure for any previous year since 1938 by more than 66 per cent.

Pymont and Bunnerong

In connection with the extensions at the Pymont power station, major work on the control house was completed and the building was made ready for plant, some of which had been installed. The manufacture of the 33 kV switchgear in England by the General Electric Co., Ltd., was delayed by war conditions. The manufacture of the low voltage switchgear, some of which had been erected, together with control boards, proceeded. The manufacture of the Bunnerong interconnector transformer by the English Electric Co., Ltd., was completed in England, and the manufacture of the two White Bay interconnector transformers by Electrical Plant Manufacturers, Ltd., was commenced in Sydney and a contract let to the same firm for four Pymont "A" interconnector auto-transformers for stepping up from 22 kV to 33 kV. The tender of the Australian General Electric Pty., Ltd., for one 50 000 kW turbo-alternator to be manufactured by the Metropolitan-Vickers Electrical Co., Ltd. in England, together with condensing plant, to be manufactured by Thompsons Engineering and Pipe Co., Ltd., Victoria, to the design of Metropolitan-Vickers, was accepted in August. The tender of the International Combustion (A'sia) Pty., Ltd., for steam generating plant, including one boiler of 430 000 lb./hr. maximum continuous rating, the major part of which will be supplied by its principals in England, was accepted in September.

At the Bunnerong power station the construction of building extensions, foundations and circulating water system required for the installation of No. 10 turbo-alternator unit, was advanced. The manufacture of the machine by C. A. Parsons and Co., Ltd., in England was completed, but delivery had not been made at the end of the year.

Company News

STERNOL, LTD.—Div. on pref'd. ord. shs. 4% for $\frac{1}{2}$ yr. to June 30, 1940.

ATLAS ELECTRIC AND GENERAL TRUST.—Intm. div. 3 $\frac{1}{2}$ % on pref., payable Dec 1.

CALCUTTA ELECTRIC SUPPLY CORPORATION LTD.—Intm. div. 3% (same).

CAWNPORE ELECTRIC SUPPLY CORPORATION LTD.—Intm. div. 3% (same).

CINEMA-TELEVISION LTD.—Net pft. £50 372 (£42 177), for yr. to Apr. 30.

BRITISH THERMOSTAT CO., LTD.—Intm. div. 7 $\frac{1}{2}$ % on ord. (same).

ADELAIDE ELECTRIC SUPPLY CO., LTD.—Fin. 3 $\frac{1}{2}$ %, payable Dec. 1.

BABCOCK AND WILCOX LTD.—Intm. div. 4%, less tax, on ord. (same), payable Nov. 14.

MARTIN BROS. (MACHINERY) LTD.—Fst. and fin. div. 12 $\frac{1}{2}$ % (same), less tax, for yr. to June 30.

RIVER PLATE ELECTRIC AND OTHER SECS. CORPORATION.—Intm. on ord. 2% (same) for yr. endg. Apr. 15, 1946.

EVER READY TRUST.—Intm. div. 3% on both ord. and defd. (same), payable Nov. 1.

BRITANNIA ELECTRIC LAMPS, LTD.—Div. on ord. 7% less tax for 11 mos. to Mar. 31 (same for yr. to Apr. 30, 1944). Net pft. after tax, £8 101 (£8 433).

LONDON ELECTRICAL AND GENERAL TRUST.—Fin. div. on ord. 3% (same), mkg. 5% (same) for yr. to June 30, payable Oct. 30, less tax.

SERCK RADIATORS LTD.—Fst. and fin. div. 15% and bonus 10% (both same), less tax, for yr. to Aug. 4. Pft. £59 597 (£56 852). To contngs. £5 000 (£15 000), gen. res. £25 000 (£15 000). Fwd. £18 465 (£13 868).

AMERICAN TELEPHONE AND TELEGRAPH.—Net income Sept. qr. \$42 432 000, or \$2.13 per sh. Revised income for Sept. qr. 1944 shows erngs. per sh. also \$2.13, but on smaller no. of shs. Net income 12 mos. to Sept. 30 \$167 024 000 (\$163 623 438), or \$8.51 (\$8.63) per sh.

SMITH'S STAMPING WORKS (COVENTRY), LTD.—Net pfts. for yr. to Aug. 4, £29 331, inclgd. estimated E.P.T. recoverable of £3 400 (net) and div. £7 500 (net) from Smith-Clayton Forge subsid. co. (Last yr. £31 655, inclgd. £7 500 from subsid.) Accts. of subsid. show net bble. for yr. £17 904 (£22 093) after creditg. estimated E.P.T. recoverable of £26 000 (net). Fin. 10%, making 10% (same), plus bonus 5% (same), both less tax.

TELEPHONE OF PERNAMBUCO.—Operatg. revs. 1944 £41 982 (£38 694), exes., inclgd. taxes, £23 782 (£17 264), property retiremt. £6 051 (£6 283). Net revs.

£12 149 (£15 148) and other income (net) £230 (£224), mkg. gross income £12 380 (£15 372). Int. on debts. at 5% £6 910 (£5 528), int. on demand note pybl. to Amer. and Foreign Power at 5% £3 955 (£6 311), other int. £4 (£3), amort. debt disc., etc., £825 (same), lvg. net bal. £685 (£2 851). Less net exch. loss on workg. cap. £168 (£328), surplus Dec. 31, £295 (deficit £223).

Company Meetings

DUBILIER CONDENSER CO. LTD.—The annual meeting was held at North Acton, London, on October 10. In the course of his address, the chairman, Mr. W. H. Goodman, said that all the company's factories were full of war work for the first six months of the present financial year, that is, until September 30, but much of this had now ceased and the dispersal factories were in process of being shut down. The war order book at Acton was still substantial but they anticipated that it would not be long before they would be free to resume normal peace-time production. They had already received substantial orders from overseas, and were in contact with most of their agents and connections abroad.

NIGERIAN ELECTRICITY SUPPLY CORPORATION LTD.—The annual meeting was held in London on October 3. In the statement circulated with the report and accounts, Major E. Seaborn Marks, the chairman, said the year ended February 28, 1945, had again given a satisfactory showing. Power sales at £221 506 was the highest figure so far reached, and was £26 928 higher than in the previous year. Operating costs, £36 132, had risen by £6 381; higher wages and salaries and increase in cost of stores, etc., were primarily responsible for this. Although during the war period their costs had steadily risen, they had not made any attempt to raise the charge for current, which had remained constant at an average price of slightly over 0.8d. per unit, a very cheap rate when it was considered that they operated 750 miles up country from Lagos on an isolated plateau 5 000 ft. above sea level.

PETER BROTHERHOOD, LTD.—The annual meeting was held in London on October 2. In the statement circulated with the accounts the chairman, Mr. A. Marcus Neal, said that as a result of suspension and cancellation of service the company's output for the twelve months was reduced by nearly a third compared with the output of the previous year, while the trading profit for the year, after providing for excess profits tax, amounted to £78 763, against £91,970 last year. Pro-

vision, for income-tax absorbed £43 500, compared with £44 817, and this provision, together with the amounts for directors' fees and war risks insurance, brought the net profit for the year, available for distribution, to £33 210, compared with £44 534 in last year's accounts. Their manufactures for the Admiralty during the six years from September, 1939, consisted of torpedo engines and components, torpedo tubes, turbo-generators, high pressure air-compressors, high speed Diesel engines, main propelling Diesel engines for submarines, gun mountings, and a number of other items; in addition to these they had manufactured hydrogen compressors and aircraft landing gear for the Ministry of Aircraft Production, and a considerable volume of chemical plant machinery for the Ministry of Supply. Concerning the year's working, they had every reason to be satisfied with the progress made.

RANSOME AND MARLES BEARING CO., LTD.—The annual meeting was held at Newark on October 11, Sir Albert Bennett, Bart., the chairman, presided. In the statement circulated with the accounts, the chairman said the company's turnover during the war had reached a figure many times that of pre-war achievements, but their net retainable profit had never, in any war year, been as high as in some pre-war years. It was, therefore, obvious that the great war effort of the company, which was of the utmost national importance, had brought them no financial benefits. He emphasised this, not as a complaint, but because there seemed to be an impression that industries like theirs had reaped great financial benefits from the war. This was entirely contrary to the real facts. The importance of exports was much emphasised at the present time, and the company were doing all they could to help in this vital task, not only by direct export but by supplying makers of vehicles and machines who were producing for export. They had their representatives and stocks in all the Dominions and other important markets, and were strengthening and extending the service they could render in this way.

BENNIS COMBUSTION, LTD.—The annual meeting was held in London on October 12, Mr. A. W. Bennis, chairman and managing director, presiding. In the chairman's statement he said the profit for the year, after charging all expenses, including depreciation, but before providing for taxation, amounted to £21 095, an increase of £3 911, compared with the previous year's profit of £12 184. Two dividends each of 5 per cent., less tax, had been paid on the ordinary shares, thus maintaining the 10 per cent. dividend on the ordinary

share capital. Referring to war-time activities, he said, now that the security ban had been partly raised, he could say a few words about their war-time activities. Fortunately, by careful management, they were able to undertake the work without any major alterations to their machinery; consequently, now hostilities have ceased, they were not left with a stock of tools unadapted to their manufactures. Bennis steam generating plant, mechanical stokers, and self-cleaning furnaces for efficiently burning the wide and varying range of fuels available, and large elevating, conveying, and storage plants for coal and ash handling were soon assisting the highly efficient steam production required for most of the Royal Ordnance Factories and larger industrial undertakings engaged on war work. More special contributions comprised the manufacture of high tensile alloy castings for landing craft engines, gun mountings and platforms, special apparatus for mine testing and development and float tanks for the Mulberry Harbour. Also, a contract for important extensions at the Gunwharf Road power station of the City of Portsmouth electricity undertaking had been successfully carried out during the war period, and the company had recently been entrusted with still larger and more extensive similar additions to the same power station.

Metal Prices

		Monday, Price.	Oct. 15 Inc. Dec.
Copper—			
Best Selected (nom.)	per ton	£60 10 0	—
Electro Wirebars ...	"	£62 0 0	—
H.C. Wires, basis ...	per lb.	9 ³ / ₈ d.	—
Sheet ...	"	11 ⁷ / ₈ d.	—
Phosphor Bronze—			
Wire(Telephone)basis	"	1s. 0 ³ / ₈ d.	—
Brass (60/40)—			
Rod, basis ...	"	—	—
Sheet " ...	"	—	—
Wire " ...	"	11d.	—
Iron and Steel—			
Pig Iron (E. Coast Hematite No. 1)...	per ton	£7 13 6	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ...	"	£28 5 0	—
Mild Steel Tape (Cable Armouring) basis 0.04 in. ...	"	£20 0 0	—
Galvanised Steel Wire No. 8 S.W.G. ...	"	£28 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	£85 0 0	—
Spelter... ..	"	£31 5 0	—
Mercury (spot) Ware- house ...	per bott.	£31 5 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.

Commercial Information

County Court Judgments

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

WARD, Carl, 54, Derby Road, Melbourne, Derby, electrician. £22 15s. 5d. Aug. 9.

WESTWOOD BROS., 47, Broad Street, Staple Hill, Bristol, radio and electrical service depot. £10 13s. 10d. Aug. 13.

WILLIAMS, P. (male), 110, Brunswick Street, Chorlton-on-Medlock, radio dealer. £22 13s. July 30.

BRAY, F. (male), 15, Glasslyn Road, N.8, radio engineer. £12 14s. 11d. July 3.

LEONARD, R. (male), 72, Maybank Avenue, Wembley, electrician. £19 18s. 10d. June 27.

GREEN, Geo. C., 390, Ewell Rd., Tolworth, electrician. £21 0s. 9d. July 9.

Satisfaction

STEWARTS AND LLOYDS LTD.—Sat'n. Sept. 25, of deb. stk. reg. Feb. 8, 1934, to the extent of £17 500.

Application for Discharge

BEAUMONT, Harry, 86, Quarby Road, Longwood, Huddersfield, carrying on business at 207, Luck Lane, Paddock, Huddersfield, electrical engineer and radio dealer. Date of hearing, November 7, 1945, 10.45 a.m., The County Court House, Queen Street, Huddersfield.

Notice of Intended Dividend

PINNEY, Gerald Cant, 128, Kendal Way, Cambridge, and MILLER, Arthur Edward, 4, Granby Street, Littleport, Cambridge, trading together as "Granby Service Co." at 4, Granby Street, Littleport, wireless and electrical dealers. Claims to be sent by October 31, 1945, to the Trustee, Mr. Tom Pollitt, 41, Sidney Street, Cambridge, Official Receiver.

Coming Events

Saturday, October 20.

I.E.E., N. MID. STUDENTS' SECTION.—Leeds. "Colour," Dr. Mole, J. A. Foot and K. A. Milligan. 2.30 p.m.—I.E.E., LONDON STUDENTS' SECTION.—Visit to Evershed and Vignoles, Ltd. 9.45 a.m.

A.M.E. AND M.E., S. WALES BRANCH—Bridgend. Discussion, "Electrical and Mechanical Aspects of the Reid Report." (Joint meeting with W. Wales Branch.)

INSTITUTE OF ECONOMIC PLANNING, MIDLAND SECTION.—Birmingham. "Competitive Planning," A. H. Huckle. 2.30 p.m.

Sunday, October 21.

BRITISH KINEMATOGRAPH SOCIETY.—Film House, Wardour Street, London, W.1. "Electronics and the Cinema," G. Parr. 11 a.m.

Monday, October 22.

I.E.E., N.E. CENTRE.—Newcastle-on-Tyne. "Steel Tower Economics," P. J. Ryle. 6.15 p.m.—S. MID. CENTRE.—Birmingham. Chairman's address, F. J. Elliott, and Reunion. 6 p.m.—S. MID. STUDENTS' SECTION.—Birmingham. "Mechanical Aids to Calculation," G. A. Montgomerie.

INSTITUTION OF ELECTRONICS.—Royal Society of Arts, London, W.C.2. "Electron Tubes for Pulse Generation," F. J. G. van den Bosch. 5.30 p.m.

Tuesday, October 23.

I.E.E., SCOTTISH CENTRE.—Glasgow. "Some Factors Affecting the Design of Electric Lighting Installations for Building Interiors," R. O. Ackerley. 6.15 p.m.

Wednesday, October 24.

I.E.E., SCOTTISH CENTRE.—Edinburgh. "Some Factors Affecting the Design of

Electric Lighting Installations for Building Interiors," R. O. Ackerley. 6 p.m.

INSTITUTE OF WELDING.—Wolverhampton. Chairman's address, H. Thompson. 7 p.m.

Thursday, October 25.

TOWN AND COUNTRY PLANNING ASSOCIATION.—28, King Street, Covent Garden, W.C.2. Lunch-time meeting. "Town Planning and District Heating," D. V. H. Smith. 12.45 p.m.

Friday, October 26.

I.E.E., MEASUREMENTS SECTION.—London, W.C.2. Chairman's inaugural address, S. H. Richards. 5.30 p.m.—SCOTTISH CENTRE.—Aberdeen. Chairman's address by R. I. Kinnear. 7.45 p.m.—S. MID. CENTRE, RADIO GROUP.—Birmingham. Kelvin lecture "Scientific Principles of Radiolocation," Sir E. V. Appleton. 6 p.m.

INSTITUTE OF WELDING.—Edinburgh. "Recent Advances in Welding in the Shipbuilding Industry," D. M. Kerr. 7.30 p.m.

Saturday, October 27.

I.E.E., N.W. STUDENTS' SECTION.—Avenham Institute, Preston. "Electronic Control of Resistance Welding Machines," F. J. Wilkinson. 2.30 p.m.

A.M.E. AND M.E., SOUTH WALES BRANCH.—Cardiff. Joint meeting with South Wales Branches of the Illuminating Engineering Society and the National Association of Colliery Managers. "Lighting in Hazardous Places," S. W. Richards.

I.E.E., N. MID. STUDENTS' SECTION.—Visit to Kirkstall Forge, Ltd. Members to meet at entrance to The Forre, 2.15 p.m.—N.E. STUDENTS' SECTION.—Visit to Hylton Road Power Station, Sunderland. 2.45 p.m.

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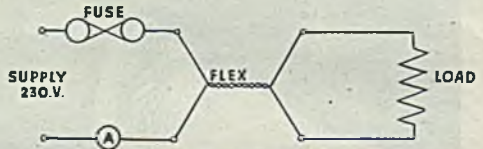
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Flexible cords often develop faults as a result of which one core is burnt away for a short distance, the failure of the flex breaking the circuit while the fuse remains intact. Accordingly a circuit was arranged as shown in the diagram below, using a short length of 14/0076 twin flexible cord. A current of 25A was passed through the flex for one minute with the object of partially destroying the insulation. A 5 α rewirable fuse was then put into the circuit and the load adjusted to give a current of 5A. After two minutes the flex arced across and one core was burnt away, breaking the circuit. The rewirable fuse remained intact. This test was done many times, each time with the same results.

On repeating the test with a DS 13 α plug pin fuse, the flex arced across but the circuit was broken every time by the DS fuse, both cores of the flex remaining intact. (DS Test No. 53 M/2/4192).

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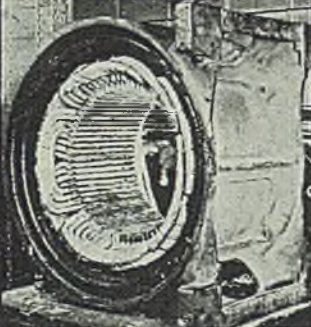


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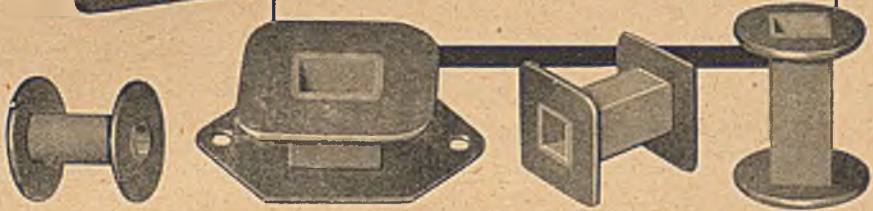
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