THE
ELECTRICIAN

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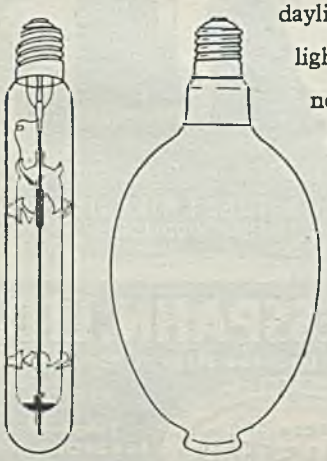

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ELECTRICITY DEPARTMENT.

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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.

J. BULMAN,
Clerk of the Council.

The Council House, Malvern.
20th October, 1945.

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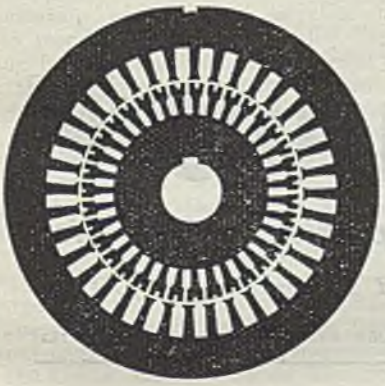

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CHIEF CONTENTS OF THIS ISUUE.

Supervising Engineers

A HIGH percentage of the technical man-power of the industry though not up to professional standard, is nevertheless, up to supervisory level and responsible for the maintenance of electrical plant of considerable value. The reputation of electrical service, both with respect to safety and reliability, is often in the hands of this personnel and in the opinion of many professional engineers, further successful penetration of electrical methods into the various industries and trades of the country is largely dependent upon company directives recognising the electrical ability which their supervising engineers have to offer, or at any rate being guided by the considered views of those in charge of their electrical installations.

The yardstick by which the professional engineer is judged is membership of the Civils, Mechanicals or Electricals, but close behind him is the practical engineer who, because he lacks the theoretical background of his professional brother, is at the moment denied the opportunity of acquiring a certified guarantee of his ability to carry out his job to the satisfaction of some impartial engineering institution. This in many cases can, and perhaps does, react against both employer and employee, for while the former, in the absence of any certified guarantee is dependent upon his personal judgment when assessing the value of the claims made by a person being interviewed for a job, the person himself though fully qualified for the vacancy, may lack the natural ability to convey to his would-be employer the breadth of his experience and suitability for the job under review. The professional engineer, on the other hand, armed with his certificate of membership of this or that institution, knows full well that by presenting himself to a would-be employer he will be accepted as being within a certain class or grade of employee, and this knowledge gives him a confidence which the supervising engineer, in the absence of any similar certificate is denied.

This condition of things was publicised by Mr. H. W. SWANN in his Presidential Address before the A.S.E.E. in 1941, and to meet the case the association has now devised a diploma examination scheme, successful competition for which will indicate a high standard of ability in electrical installation or maintenance work, or both. The value of the diploma is, incidentally, very appreciably enhanced by the fact that the examination is open to any who care to sit for it, irrespective of whether or not they are A.S.E.E. members.

The examination itself shows that a great deal of thought has been put into it, and as the candidates will in most cases be men of mature years with long

technical experience to their credit, the reason for this thoroughness is easily understandable. The form of examination is based on a desire to test the candidates for leadership, initiative, and the ability to find for themselves knowledge, which though not perhaps to hand in a given set of circumstances, is within their reach in text-books or elsewhere if their inquisitive spirit is of the right type and sufficiently determined.

Technical Standards of Personnel

THE gap which has for too long existed in the industry's training programmes of the professional and practical engineer—appears to be bridged by the Swann Diploma, and the industry will watch events with considerable interest. The standards of technical knowledge and of skill demanded of the industry's man-power are ever rising due to natural progress, and on account of the example which the industry must set in the fight to retain its place in world trade, the standards will become even higher. The Swann Diploma should go a long way towards contributing to those standards for not only will it ensure that its holders are the right men in the right jobs, but when it is accepted as a hall-mark of supervisory efficiency it will eliminate the less dependable.

Availability of Consumer Goods

DURING the war the Government collected a great deal of information about supplies of goods becoming available for the home civilian market, and the Board of Trade have now published in statistical digest form, details of a number of trades, including the electrical. These figures are interesting, for by comparing those relative to the war years with those of 1937, it becomes increasingly obvious that the leeway which the industry has to make good is as major a concern as is the recovery of export trade, with the difference that the home market is already over-anxious for the goods, whereas the export markets have yet to be won. Though the figures do not in all cases apply to post VJ-Day conditions, they are even so, disappointing. This is particularly marked when the 1945 returns are compared with those for 1937, for it seems reasonable to assume that the industry would by now have been assisted by the supply departments to meet the public demands for electrical apparatus. No one is likely to hope for immediate and complete satisfaction, but the published figures with respect to cookers, radiators, kettles and so on, suggest that the industry is being starved of materials and labour, not only in a way that is both unassisting in meeting public demands, but which may, too, react upon the ability of the industry to readily absorb whatever unskilled labour the Armed Forces may release during the next few months.

Shortage of Electrical Appliances

THE statement issued by the B.E.A.M.A. with respect to the shortage of appliances is further evidence of how industry is being handicapped by an absence of the right kind of labour. This applies not only to the electrical industry but also to those other industries upon which the electrical manufacturer depends for supplies of parts, etc., and until there is a steady flow of suitable personnel back to the industries concerned, the supply of electrical appliances is likely to lag behind demand for some time. The position is aggravated, too, by the fact that though the war is over, many Government contracts have still to be executed and this work is absorbing a considerable amount of manufacturing capacity which would otherwise be available for satisfying home and export needs. The war showed that the industry is capable of enormous output; in the years of peace it is anxious to achieve even greater things—and will, so soon as it is permitted to recruit its manpower.

Electricity in War-time

THE black-out on electricity statistics which the war brought about in 1939, denied the industry the opportunity of appreciating the growth of generation by authorised undertakings, in that, included in the details which were prohibited from publication were the monthly returns formerly made public by the Commissioners. It was generally known from the experience of demand that generation output was on the increase, but by what amount it was only possible to hazard a guess. Restrictions on the publication of statistics has now been removed for some months and the Commissioners have therefore

been able to complete their records so as to present a complete picture covering twelve years. In 1933, the generation of electricity amounted to 13 562 million units and subsequent increases were approximately at the rate of 2000 million per annum until, in 1936, the 20 000 million mark was reached. The largest actual advance was between 1940/41, when, following the retreat from Dunkirk, industry was stepped up to maximum war production, and generation output rose from 28 776 million to 32 369 million units.

Navigating the Atolls by Radar

UNTIL now the war purposes of radar have naturally attracted most attention, but it has already proved its possibilities in assisting the safe navigation of ships in peace. In March, 1944, the Prince Liner, "Chinese Prince," under Capt. THORNTON, detected a Japanese submarine manœuvring for attack. Instead of steering away, Capt. THORNTON made towards the enemy position and bore down on the submarine at full speed. The Japanese commander, as had been intended, thought that he was to be attacked with depth charges and crash-dived, while the "Chinese Prince" made off. The bluff would not have succeeded twice and the Asdic soon detected the enemy in pursuit, so Capt. THORNTON made for the shelter of a cluster of atolls through which, with darkness falling rapidly, no submarine would venture submerged. The channel between the palm covered atolls was intricate but the radio officer contrived to get radio reaction from the trees perfectly clearly, and in the darkness the ship proceeded through a channel that would deter most navigators in daylight. By the time she reached open water on the other side there was no sign of her assailant and she proceeded on her voyage.

Industry and Statistics

THE details revealed in the pre-war Census of Production gave a good insight into the depth of electrical penetration in industry generally, and permitted in some measure anticipation of future demand for industrial motors and like equipment. Because of this, special interest will be found in the report of the Census of Production Committee, an abstract of which is given on another page. It will be remembered that the Committee was appointed only last June, and it stands to the credit of the leadership of the chairman, Sir GEORGE NELSON, that the work was completed in under four months—an example which many other committees might follow with advantage. The recommendations put forward in the report are designed to increase the value of the census to industry, while at the same time account has been taken of the requirements outlined in the White Paper on Employment Policy. Most of the information called for in the report is claimed to be essential for adequate industrial and economic analysis, and if the findings of the Committee are really of benefit to industry, the additional information will no doubt be willingly provided. It is imperative however, that the census be used with discrimination, not in order to collect statistics for their own sake but in order to assist the framing of public economic policy and to guide industry in its future decisions.

Radio Industry and Reconversion

THE reconversion of the radio industry to peace-time production will be accelerated to an appreciable extent by the granting of licences to some seventy manufacturers to turn out in the next twelve months about a million receiving sets, of which 400 000 are to be earmarked for export. If relieved of all restrictions, it is probable that the industry, with its greatly improved technique, could exceed this output considerably and more adequately supply the mounting home demand. Before the war the average annual production of radio sets in this country was approximately 1.4 millions, and the average export was 66 000, so that the approved programme allows for an overall production of about 70 per cent. of the pre-war figure. Should the exports materialise on the scale visualised by those responsible for the reconversion arrangements, the industry will not only make a noteworthy contribution to the Government's policy of increasing export business, but also establish valuable connections that should lead to the capture of much of the trade formerly enjoyed by foreign competitors and the opening up of new markets.

Science and Technology

Contributions of Imperial College to Total Victory

THAT the success of our D-Day invasion was in considerable part due to engineers trained in the City and Guilds College was stated by the King when he attended, with the Queen, the centenary celebrations of the Imperial College of Science and Technology at the Albert Hall, on October 25. Their Majesties were given an enthusiastic greeting by a gathering of 5 000, including members of the Governing Body, the staff, past and present students, and heads of many industrial firms.

Lord Rayleigh, chairman of the Governors, spoke of some of the outstanding achievements of the college in the last 100 years, and said their organic chemistry department, under Prof. Heilbron, was vigorously occupied with the preparation of concentrated penicillin and the question of its chemical nature. To radar, "Fido," "Pluto," jet propulsion and the atomic bomb the Imperial College might also claim important contributions.

The King, in reply, said he took pleasure in the contributions the college had made to total victory. Lord Rayleigh had touched

The King signing the memorial record of the work of Imperial College in the last 100 years. The Rector is on His Majesty's right

on some of the fields of applied entomology and preventive medicine and, had time allowed he could have pointed to equally impressive victories won by other departments in other fields. The success of our D-Day invasion was in great part due to engineers trained in the City and Guilds College, and he knew, moreover, that Imperial College had contributed to victory not only by research, but by its training of

A simple demonstration of the principle of radar in the telecommunications laboratory, City and Guilds College

men who went from it to all parts of the Empire. The achievements of British science and technology during the last years of total war had been outstanding. With relatively limited resources—and these strained to the uttermost—we might nevertheless claim to have outmatched our enemies in every vital respect.

The employment of atomic energy, for the first time under the stress of war, might well mark the beginning of a new era of scientific discovery, the possibilities, of which seemed limitless—of vast material benefit to all mankind on the one hand, or, on the other hand, of destruction on a scale hitherto undreamt of. We should all pray that wisdom might be vouchsafed to the statesmen of the world so that means might be found, before it was too late, of ensuring that the new knowledge recently gained was used solely for the promotion of peace and the raising of standards of life in all parts of the world.

The Rector, Mr. R. V. Southwell, F.R.S., having expressed the thanks of the staff and the students, His Majesty signed the memorial record of the work of the college in the last 100 years, and of that occasion.

The guests included, among others: Sir Stanley Angwin, engineer-in-chief, G.P.O.; Lord Brabazon of Tara; Mr. E. S. Byng, vice-chairman, Standard Telephones and Cables, Ltd.; Sir Edward Crowe, W. T. Henley's Telegraph Works Co., Ltd.; Dr. P. Dunsheath, W. T. Henley's Telegraph Works Co., Ltd.; Sir Frank Gill, chairman, Standard Telephones and Cables, Ltd.; Sir George Nelson, chairman English Electric Co., Ltd.; Mr. H. C. Nelson, D. Napier and Son, Ltd.; Sir Leonard Pearce, London Power Co., and Dr. W. G. Radley, G.P.O.

Vertical Plane Lighting

By FRANCIS G. W. TREE, A.M.I.E.E., F.R.S.A.

THE predominant need for illumination on the horizontal plane often obscures the necessity for adequate light on the vertical plane, and various premises have in consequence illumination of a nature more illusionary than effective. In power stations and certain classes of workshops, various

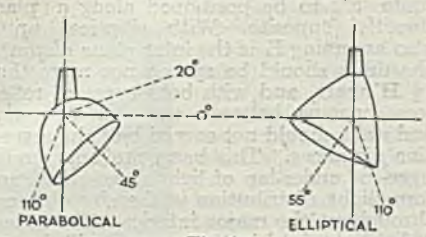


Fig. 1

objects obstruct the general light flux of ordinary overhead light units and cause dense shadows; also, the height/width ratios commonly found in such premises render vertically-directed light of little avail, and its use inevitably results in uneven light distribution. Consider a characteristic power station interior, in which the ceiling height is two or three times the width, and in which operative gear exists to almost full height along one side. A number of centrally positioned light units lengthwise along the " ceiling " may provide suitable illumination in the region of their level, but, to give adequate light intensity at lower levels, they must have correspondingly greater lamp power. Thus, adequate low level illumination is obtained at the expense of higher level lighting above required intensity, with a relative waste of light power. Furthermore, when the light flux is obstructed by operational gear, the upper level high intensity results in correspondingly deep shadows. Placing such downcast light units nearer to the wall and operative gear, does not appreciably improve conditions, since the intensity is further increased and the shadows cast are denser. Of course, the extent of the shadows is governed largely by the reflective quality of the interior surfaces, particularly the reflection factor of the lower interior, but in average cases this factor is not sufficiently high to minimise shadows. By employing spherical distributing units, the height of the units may be lower and effect more uniform intensity, but the interior conditions in such premises do not usually conduce to the use of this class of lighting unit. Therefore, if reasonably uniform vertical plane illumination is to be obtained with economy and efficiency, it is necessary to use units capable of permitting the light to be appropriately adjusted to the requirements at the various levels. Units of this type are even more necessary, where the general light flux has to illuminate recesses or cubicles beyond the vertical surface, incidental to lighting the vertical and horizontal planes.

As is evidenced by the polar curves of the various types of lighting units, the angular intensity of the light flux emitted depends upon the characteristics of the specific unit, and certain units give decidedly higher intensities at specific angles of their distributive range. The simple parabolical and elliptical angle reflectors are units of this type, and their general details are too well known to need description. But, as is evidenced by various unsuitable lighting conditions, the factors essential to their proper application are not commonly understood. Although the specific characteristics vary slightly according to make, the flux distribution and intensity control of these reflectors are generally as shown in Fig., 1 and their angles of light cut-off are also indicated. The parabolical reflector has a maximum flux intensity at an angle of 45° below the horizontal, with a top light cut-off at some 20°

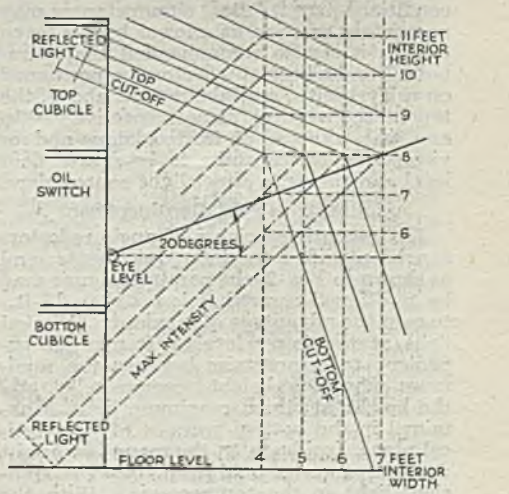


Fig. 2

above, and a bottom cut-off at about 110° below the horizontal. Thus, while the flux density is asymmetrical, the general flux distribution is symmetrical and typical of parabolical reflection. With the elliptical reflector, the maximum intensity is at the angle of 55° below the horizontal, with a

top cut-off at the horizontal and a bottom cut-off at approximately 110° below it.

Characteristics of Design

This unit is asymmetrical in its flux density and flux distribution, and the light emitted from it is characteristic of a horizontally elliptical reflector. Both of these units are designed to give controlled intensity light on both horizontal and vertical planes, when they are applied in accordance with certain basic rules. The actual position of these units in any interior depends upon the proportions and conditions of the interior, but, as a measure of guidance, it is possible to state the relative basic ratios required in all general circumstances. By way of illustration, and as an example of one of the most difficult interiors to illuminate efficiently, again consider an electric power station, with a height some three times the width and a length about six times the width. Fig. 2 shows an end view of such an interior, with top and bottom recesses containing operative gear, and with flush oil-switch controls throughout the entire length of the interior. Appropriate lighting is required on the horizontal and the vertical planes, as also in the cubicles, and the lighting is to conform with the Factory Act requirements concerning direct vision of the light sources. Regarding the latter point, some authorities advise that the angle units be positioned at a height of at least 15 ft. above floor level, and there is much to be said for this where conditions permit. But, circumstances may necessitate erection at a lower height, even though it is also recommended that parabolical and elliptical reflectors be positioned on a level with, and about 3 ft. above, the top of the vertical plane respectively. In any case, the use of frosted lamps and/or visors enables the units to be nearer floor level and prevents direct light source glare.

Mounting Height Considerations

The mounting heights of angle reflectors can be modified to suit requirements, and as shown in Fig. 2, the parabolical unit may be positioned somewhat lower than 15 ft., to gain the advantage of maximum reflected light at the lower levels. It may be expedient to compromise between the minimum mounting height recommended and the height at which maximum light is obtained in the bottom recesses of the vertical plane. Incidentally, the mounting-height decided upon should also provide sufficient light in the top recesses. With the elliptical unit, since the top light cut-off and the maximum flux angles are lower, it is necessary to adopt a greater mounting height than for a parabolical unit. The actual number of units required depends upon the area to be illuminated, and also upon the characteristic lateral spread of light obtainable with the type of unit chosen. Indeed, it is obviously due to a misunderstanding of the spacing of these angle units that various poor lighting conditions are due. Thus, the following simple principles provide a basis for accurate estimation of inter-unit spacing. For parabolical units, assuming H is the distance between the vertical plane and the plane on which each unit is to be erected, the inter-unit spacing should not exceed the higher H. This is the height of each unit above the vertical surface, and it is assumed the units are to be positioned along a plane directly opposite. With elliptical units, also assuming H is the inter-plane distance, the units should be spaced not more than 1½ H apart, and with both types of reflectors, spacing between the end units and end walls should not exceed half the respective distances. This basis prevents undue over- or under-lap of light fluxes, and uniform light distribution is thereby obtained throughout the major interior. The extent of light obtained in the recesses will depend largely upon the reflective abilities of their interiors, and the reflection factor can be much improved by suitably lightening the recess interiors.

In some classes of premises it may be desirable to position a number of units along the lengthwise wall, with the addition of a unit on each of the end walls, but care is necessary to avoid light waste by crossed fluxes.

Calculating Lamp Power Required

Increasing the height of a unit, above floor level, decreases the intensity at that level proportional to the distance squared, but the relative distance between the unit and the vertical plane is unaltered. Consequently, in calculating the lamp power required in a reflector, it is essential to do so on the basis of the intensity required at a given point, and this takes into consideration the minimum intensity specified for any point. While from the light utilisation point of view the vertical surface may be regarded as the working plane, certain requirements call for adequate light on the horizontal plane—especially at or near floor level. Thus, in estimating the lamp power required, it should be observed that the lumen method of calculation gives only the average intensity available. Where vertical plane lighting is used, except for display boards and the like, a certain amount of light is usually specified for other directions. To ensure of adequate light at the various specified points, it is necessary to calculate by means of reflector polar curves, thereby to ascertain the individual angle intensities. This method obviates trial and error lamp changing after erection of units and the little extra trouble in calculation is more than justified by the better results obtained.

Education and Training

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

IN his inaugural address to the members in London on October 26, Mr. S. H. Richards, the new chairman of the I.E.E. Measurements Section, gave his views on technical education and training

On more than one occasion, he said, two facts had forced themselves upon his attention. The first was that the older testing engineer had not kept pace with the progress of the times and the second was that the young learner had often lacked the opportunity and incentive to utilise, improve, and increase his natural gifts to his own and his generation's benefit.

Mr. S. H. Richards

They would be wrong to assume that he would be criticising either the present educational system of post-war planning, its scope and its opportunity for the younger generation. He was delighted to think that the older generation had realised that, if the future of the world, the individual, and the engineer was to improve on the past, it must be by giving coming generations those opportunities which were lacking in the past.

During the past two years, two reports on education and training containing full-time and part-time proposals, had been produced by the institution. If read, as they were meant to be read, with imagination, they were productive of interest that was bound to be translated into action. Since the beginning of this century, individuals as well as firms had felt the urge to place on a better footing educational advantages which otherwise would have been impossible to the budding engineer. It required vision to appreciate the need of the times, and the need of youth. Individually and collectively much had been done, and those documents summed up and extended the experience of the past, bringing together that experience in a set of proposals which made opportunity more equal for all.

Those reports presented them with a collective responsibility as well as a challenge. They were a challenge to their imagination and an incentive to their endeavour. The educational proposals of the institution were a challenge as much to the younger as to the older members. There was a call to better opportunity, to better training, to greater endeavour so that the profession they believed in should be manned by the best-trained personnel, fitted and adapted for the work that lay ahead. Their leaders had shown the way; it was for them to follow.

Each one of them must play his part in making good the institution's intentions. They must not let those proposals fail because of apathy and lack of interest. They were vital for the betterment of the individual. They gave more opportunity to a larger circle. They would make for better engineers and more of them. We needed more engineers; the world needed them as never before, better trained and better equipped to serve their day and generation.

As a survey of the educational proposals of the institution was made, and the history of full-time and part-time education during this century was considered, it was more than evident that the reports stood as a landmark, and more than a step forward in that history. While the full-time course was a decided advance on the full-time course at the beginning of the century, the effect on the collegiate was not so marked as in the case of the part-time student. In the former case—as there would always be—they had those to whom opportunity came initially because it was inherited. Financial considerations did not affect the chance that was theirs; the course could be afforded; parents or guardians welcomed that desire for an engineering training which gave them the privilege of furthering the ambition of those for whom they had such a regard. The goal of ambition could be achieved with minimum effort, in comparison with the effort required by the part-timer. It became there only a case of the use of opportunity; the way was made plain; if only desire and opportunity walked hand in hand, the road, though hard, was comparatively easy.

Part-time Education

At the beginning of this century the recognition of a more intensive part-time educational need was becoming a predominant factor in the life of the individual. It was generally recognised that the assets of the nation were sadly depleted by the short-term policy of education to the age of 14. The further need was productive of an increase in the number of schools being opened, and a more generous number of subjects being taught. Already the

nation was reaping the advantage of such evening educational facilities being given to the masses.

Later, engineering and other firms recognised the potential worth of educated brain power, and developed their own schools and training centres. True, the ulterior motive persisted, for the advantage of having a trained staff and workpeople was recognised as fundamental if the fullest possible advantage was to be taken of every business opportunity that offered. Amongst those engaged in such work there were a few visionaries who could and did see beyond immediate needs. In consequence, the development of part-time schooling during training became an accepted fact—on a much larger scale than heretofore—and included in its orbit many who had previously been ignored.

From these primitive beginnings had developed the present scheme. Its orbit embraced all types under all conditions, whatever their status in life might be. It differentiated between the manual and mental worker, but while it divided it gave equal opportunity in each field. That division was according to mental capacity, but opportunity was accorded to all to develop on the lines best suited to their talents. To each man his due, according to his need. The opportunity was there; in future, no youth would be able to say that circumstance had prevented him from developing his ability to his best advantage.

Need for Co-operation

The implementation of those reports depended on several factors; the co-operation of the older generation of engineers and the avidity with which the younger generation seized the chance that was being offered. They might quibble about details—that was human nature—but they could not quibble about the offer that had been made. It was generous, but above all it was vital to the industry in which they were engaged, to the industry from which they made their living, and above all the industry which they should love.

To the younger generation he would say, " If you have had a grouch because of your lack of opportunity, you cannot say that now; and, above all, if you feel you are a round peg in a square hole, then make a change now if you would find happiness in your work, even to the extent of abandoning electrical engineering altogether for it is never too late to start again, provided you find happiness in the work in which you are engaged. Real success comes, not from uncontrolled ambition, but from happiness in the work in which you are engaged. It is not arrived at by striving for the topmost place; it comes from working together towards a common end and the uplifting of our professional status. Above all, it comes from a united desire to work for the common good."

No Easy Way

In their work they had as great an opportunity as in any to further the ease and comfort of humanity. Electricity touched every phase of life. To-day they saw it in its beginnings; the future held visions of greater opportunity. If this opportunity was to be seized and implemented, if its possibilities were to be put into practice, it was the way of youth. It was no easy way, but it was a way made clearer because of the vision of that place. It was the way to greatness, not necessarily for each of them but certainly for the profession they loved. It necessitated toil and endurance; it would come only by hard work. It extended from the research worker to the sales engineer. It was the way of high ideal. It was the way through subjugation of self to service for all.

To understand a little should bring the urge to understand more. The man who was alive was always asking the question " Why? " and he was never satisfied until he had found a practical answer to his question.

Life should be a persistent search for experience, for explanation, for adventure. To search was not always to find, but it was always exciting. Members of the Measurements Section had a unique opportunity for reaching out to the unknown; for searching for the hidden; for seeking for what might be a pearl of great price; undaunted if they had not succeeded, but determined to carry on their search in spite of failure. They lived, or should live, in the midst of great adventures. It should stir them out of placid compliance with dull routine. There was a divine discontent that inspired effort. They should not be content with a little knowledge. Their duty, nay their delight, should be to know more.

It was of little use to want what they could not have, but they could not know what they could not have until they had risked diligently the little they had in seeking the greater prize.

The find was often unexpected, something new, something strange, and therefore the more exciting. To attain to this it was worth while to prepare. They had the lead given by their institution. It was worth while to belong to such a body, to be one amongst a company of adventurers: no sloth in endeavour, but joining with a band of seekers for hidden truth.

Industry and Statistics

Recommendations of Census of Production Committee

THE recommendations of the Census of Production Committee, the chairman of which is Sir George Nelson, appointed last June, whose report is now published (Stationery Office, price 6d.), provide for the collection of additional information from industrial businesses relating to costs, fixed capital assets, stocks and work in progress, sales, and other items.

In introducing their report the committee stress that in order to help the policy as set out in the White Paper on Employment, the new information must be precise, so as to avoid misleading deductions; duplications by Government departments must be avoided; Government departments should use common industrial classifications; international comparisons of the census figures should be made easier; and early publication of the figures is essential.

Scope of Census

A recommendation is made that the Census of Production Act should be amended to allow the collection of particulars of wages, salaries, depreciation, rent, and taxes (other than taxes on profits), and other principal items of costs. The present Act specifically prohibits the collection of particulars of wages, and this necessitated voluntary inquiries by the Ministry of Labour. The committee consider that the amount of wages should be stated on the census schedules, together with a moderate figure for salaries. In addition to depreciation, rent, rates, etc., it is recommended that advertising expenditure, a large costs item in certain industries, should be stated separately where it is important.

Statistics of man-hours worked should be collected, but the committee consider that compulsory powers for collection should be applied only after consultation with each industry and agreement with them that such statistics would be useful.

The committee consider it essential that regular and accurate statistics should be collected regarding fixed assets, stocks, and work in progress, in view of the incidence of fluctuations of capital expenditure on general business and employment. The values of fixed capital assets employed by productive businesses, including land, should so far as possible be those used for income-tax purposes. Where these assets are hired, the Board of Trade should have power to approach the owning company for values on the income-tax basis. The number and capacity of machines and plant installed should be collected for industries where they would be valuable for statistical purposes. This power, it is suggested, should be used only after consultation with representatives of the industries concerned. It is recommended that quantities and volume of stocks (as valued for income-tax purposes) should be collected, together with statements on the policy of each firm with regard to (a) whether it is their normal practice to hold stocks of finished goods; (b) the method of valuation of stocks held. It would be useful, the committee state, to distinguish between (a) stocks of materials of all kinds, (b) work in progress and (c) stocks of finished goods ready for sale. The aggregate value of each of these three categories at the beginning and end of the year should be obtained.

Provision should be made for the collection of statistics relating to:—

(1) The value of fixed capital assets acquired by manufacture or purchase, or disposed of, by productive business; and to purchases of British and foreign machinery, should this be necessary.

(2) The capital value of all assets hired or rented for the first time during the year or of assets handed back during the year: from the companies owning such assets.

In the opinion of the committee, information on this subject will be essential as part of the Government's employment policy.

On the question of factory space the committee recommend the collection of information about the ground floor area and the total floor area of factory buildings. They also suggest the collection of information about the age of buildings owned or rented for productive purposes.

Another suggestion is the collection of statistics relating to the different categories of manufacturers' sales. Information on this subject would be required from manufacturers if a Census of Distribution were taken, but apart from this the committee regard certain information as necessary in any case as to direct export orders, transfers at internal costing valuations to other works under the same ownership, and sales to manufacturers in the same trade.

Publication Date

So that results should be available with the minimum of delay, it is recommended that forms should be completed and returned not later than two months after their issue (instead of three months as at present), with a reduction to one month in the case of forms issued on January 1 to firms making returns in respect of financial years ending before the end of October. It is strongly recommended that the results of any census should be available within twelve months of the relative year.

Electricity and Nationalisation

Address by Sir John Dalton on Future Fuel Policy

ON his election as president of the Fuel Luncheon Club, Sir John Dalton spoke, at the luncheon in London on October 25, of the far-reaching Government proposals affecting the fuel industries which had been the subject of public pronouncements. He stated that the capital involved in the mining, gas and electricity industries was over £1 000 millions, and the number of people directly employed by the industries was over 1 000 000. Any change of ownership or operation would, therefore, be an enterprise of such a scale that it could not be done in a hurry unless the risk was taken of doing injustice to a large section of the public or, alternatively, to the future stability of the industries.

Average Holdings by Shareholders

Sir John stated that the average holding of stock for shareholders in gas and electricity companies was of the order of £200, so that the bulk of holdings were in the hands of the small man. Holdings over £2 000 only represented some 2 per cent. of the whole issued capital.

He thought that nobody could challenge the principle that where any industry was nation-wide and was completely independent, there must then be possibilities of the public interest being endangered, and any Government would be bound to control that industry in some way or other. Difficulty was to apply this principle to the fuel industries. There were no other industries in the country so exactingly controlled as mining, gas and electricity, and there must therefore be other considerations in the minds of any Government which proposed the nationalisation or reorganisation of these industries.

Dealing with mining, Sir John observed that the week before every holiday period was known in the industry as a "Bull Week," the country got a good production of coal during those weeks because spending money was required. He stated that, if the output per man shift, produced the week before Easter or Whitsun of this year had been maintained throughout the year, we would have had by now well over the 8 million tons which the Minister of Fuel was still asking for.

Sir John gave the opinion, with regard to recruiting for the mining industry, that a new attitude of mind was required. The industry should stop blackening itself still more; it should be announced to the thousands of able-bodied men now returning from the Forces that mining was a job with a great future: a job which entailed about 5½ hours' a day hard work and which, in the future, would probably only be for five days a week with increased mechanisation, and which, at the end of the week, was remunerated by a pay packet containing anything between £5 and £14 a week, according to ability and willingness to earn it.

With regard to the gas and electricity industries, Sir John had difficulty in finding any justification for nationalisation. Governmental control was at the moment exacting and almost complete. Dividends and prices were already regulated, or the power had already been obtained to regulate them. Every single operation of both industries required prior sanction or approval by some Department or other.

He foresaw a complication immediately the mining industry was nationalised. The Government would then be the owners of the house coal market of the coal trade—the most remunerative of all coal and of which some 40 000 000 tons was sold to the domestic market; the State would therefore become competitors with the gas and electricity industries for domestic heating, while at the same time the State would be the dictators of the price which gas and electricity undertakings would have to pay for their coal. Sir John instanced the fact that coal for electricity undertakings had increased in price since the beginning of the war by 140 per cent. in the south of England and 125 per cent. in other parts of the country.

ATOMIC ENERGY RESEARCH

Mr. Attlee announced in the House of Commons on Monday, that in accordance with a recommendation which had been received from the Advisory Committee on Atomic Energy, of which Sir J. Anderson was the chairman, the Government had decided to set up a research and experimental establishment covering all aspects of the use of atomic energy. Accommodation was being provided at Harwell airfield, near Didcot. It had further been decided that, in view of the importance of this work to the Service departments, responsibility for research on this subject, which had hitherto rested with the Department of Scientific and Industrial Research, would be transferred to the Ministry of Supply.

It is anticipated that an expenditure of at least £30 000 000 to £40 000 000 will be involved.

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. J. Ryan, borough electrical engineer, Hastings, is retiring after 32 years' service.

Ilford Electricity Committee reports the retirement on superannuation of **Mr. H. King,** assistant commercial manager of the undertaking.

Mr. A. J. Newman, formerly city electrical engineer and manager of the Bristol electricity undertaking, has been elected an Associate Member of the I.M.E.A.

Mr. E. Oldale, mains superintendent, Oldham electricity department, has resigned to become mains engineer at Stockport. He has been at Oldham for about ten years.

Poplar Electricity Committee has reorganised the electricity department in connection with the new power station scheme and **Mr. W. T. Andrews,** chief engineering assistant, has been appointed deputy borough electrical engineer.

Fulham Electricity Committee reports the resignation of **Mr. H. Outram,** assistant engineer at the power station, on his appointment as power station superintendent of the Hong Kong Electric Company.

The honorary degree of Doctor of Science has been conferred by Leeds University on **Sir Edward Appleton,** secretary of the Department of Industrial and Scientific Research.

Ilford Corporation has presented a gold wrist watch to **Mr. Norman Elliott,** formerly deputy borough electrical engineer, for his voluntary services during the war, when the need of help was greatest.

Mr. G. S. Rhoden, a teacher at Blackpool Technical College, has been appointed master-in-charge of the day continuation school of British Insulated Callender's Cables, at Prescot.

Mr. R. H. Pilcher, who has been serving with the R.A.F., has now resumed duties as manager of the Ipswich branch of Johnson and Phillips, Ltd., at 5, Arcade Street.

Following on the retirement of **Mr. W. M. Hime** from the position of hon. secretary and treasurer, the Scottish Region of the E.I.B.A. has appointed **Mr. V. P. M'Naughton** of Crompton Parkinson, Ltd., as his successor.

Dr. Percy Dunsheath, director and chief engineer of W. T. Henley's Telegraph Works Co., Ltd., has been appointed by the Admiralty to act as consultant and adviser to the Director of Electrical Engineering in connection with problems affecting electric cables.

The Chairman of the Thornton Cleveleys (Blackpool) District Council (Coun. C. Grundy, J.P.), on October 25, paid tribute to the work of Mr. A. G. Cooper, electrical engineer and manager since 1926, whose death was announced in our issue of October 19, and the members of the Council stood in silence as a mark of respect.

Mr. A. V. Alexander at the G.E.C. Witton works. Behind him is Sir Harry Railing, chairman of the company

It is proposed to move at the next meeting of the Council of the I.M.E.A. that **Mr. B. Handley,** former electrical engineer and manager of the Portsmouth electricity undertaking, be elected an Honorary Member of the association in recognition of the services he has rendered as a members of the Council and President of the association.

Mr. H. B. Style is retiring from the position of general manager of the Wessex Electricity Co. to take up an appointment abroad. **Mr. Robert B. Brown,** deputy-general manager prior to his military service, has returned and will succeed Mr. Style as general manager of the company as from the date when Mr. Style relinquishes that position, which is expected to be within a month.

Liverpool Electric Light and Power Committee has recommended that **Mr. H. Blackbourne,** temporary assistant inspector, be appointed on his return from the Forces as apprentice instructor; **Mr. J. L. Low** (now in the Forces), be appointed assistant maintenance engineer; **Mr. S. Lowey,** consumers' engineer, be designated meter and test superintendent; and **Mr. W. H. Murray,** chief inspector, electricity meters, be designated meter and test engineer.

As briefly mentioned in our last issue, the First Lord of the Admiralty, the Right

Hon. A. V. Alexander, accompanied by Mr. H. D. MacLaren, Director of Electrical Engineering to the Admiralty, and Mr. R. W. Adams, Admiralty Regional Electrical Engineer, Midland and South Wales District, visited the Witton engineering works of the General Electric Co., Ltd., on October 20, and were received by **Sir Harry Railing**, chairman of the company, and **Dr. C. C. Garrard** and **Mr. J. J. Gracie**, joint general managers of the works.

Sixty Chinese engineering post-graduates who are to be trained in British engineering works, under the scheme arranged by the Federation of British Industries in conjunction with the Chinese Government, were welcomed in London on October 24 by **Sir Frank Gill**, chairman of Standard Telephones and Cables, Ltd., and of the F.B.I. China Committee. Ninety engineering students have already been trained under the F.B.I. scheme and more than half are back in China helping in the reconstruction of their country.

Lt.-Col. K. G. Maxwell has resumed his duties as manager of the publicity department of the Metropolitan-Vickers Electrical Co., Ltd. **Mr. E. E. Walker**, who was acting manager during Lt.-Col. Maxwell's absence, has been appointed assistant manager. **Mr. M. Hird** has relinquished routine duties with the publicity department, but is retained as adviser on technical editorial publicity.

A presentation has been made to **Mr. Jonah Newark** upon his retirement, after completing 55 years' service with Automatic Telephone and Electric Co., Ltd. Mr. Newark, who is a wireman, helped to design cable for use with the earliest telegraph relays, notably the Gulstad type; he took part in the first outside installation work undertaken by the firm, which was a manual exchange at Glasgow, and later went to London to assist in the installation of equipment at Carter Lane, which formed one of the main arteries for London's telephone communications. During the first world war he was employed on submarine signalling equipment. Mr. Newark was presented with a cheque by **Mr. W. S. Vick**, the work's manager, whilst Mrs. Newark received a handbag.

Mr. W. S. Vick (centre) works manager, of the Automatic Telephone and Electric Co., presenting a cheque to Mr. J. Newark on completion of 55 years' service

Sir Alexander Roger has returned to London after some weeks in Portugal and Spain.

The late **Mr. J. E. Betts**, electrical engineer, for 45 years with the British Thomson-Houston Co., Ltd., Rugby, left £23 646 (n.p. £23 584).

Mr. R. W. L. Harris, the newly-appointed registrar and secretary of the Professional Engineers' Appointments Bureau, was educated at the Royal Grammar School, Newcastle-upon-Tyne, and Armstrong College (now King's College) University of Durham. He served his apprenticeship with A. Reyrolle and Co., Ltd., and subsequently was on their staff for ten years, rising to the position of personal technical assistant to the technical director and sales manager, the late Mr. H. W. Clothier. In 1940 he joined the staff of Messrs. Kennedy and Donkin as a senior engineer, and was engaged on work for the C.E.B. and the Government of Northern Ireland, resigning this position to take up the registrar's post in September.

The closing day of the Women's First Electrical Exhibition at Dorland Hall, October 25, was marked by a visit from the Queen, accompanied by Lady Catherine Seymour. During her tour of the exhibition, she was escorted by the **Dowager Lady Swaythling, Miss C. Haslett** and **Mr. V. W. Dale.** Her Majesty showed great interest in the demonstrations of women's work during the war, and was particularly attracted by the all-electric kitchen. She expressed the opinion that equipment such as a clothes-washer, on view in the kitchen, which performed 11 operations on washing-day, would be a boon to every housewife. Several officials of the British Electrical Development Association, the promoters and organisers of the exhibition, were presented to the Queen when she visited their stand.

Mr. G. J. Casselden, who was chief clerk of the Brighton electricity undertaking, has the following proud record of service.—From 1888 to 1894 he was employed on the clerical staff of the

Brighton Lighting Co.; when the Corporation took over the undertaking in 1894, Mr. Casselden transferred his services and continued in the employ of the Council until 1938, when he retired at the age of 65; in 1939 Mr. Casselden returned and gave his services during the war; he resumed his well-deserved retirement on September 29, 1945, making a total of 56 years' service.

Manchester Electricity Committee has expressed appreciation of the services of **Mr. F. P. Seager,** sub-stations engineer, and **Mr. W. Baxter,** superintendent of electrical repairs, who have retired.

The Minister of Fuel and Power has extended an invitation to **Sir Patrick Dollan,** chairman of the Scottish Fuel Efficiency and Economy Committee, to continue in office, and offered thanks for the excellent work done already by Sir Patrick and his committee.

In his inaugural address at the James Watt Memorial Institute on October 25, as president of the Birmingham Metallurgical Society, **Dr. J. W. Jenkin,** director of research, Tube Investments, Ltd., said the Institution of Metallurgists had been formed to provide for coming generations a hall mark in recognised grades and certificates of competence, not merely of book knowledge. It was not designed to overlap the work of learned societies. Dr. Jenkin presented the society's silver medal to **Mr. W. L. Govier** in recognition of his work as president during the preceding year.

On relinquishing his appointment as Controller of Light Metals in the Ministry of Aircraft Production in order to rejoin the British Aluminium Co., Ltd., **Mr. G. W. Lacey** has been appointed general sales manager. **Mr. G. A. Anderson,** who recently relinquished his appointment as Deputy Controller of Light Metals to rejoin the company, has been appointed deputy-general sales manager. The following other appointments have been made: Mr. E. A. Langham, sales manager; Mr. A. W. Langham, sales planning manager; Mr. H. H. Cundell, development manager; Mr. R. M. Warrington, assistant development manager; and Mr. L. Hart, assistant sales planning manager.

Lt.-Col. Joe Taylor, R.E.M.E., has been released from the Army to return to the staff of Ferranti, Ltd., and has been appointed Northern area manager, operating from the works at Hollinwood. **Mr. J. Mendelson,** manager for Scotland and Northern Ireland, has removed to 98, Greenbank Crescent, Edinburgh, 10. **Mr. L. A. Walker** has been promoted manager, Midlands area. **Mr. H. H. Weeks** is manager of the Western area. **Mr. R. M. Hobill,** who during the war years has been the transformer works manager, will shortly take over the duties of London area manager. **Mr. R. J. Hebbert,** while retaining the position of staff manager, has lately been appointed manager, Eastern Counties.

Group Captain A. C. Menzies has been appointed controller of research and development to **Adam Hilger, Ltd.,** and commences his duties on November 14, succeeding **Mr. F. Twyman,** F.R.S., in this capacity. Mr. Twyman continues with the firm as managing director and technical adviser. Dr. Menzies saw active service in the war of 1914-18 as a seaplane pilot in the R.N.A.S., and after graduating from Cambridge University had appointments in physics at Leeds University, University College, Leicester, and University College, Southampton. In this war he was in charge of operational research at the Air Ministry and was Deputy-Director of Science and Deputy Scientific Adviser. Since December, 1944, he has been acting as Scientific Adviser. He has specialised in spectroscopy, first in atomic spectra, later in the Raman effect.

The Women's Engineering Society this year held its conference to coincide with the twenty-first birthday celebrations of the Electrical Association for Women. The opportunity was taken of visiting the Motion Study Exhibition now being held in London. The evidence provided here of modern planning methods and their application to human effort was much appreciated by the women engineers who attended. The keen interest of women engineers in industrial planning was also evident in the discussion which followed the Presidential Address of **Miss M. M. Partridge.** She called for a big increase in the efficiency of British industry, and proposed the foundation of a college factory, which should train engineers in management, as thoroughly as technical colleges now train them in production. The new president of the society is **Dr. W. Hackett,** a noted research engineer, who is to hold office for two years. Members of the W.E.S. joined in a visit to the Battersea power station.

Obituary

Mr. Thomas Greenwood, a director of Greenwood and Batley, Ltd., in an accident.

Mr. John J. Fullerton, former chief engineering draughtsman with **C. A. Parsons and Co., Ltd.,** Heaton, Newcastle-on-Tyne, aged 81 years. He served his apprenticeship with Clarke, Chapman and Co., Ltd.

Mr. William Marshall, head of W. Marshall and Sons, electrical and mechanical engineers, Stirling, aged 61 years. He was well known in the trade in the central Scotland area, where he succeeded his father as principal of the firm.

Electricity Generation

Steady Growth in Output During the War Years

A FURTHER stage in the lifting of the statistical black-out imposed by the war is reached by the publication by the Electricity Commission of figures showing the generation of electricity by authorised undertakings in Great Britain during the war years.

Publication of the monthly statements of the number of units generated by authorised undertakers was, as will be remembered, suspended by the Commissioners at the outbreak of war. Below will be found complete figures not only for the war years but also for the pre-war period since 1933, in continuation of the previous statement issued by the Commissioners for years 1927 to 1932.

The table shows that a consistent increase was made throughout the whole period from 1933. The peak of electricity production was reached in 1944, when the total of units generated, subject to partial revision, amounted to 38 354 millions, compared with 36 951 millions in 1943; 35 654 millions in 1942; 32 369 millions in 1941 and 28 776 millions in 1940.

In 1933 the generation of electricity amounted to 13 562 millions. Subsequent increases were approximately at the rate of 2 000 million units per annum, the 20 000 million mark being passed in 1936. The largest actual advance was between 1940-1941, when the output rose from 28 776 millions to 32 369 millions.

The monthly figures show a seasonal variation, and though there have been signs of a small decline in certain months of 1945 to date, the figure for January of 4 174 million units represents a record throughout the whole period covered by the figures.

Month.	Units Generated by Authorised Undertakers (in Millions).												
	1933.	1934.	1935.	1936.	1937.	1938.	1939.	1940.	1941.	1942.	1943.	1944.	1945.
Jan. ...	1 338	1 536	1 714	1 970	2 176	2 382	2 704	3 018	3 145	3 616	3 437	3 712	*4 174
Feb. ...	1 152	1 343	1 478	1 824	1 944	2 145	2 334	2 658	2 725	3 323	3 075	3 594	*3 295
March ...	1 162	1 391	1 509	1 753	2 074	2 111	2 508	2 451	2 867	3 370	3 306	3 691	*3 383
April ...	953	1 188	1 330	1 554	1 832	1 849	2 046	2 347	2 632	2 860	2 854	2 886	*2 926
May ...	1 005	1 125	1 327	1 457	1 621	1 854	2 068	2 194	2 593	2 741	2 894	2 924	*2 812
June ...	885	1 049	1 147	1 334	1 574	1 612	1 912	2 036	2 230	2 577	2 641	2 745	*2 652
July ...	913	1 042	1 216	1 403	1 588	1 656	1 918	2 152	2 287	2 566	2 648	2 605	*2 537
Aug. ...	928	1 059	1 189	1 332	1 529	1 679	1 885	2 076	2 320	2 461	2 645	2 606	*2 474
Sept. ...	1 023	1 142	1 321	1 544	1 752	1 868	1 897	2 056	2 480	2 675	2 932	2 919	*2 707
Oct. ...	1 245	1 434	1 650	1 861	2 029	2 195	2 225	2 450	2 858	2 976	3 248	*3 332	—
Nov. ...	1 421	1 595	1 758	2 010	2 285	2 346	2 350	2 559	2 993	3 186	3 522	*3 597	—
Dec. ...	1 536	1 557	1 929	2 180	2 497	2 675	2 563	2 778	3 236	3 300	3 747	*3 744	—
Total for Year	13 562	15 462	17 568	20 221	22 902	24 373	26 409	28 776	32 369	35 654	36 951	*38 354	—

NOTE.—All figures have been rounded to the nearest million. * Subject to revision.

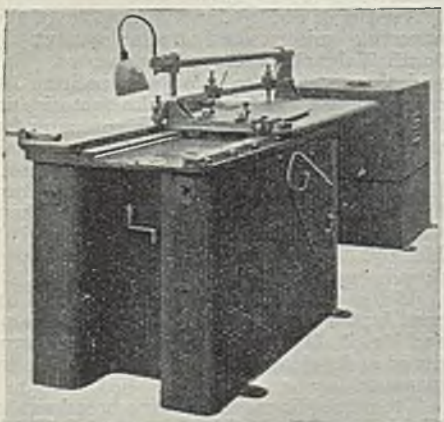
Purchase Tax Exemptions

THE Commissioners of Customs and Excise have issued a notice setting out in detail domestic goods that are now exempt from purchase tax and those appliances which remain chargeable with tax. The articles exempted include cookers, boiling rings, grillers and hot-plates; radiators and convectors; instantaneous water heaters, immersion water heaters and storage water heaters; wash-boilers and coppers; parts of cookers; domestic refrigerators; circulator water heaters; calorifiers; heated towel rails; electric fires; panel and tubular room heaters. Goods which are not exempt include articles, not themselves falling within the terms of the exemption, which incorporate components that would be exempt as separate articles, e.g., hollow-ware cooking utensils incorporating boiling rings; drying cabinets and air-conditioning appliances incorporating convector heaters; washing machines incorporating wash-boilers; ice cream machines. Electric kettles and other culinary hollow-ware, whether fitted with heating elements or not; toasters; waffle plates; coffee roasters; irons and ironing machines; dish washers; bed warming appliances, such as heating pads, bottles and blankets; curling tongs and heaters therefor; hair dryers; radiant heat lamps, sun lamps, ultra-violet lamps, infra-red generators and similar apparatus.

New Equipment

Cutting Tool for Plastics—House Service Units

THE Abrasaw, designed and manufactured by **Small Electric Motors, Ltd.**, is planned for the accurate cutting, with a good finish, of materials which are abrasive, or which cause over-heating and consequent frequent re-sharpening of metal saws. Most plastics, such as ebonite, loaded ebonite, W.T.22, synthetic resin paper board, and so on, fall within this category. The machine has a 48 in. long moving table which runs accurately and parallel to the abrasive wheel and has suitable and varied clamping and measuring devices that ensure the cutting of panels, etc., square and to size without the need for further machining. The finish obtained is such that, for all normal purposes, no further processing of the cut edge is necessary. Although for absolute maximum efficiency different gradings of wheel can be obtained for the cutting of each separate material, one grade of wheel will cut all the materials quoted above with no appreciable difference. The machine is, therefore, of great use in a factory employing a number of different insulating materials, most of which can only be machined efficiently with tungsten carbide cutters, and which are very difficult to cut. The dust collector, designed specially for use with this machine, is of the wet type and prevents the risk of fires in the collector arising from certain types of dry filter when cutting synthetic resin, paper board, etc. The



The Abrasaw, showing moving table, and dust collector in the rear

machine and dust collector are both totally enclosed and have similar external appearance. The motor is mounted in a slideway machined in the same pivoted frame by which the spindle is carried. The motor, therefore, moves with the spindle and no belt adjustment is required to compensate for spindle movement. It is of 10 H.P., 3 000 r.p.m., 3-phase 400 V.

The interest in the subject of house service units for the post-war building programme, has been further stimulated by the publication of the British Electrical Development Association's specification for a standard service unit, referred to in our issue of October 26. Information now reaches us that **British Insulated Callender's Cables, Ltd., W. T. Henley's Telegraph Works Co., Ltd.,** and **Revo Electric Co., Ltd.,** are expecting to be able to supply service units in accordance with this specification in the near future.

A service unit in accordance with the E.D.A. specification

The accompanying illustration shows a representative assembly consisting of three main components, viz: (1) Supply intake chamber (2) main switch chamber; (3) consumer's fuse chamber. The three components can be fixed in alternative positions, so that a wide variety of assemblies is possible. The normal arrangement, as shown, caters for a single meter and provides for six outgoing circuits. This will suit the common single meter tariff and so cater for most domestic wiring needs, but the flexibility of the assembly and the provision of spare fuse ways permits of the complete unit being adapted for any local requirement by the use of standard components. Among the advantages claimed for the unit are ease of installation and connection; safety is ensured by the enclosing and protecting of all live parts and connections, including those to the meter; the circuit fuses of the cartridge type can be readily renewed without any special tools. The cases are constructed of sheet steel,

rust-proofed and stove-enamelled. The units are ventilated and are protected against the ingress of dust, etc. Provision is made for sealing each chamber if required and particular attention has been given to the provision of adequate and permanent bonding and earthing connections.

Lamp Factory for Wales

Merthyr Trainees Given a Civic Welcome in London

THE first electric lamp factory to be established in Wales is being erected at Merthyr Tydfil, for Thorn Electrical Industries, Ltd., makers of Atlas Lamps, domestic appliances and radio equipment, in conformity with the Government's policy of decentralisation of industry. Pending the completion of the new building, a Royal Ordnance factory near the town will be utilised and many of the young women who were employed there on the making of munitions will be engaged on the manufacture of lamps, which will commence at the beginning of next year. A large part of the output will be for export.

The Mayor of Merthyr Tydfil and Mr. A. S. Shier, a director of Thorn Electrical Industries, Ltd., talking to some of the girls. The Mayor of Edmonton is seated on the left

Merthyr girls trained at the company's factories at Edmonton and Tottenham will form the nucleus of the staff of the new factory, and the first twenty-six journeyed to London on Monday. Their ages are between 17 and 25, and they have been specially selected by the Ministry of Labour for their suitability for lamp making. Accompanying them were the Mayor of Merthyr Tydfil (Ald. T. E. Rees, J.P.), the Deputy-Mayoress (Miss Edith Rees), Mrs. H. Morgan (sister of the Mayor), Councillor H. I. Williams (a former Mayor), and Councillor T. J. Evans. At Paddington Station they were met and welcomed by the Mayor and Mayoress of Edmonton (Ald. W. Preve, J.P., and Mrs. Wagner), the Mayor and Mayoress of Tottenham (Ald, E. J. Field, J.P., and Mrs. Field), the Deputy-Chairman of the Enfield U.D.C. (Councilior David Mason), Mr. H. O. Harries (hon. sec. of the Welsh Services Club in London), and Mr. A. Stanley Shier (sales director of Thorn Electrical Industries, Ltd.).

After being photographed, the party was conveyed by motor coach to the factory of the Ferguson Radio Corporation, Ltd. (a subsidiary company of Thorn Electrical Industries, Ltd.), Great Cambridge Road, Enfield, where the girls and other visitors were given tea.

Mr. A. S. Shier, welcoming the girls on behalf of the company, said they wanted them to feel they were among friends. They had done all they could to make them happy during their stay in London for the next three or four months. They were the vanguard of something new in the redistribution of industry, and he hoped that in the future they would be able to look back with pride and say they helped to build a new Merthyr. He spoke of the company's war work, and said they employed 2 000 people in their four factories in the London area.

The Mayor of Merthyr Tydfil spoke of the poverty, misery and unemployment in South Wales that followed the last war, and said they wanted to avoid a repetition by encouraging industries to take factories in those areas. He thanked the company for their reception and said he was sure they would be proud of their Merthyr employees. His Council were grateful to the firm for establishing a new industry in their town, and he hoped the lamps made at Merthyr would be the best ever produced.

Addresses of welcome were also given by the Mayors of Edmonton and Tottenham, and Mr. H. O. Harries, who had been introduced and welcomed by Mr. S. Carne, works manager.

The proceedings, which were broadcast to Wales, concluded with singing of a Welsh song and the Welsh National Anthem, by the girls.

They were then escorted by the company's welfare officers to billets with families at Edmonton and Tottenham.

Telephone Interference

Some Results of Investigations Over Ten Years

A SUMMARY of investigations into telephone interference carried out in this country between 1934 and 1944 was given in a paper entitled " Practical Aspects of Telephone Interference Arising from Power Systems," by Messrs. P. B. Frost and E. F. H. Gould, read at a meeting of the Institution of Electrical Engineers in London last night, Thursday.

The authors stated that it was appreciated that the study of fundamental causes and remedies involved both power and telephone interests and that the best solution required full co-operation. This had been realised partly through the operation of Electrical Research Association committees.

In the section of the paper dealing with electro-magnetic induction at fundamental frequencies and the serious consequences of exposing communication circuits to high induced voltages, the authors discussed the effect of an earth fault current from a h.v. power line upon parallel communication circuits and remedial measures available on the power system and on the telecommunication system. On the latter, they said, gas discharge tubes had given most promise and had been used to some extent.

Risk of Acoustic Shock

Experiments had been made to determine the precise degree of risk, as regarded both injury to personnel and damage to plant, arising from exposing communication circuits to high induced voltages. Field tests had been carried out to ascertain the order of agreement between measured and calculated values of the mutual inductance between parallel lines. Very fair agreement had been obtained, but calculations were liable to considerable error until more reliable means of estimating the effective earth resistivity and the screening factors appropriate to railway lines, for example, were available. The actual risks to communication equipment from the application of high voltages of short duration had been investigated in the laboratory. Voltages of the order of 2 500 V at 50c/s were applied to representative lines and terminal apparatus for periods from 10 to 1 000 millisec. It was demonstrated that telephone operators and the general public might suffer severe acoustic shock. Acoustic-shock suppressors (cuprous-oxide type) had been found effective in suppressing shocks of lesser magnitude, but although operative under the severe conditions of the experiment, they did not, under such conditions, materially reduce the acoustic impact, also they were liable to breakdown.

Arcing occurred on fuse mountings, and as these must be mounted close together, the simultaneous operation of a number of affected lines was found to constitute a grave fire risk at exchanges. The standard protector with heat coil and fuse was a fair safeguard, but if the protectors were omitted to prevent arcing at the fuse mountings, severe damage of a widespread nature might be expected in the exchange apparatus.

Assessing Danger to Jointers

Further tests were made on the terminating transformers of trunk circuits in cable where no protectors were used. With 2 500 V applied, breakdown of quad-type cables was usually observed before the failure of transformers. While cable breakdown was generally more serious than transformer failure, the latter constituted a serious fire risk. Terminating transformers could, however, be redesigned to withstand a higher voltage; induced voltages higher than 300 volts could, therefore, be tolerated if the safety of apparatus alone were at stake. The risk to jointers thus remained the major objection to permitting a higher induced voltage where cables terminated on transformers were involved. No satisfactory jointing technique for dealing with this risk under practical working conditions could be devised. With a view to assessing the danger to jointers working on a cable exposed to high induced voltage, a mathematical investigation was undertaken to cover the various conditions that arose in practice. These included (a) a moderate degree of coupling uniform over a long distance, and (b) a short severe coupling on a cable route otherwise unexposed. In both cases the conditions arising when the circuits were (1) open at both ends and (2) earthed at the far end, were investigated. It was found that under both these conditions the current through a jointer making contact with a wire in the cable and with earth might reach very high values judged from the standpoint of danger to life, even though the total induced voltage over the whole cable did not exceed 300 V.

Brief summaries of the results of a number of field tests were given, and it was stated that these tests did not provide a complete answer to any of the problems still

outstanding, but furnished useful data and indicated that in many cases the mutual inductance between two lines with earth return could be calculated with sufficient accuracy for practical purposes.

During the last eight years every main cable projected by the Post Office had been examined in relation to existing power lines, before the proposed route was finally settled. It had been possible to correlate a number of faults on power systems with damage and other effects on the telephone system.

Noise interference on telephone circuits paralleling a power line might be due to electric induction by harmonics in the line voltage or to electromagnetic induction by harmonics in the line current. Electric induction was only appreciable with very high voltages and long close parallels; adequate separation and the practice of placing telephone lines underground where they crossed 132-kV power lines had so far given freedom from this effect.

Relatively little experimental work on interference from grid-controlled rectifiers had been done, but the following was a brief statement of the conclusions that appeared to be so far substantiated: The d.c. output had a higher harmonic content than in the absence of grid control. Increased angle of overlap was beneficial, and cathode and anode reactors, and interphase transformers, together with the internal impedance of the supply system, exercised some filtering action in conjunction with the load impedance. Telephone interference from a.c. lines feeding large rectifiers had recently received much consideration, and was likely to become very important where industries employing large rectifiers were located far from the power source.

Reassuring Results

The reassuring results and experience gained from tentatively-installed multiple-earthed h.v. systems had enabled the Electricity Commissioners, in collaboration with the Post Office, to formulate conditions of approval for the multiple earthing of h.v. systems.

In general, noise interference arose from the residual currents in the power line. Non-triple harmonics would arise from unbalanced voltages or from the effect of line or load unbalance on balanced voltages. From a noise-interference point of view, however, especially where no delta windings were provided, triple harmonics were of more importance, since they were in phase in all three lines and were most affected by multiple earthing. Triple harmonics might originate in the generator owing to faulty design or in the transformer, particularly if high flux densities were used, or in both. Whether they appeared in the outgoing transmission line depended upon earthing arrangements and transformer connections.

The general conclusions drawn from tests made were that, from the interference aspect, the adoption of l.v. multiple earthing of the neutral, including p.m.e., on a rural power-distribution system was not necessarily objectionable.

Use of Gas Discharge Tubes

Where a telephone line was subject to high longitudinal induced voltage, the safety of personnel and apparatus might be secured by earthing the telephone line at intervals along its length for the period the power fault-current persisted. The device used for this purpose should (a) operate instantaneously at a low voltage, but not so low as to risk operation by ringing voltages or as to be maintained in operation by them, (b) disconnect the line from earth as soon as the induced voltage ceased, (c) connect both legs to earth simultaneously and subsequently disconnect them simultaneously, (d) carry without damage to itself, for the whole duration of the power fault, a current of such magnitude that the whole of the voltage induced in the line (less that required to keep the device in operation) was absorbed by the impedance of the line. The voltage across the device during operation should be low. Those stringent requirements were partially met by three-electrode gas discharge tubes, and in default of a better solution, considerable numbers of them had been used. The breakdown voltage was not uniform, and after prolonged inaction operation was delayed by the absence of free electrons. They did not assure absolutely simultaneous operation of both line electrodes, and therefore did not altogether prevent acoustic shock. They appeared not to function with the higher-frequency transients that arose with Petersen-coil operation. They were liable to damage by lightning. The earth-electrode resistance must be very low to reduce the line voltage to a relatively safe value.

Although there was evidence of these tubes having operated in practice, further investigation was required to confirm that their object was adequately achieved.

Tests had been made with a relay which it was proposed to use in the same manner as gas discharge tubes. To avoid impairment of transmission, it was connected through spark-gaps; it earthed the line while induction continued and released immediately, when it ceased. The impedance of the coil was designedly low. The operating delay was 30 millisec ($1\frac{1}{2}$ c/s at 50 c/s) and caused considerable acoustic shock. Low-resistance earth electrodes were necessary, as with gas discharge tubes.

Plastics Notes

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

Vinyl Materials.—During the last decade, and particularly during the war, enormous strides have been made in the development of vinyl products, such as polyvinyl chloride, polyvinyl acetate, polyvinyl alcohol and co-polymers of these products with each other and with other materials. These products are all thermoplastics and they all contain the hypothetical vinyl radical, CH_2:CH–. Manufacture of polyvinyl chloride, commonly called PVC, has taken place in this country but has been restricted owing to our lack of supplies of acetylene. In America it has been manufactured on an enormous scale.

Polyvinyl Chloride

Vinyl chloride CH_2: CHCl can be made from acetylene and gaseous hydrochloric acid in the presence of a catalyst at about 180°C. In America it is produced from acetylene and also from natural gas and from " cracked " petroleum gas. Vinyl chloride is also formed by the interaction of hydrogen chloride and nascent acetylene, e.g., by treating calcium carbide with concentrated hydrochloric acid in the presence of copper and mercury salts at about 80°C. By working at increased pressure, the use of a catalyst can be avoided.

On standing, especially if exposed to light, vinyl chloride polymerises to polyvinyl chloride, which is an amorphous insoluble practically colourless material. It is resistant to dilute acids and alkalis.

Polyvinyl chloride can be coloured by the introduction of dyestuffs, and it can be plasticised by the addition of such plasticisers as tricresyl phosphate, to give materials which are hard like ebonite when the plasticiser content is low and which are soft and rubbery when the plasticiser content is higher.

The plasticised material can be moulded by injection in much the same way as cellulose acetate and other thermoplastics, with but a slight variation in the moulding technique. It can also be moulded by extrusion, and it is in this way that the well-known cable sheathings are made.

Electrical Properties

Owing to the fact that the material will vary according to the degree of polymerisation and also owing to possible variations in the plasticiser content, it is difficult to give precise figures for the mechanical and electrical properties, but for purposes of comparison with the other plastic materials, which have been, or will be, described in the present series, the following average figures are set down: Specific gravity, 1.35; tensile strength, 3 000 lb.-sq.in.; volume resistivity, 10^{12} ohms.cms.; dielectric strength, 250-450 V per mil.; water absorption (24 hours), 0.5%. However, these figures can only be given as a rough guide. The manufacturers make several different grades, each of which is suitable for certain purposes, and figures are quoted for each grade according to circumstances.

For example, four regular grades are made in this country:—

(1) A high-grade dielectric material with only moderate low temperature flexibility. (2) A grade classed as good for dielectric properties and low temperature flexibility. (3) A grade with only moderate dielectric properties but with very good low temperature flexibility. (4) A special grade resistant to petrol.

The first grade is used mainly for extrusion of tubing, conduits, etc., and also for mouldings. It can be extruded over wires and cables. The second grade is used mainly for extrusion, while the third grade finds application chiefly for the outer sheathing of cables where electrical properties are a secondary consideration. The fourth or petrol resistant grade has been used, as is to be expected, for flexible petrol and oil tubing, thus avoiding the use of the so-called petrol resistant rubbers. These four grades are all rubbery in feel but more or less rigid grades have been produced.

Chlorinated Wax as Plasticiser

As indicated above, the common plasticiser used in the manufacture of polyvinyl chloride materials is tri cresyl phosphate, but during the war this material was in somewhat short supply and a substitute was found in " Cereclor," which is a chlorinated wax. The use of this substitute plasticiser gave quite good products.

Polyvinyl chloride possesses the interesting property of being capable of being welded. To weld it, all that is necessary to be done is to heat the surfaces to be joined and then press them together. Welding is used for repairing articles in polyvinyl chloride which have been damaged, and it is also used for fabricating articles from sheet material. Small rents which may occur in, for example, cable sheathing, may be repaired by ironing over the fault with a hot iron. This method is only applicable to small cuts or rents. Larger gashes are repaired by inserting a piece of polyvinyl chloride, of the same grade as the material to be repaired, into the gash and then welding with a hot iron.

Welding with a hot iron can also be used

for joining together tubes or pieces of sheet. As an alternative to a hot iron, a blast of hot air is sometimes used as the source of heat, and the surfaces to be joined are then pressed together with a suitably designed cold tool.

H.F. Heating

High-frequency heating has been developed in recent times for the welding of thermoplastic materials, including polyvinyl chloride. In some respects this method of heating the material for welding is superior to the hot iron or hot air blast methods, as it can be applied through water-cooled metal plates or tubes, thus keeping the outer surfaces of the polyvinyl chloride cold, while the material is softened at the point of contact. The hot iron or hot air blast methods both heat from the outside and may therefore mar the surface appearance of the article at the joint.

For some jobs special machines have been designed to apply h.f. heating. For example, there is a sort of sewing machine, which can be used for securing together two sheets of polyvinyl chloride by pressing them between a pair of small metal rollers. One of these rollers is placed above the work, like the needle in an ordinary sewing machine, while the other is immediately below it in the table of the machine. Jig welding machines with h.f. heating have been devised for the manufacture of such articles as tobacco pouches from polyvinyl chloride, for bags and envelopes for display and packaging purposes and so on. It is claimed that a tobacco pouch can be welded in two seconds by such a machine.

In addition to the extruded, moulded and sheet forms mentioned above, polyvinyl chloride is also available in paste form, looking something like a thick paint. This is simply a mixture of polyvinyl chloride and a plasticiser and, when heated, it passes over into a form closely resembling the ordinary sheet or tube material. The paste finds outlet for repair work not readily carried out by welding. To repair rents and gashes, it is spread into the hole and built up to the surface of the cable or article and then held near a flame, or heated by exposure to a blast of hot air to turn it over into the solid form.

Polyvinyl Acetate.—Another vinyl plastic which has many interesting applications is polyvinyl acetate. Its preparation is somewhat analogous to that of polyvinyl chloride, for example, if acetylene gas is passed into glacial acetic acid, containing a small quantity of a mercury salt, such as mercuric sulphate, as a catalyst, vinyl acetate is formed, provided the temperature is kept low. If acetylene is passed rapidly through acetic acid at about 70°C., the rapid stream of gas removes the vinyl acetate as soon as it is formed and prevents secondary reactions taking place. An alternative process depends upon passing a mixture of acetylene and acetic acid vapour through a tube heated to about 200°C., containing activated charcoal which has been impregnated with zinc or cadmium acetate.

Vinyl acetate is described as a mobile, colourless, non-toxic liquid which boils at 73°C., but it is not in this form that it has commercial values. In the dark vinyl acetate is fairly stable, but when exposed to light, like vinyl chloride, it polymerises to form polyvinyl acetate, and it is this material which has valuable industrial properties. Alternatively, vinyl chloride will polymerise in the dark when heated to 100°C., and the change is accelerated by the presence of oxygen or peroxides as catalysts. One of the most efficient catalysts is benzoyl peroxide, and this is used commercially for the process. Sometimes the polyvinyl acetate is produced direct without isolating the monomer, vinyl acetate, for example, by passing acetylene under pressure into acetic acid in the presence of small amounts of metals such as magnesium, tin or copper. To reduce the risk of explosion, the acetylene may be diluted with an inert gas such as nitrogen, benzene vapour or petroleum vapour.

The polymerisation reaction is fairly violent, once started, and is highly exothermic. Industrially, it is sometimes preferred to carry out the polymerisation in solution in a solvent, and thus render it more readily controllable.

Properties of Polyvinyl Acetate

Polyvinyl acetate is odourless, tasteless and non-toxic. It will not burn readily, and, like polyvinyl chloride, it is practically colourless. It is soluble in ketones, esters, chlorinated hydrocarbons, certain hydrocarbons and alcohols. It is insoluble in water, certain hydrocarbons, waxes and fats. Like polyvinyl chloride it can be plasticised. In solution it finds application as an adhesive and binding agent; also as a lacquer for use on metals and in inks. Alternatively, it can be mixed with various fillers to produce a moulding compound.

Co-polymers.—Commercially a range of mixed polymers of vinyl chloride and vinyl acetate has been developed with the object of taking advantage of the good qualities of both materials. These co-polymers are odourless, tasteless, non-toxic and non-inflammable. They are very tough and, unlike many plastic materials, they are non-shrinking. The water resistant, chemical resistant and good dielectric properties of the constituents are maintained in the mixed compound.

The use of plasticisers is not always necessary because the acetate appears to

exert an internal plasticising action. When plasticisers are used they are the same types as are used with the straight polyvinyl chloride.

It should be made clear that these co-polymers are not simply mixtures of polyvinyl chloride and polyvinyl acetate. In their manufacture the starting points are vinyl chloride and vinyl acetate. These two substances are mixed together with a solvent and a catalyst is added. Polymerisation then takes place along the lines described above for polyvinyl acetate in solution, and the product obtained is a chemical compound in which the two original constituents have polymerised with each other and with themselves, yielding a material of very complex chemical structure.

By varying the proportions of acetate and chloride, co-polymers of different properties can be produced, but most of the co-polymers of industry contain between 80 and 95 per cent. chloride. Different degrees of polymerisation give rise to different properties, so, as was the case with polyvinyl chloride, it is only possible to quote average property figures. However, to enable comparison to be made with other plastics, the following details are given:— Specific gravity, 1.35; tensile strength (lb. per sq. in.), 9 000; impact strength (ft. lb. per sq. in.), .2 to 1.4; volume resistivity (ohms.cms.), 10^{11}; dielectric strength (V per mil.), 400-500; water absorption (24 hours), 0.1 per cent.

Polyvinyl chloride will also co-polymerise with vinylidene chloride, but the product formed is rather special in its properties and it is proposed to defer consideration of it until a later article on polyvinylidene chloride.

The applications in industry of these polyvinyl products are many and varied. From references made above under polyvinyl chloride to extrusion of cable sheathings, etc., and the repair thereof, it will have been gathered that one of the main applications of polyvinyl chloride is in the cable industry. During the war, when cable sheathings were in great demand and rubber was short, practically all the polyvinyl chloride produced in this country and also that imported from America were used in cable work. Control of the material was very rigid and only relatively small quantities were used for other purposes. Among such purposes may be mentioned moulded grommets and other small insulating parts, insulating washers and sheets, washers in scientific and optical instruments, and so on. A certain amount of the petrol-resisting grade was used for petrol hose or tubing, as it is much more satisfactory than natural rubber; and the type of synthetic rubber, Neoprene, suitable for use with oil or petrol, was in very short supply.

One of the main applications of polyvinyl acetate is as an adhesive when it is used in solution, in the form of an emulsion, or sometimes just melted by itself. It is also used as a binder in certain moulding materials.

The co-polymer of acetate and chloride can be worked in all the ways that rubber can be worked, i.e., it can be roll-milled and calendered and it can be extruded and injection moulded. Made up in emulsion or solution, it is used extensively for coating fabrics. Alternatively, the emulsions may be used to manufacture the durable films and coatings of various kinds. However, as these applications are not of special interest in the electrical industry, it is not proposed to discuss them here in detail.

Electricity in India

From Our Own Correspondent

WHEN the estimates of the Department of Electrical Undertakings were considered during the discussion of the Budget in the Ceylon State Council, Mr. R. E. Jayatilaka asked when the hydro-electric scheme would be completed and how local authorities could renew their worn-out plant.

Mr. J. L. Kotalawala, Minister of Communications and Works, replied that if all went well the hydro-electric scheme would be ready by 1948. Local bodies who wanted new equipment for renewals would have to wait at least two years before heavy plant was available, and by that time the hydro-electric scheme would also be ready.

Outlining his policy of industrialisation of Ceylon, Mr. G. C. S. Corea, Minister of Labour, Industry and Commerce in the State Council, referred to a five-year plan he has prepared, all the details of which, however, were based on the use of coal and fuel oil, as he did not anticipate that the availability of cheap electric power would be made soon enough.

At a meeting of the Executive Council of the Government of Mysore, South India, the Dewan presiding, matters relating to the post-war development of electrical power, and particularly the Jog power scheme, were discussed. The first stage of this scheme is expected to be completed by the middle of 1947, though some power may

be available by about June next year. The generating capacity of the plant at the end of the first stage will be 48 000 kW. But provision has been made for installing additional generators and penstock lines, with a view to increasing the capacity to 120 000 kW. The probable cost of this expansion will be Rs.5 crores, which is to be spent over a period of about five years. The total capital investment in Mysore State's electrical undertakings will thus have risen to about 16 crores of rupees.

The Commissioner of the Madras Corporation has approved a scheme for the substitution of lighting by gasfilled lamps in important roads and road junctions in Madras, with mercury vapour lamps. In this connection it is proposed to apply for a loan of Rs.100 000. Two roads and some important road junctions have already been provided with mercury vapour street lighting.

Trolley Bus Proposals

Mr. M. Damodaram Nayudu, a member of Madras Corporation, has given notice to the Mayor of his intention to move a resolution at the next meeting of the City Council to point out to the Government the need for the introduction of trackless electric trolley buses in those parts of Madras where electric trams are not running, and their extension to other parts of the city, gradually replacing electric tramways.

About one-third of the country's requirements of electric lamps are now made in India from imported components, except for glass bulbs and brass caps. A similar position exists with regard to electric fans, lighting accessories, dry batteries and cells, accumulators, distribution transformers and electric motors. All are assembling industries depending to a greater or lesser extent on imported components or raw material. The progress of local metal and glass production has enabled more and more Indian-made parts to be included in the list of components, though as yet there is no production of the finer gauges of wire, or of silk-covered or enamelled types. Nearly all insulating material is also imported except black adhesive tape. To make accessories, Indian producers have to import supplies of Bakelite powder, spring steel wire and certain types of brass rod.

The Policy Committee of Industries and Commerce of the Mysore Economic Conference, which met at Bangalore under the chairmanship of Mr. Ramachandra Rao, retired Director of Industries and Commerce, Mysore has approved the five-year scheme of Post-war Electric Power Expansion Projects in Mysore State, which are estimated to cost Rs.5 crores. The main proposals of the scheme are the installation of four 18 000 kW generating units with the necessary transformers and switch gear at Jog, the construction of a transmission line to Bangalore (165 miles), the construction of a duplicate transmission line between Jog and Bhadrawati (75 miles), a transmission line between Mandya and Chennapatna (126 miles), and between Davangere and Tumkur (110 miles). The scheme would involve an annual recurring expenditure of Rs. 600 000. It is expected that this development of power will not only encourage expansion of industries in Mysore, such as the manufacture of iron and steel, paper, textiles, etc., but by relieving the load on existing power stations, more water from Krishnarajasagar will be made available for agricultural development. The scheme will also give considerable scope to qualified men for securing employment on demobilisation from the Armed Forces.

India's Central Technical Power Board has started detailed investigations for planning a multi-purpose scheme for the development of Damodar Valley. The scheme is designed to benefit 5 000 000 people in the valley and another 2 500 000 in neighbouring towns and cities, including Calcutta.

A series of reservoirs are to provide water for irrigation and hydro-electric and thermal power stations and to assist in flood control. The general plan of development includes the building of eight dams and a barrage. The area to be served contains India's main coal resources and many other facilities for future industrial development. The total capital cost of the scheme has been estimated at Rs.55 crores, subject to preparation of more detailed estimates. How this will be shared between the Central and the Bengal and the Bihar Governments is not yet decided; preliminary expenses will be charged to the project if it materialises and divided half and half between the Centre and the Provinces if it does not.

Work at present consists mainly in studying hydraulic factors and organising the necessary surveys. A technical mission from the United States, which will advise on the type of dams to be built on the first two sites, is expected to arrive in India early next year.

Water Supplies and Generation

The first two dams to be investigated and planned in detail will be those at Maithon on the Barakar river, and at Aiyar on the Damodar river. The plan provides for a perennial supply of irrigation water sufficient to serve an area of approximately 750 000 acres, and a combined hydro-electric and thermal power station installation and transmission lines to supply a load of 300 000 kW.

A traffic survey will also be probably made to determine the economic feasibility of providing a navigable channel along the Damodar river; utilisation of water supply for both industrial and domestic purposes

will also be fully investigated. An administrative officer is to be appointed as soon as possible to consider the type of organisation required to operate the entire scheme. It has been suggested that while the plan will prove a boon in many ways, the incidence of malaria in the lower Damodar Valley, already high, may increase.

The scheme may also be opposed by coal-mine owners and others who have industrial interests in the valley; rehabilitation of displaced population will be another thorny problem. It is also stated that before final plans can be made much information will have to be obtained about the geological formations at the proposed dam sites, the quantity and type of construction, materials locally available and the availability of equipment.

If preliminary work proceeds according to plan, construction work is expected to start in 1946.

The proposal of the Calcutta Corporation to purchase part of the Calcutta Electric Supply Corporation on the expiry of their present agreement has, it is learnt, been turned down by the Bengal Government.

In a recent letter to the Corporation, the Government has informed it that under the existing law the Corporation is not competent to purchase part of the undertaking as it claimed to do. It has further been stated that even if the Corporation is competent, the Government will withhold the required permission, as, in their opinion, it would be extremely undesirable to break up the undertaking of the Calcutta Electric Supply Corporation, which has grown and developed as one unit. The whole of the area of supply of the Calcutta Electricity Licence is not situated within the boundaries of the Calcutta Corporation.

The Corporation has further been informed that the Government in their negotiations with the Calcutta Electric Supply Corporation have come to an agreement under which they have obtained the option to purchase the entire undertaking.

Atomic Energy and Industry

By J. H. BOOTH, Assoc.M.C.T., A.R.T.C.S., Grad.I.E.E.

AN engineer's training usually encourages a balanced and critical view of scientific developments, and it is with some misgivings that he reads reports in the lay Press of technical and scientific achievements with all their exaggeration, colour, embellishments and grandiose predictions. The end of the war has brought several disclosures of new developments, terminating in the announcement of the atomic bomb.

The development of applied atomic energy will probably be comparatively slow. It must be remembered that the atomic bomb itself was the product of many, many years research in a number of countries, and in itself is only the clue to the release of the "raw energy." Before atomic energy can be commercially applicable, i.e., economically useful, it must be readily transformable into mechanical work, electricity, light, etc., and be either easily transmitted and distributed over a large area from some central source or conveniently generated where it is required. It is in how soon atomic energy can be harnessed along these lines that the fate of the electrical industry rests. The industry should be alert and conscious of such a possibility.

The development of applied atomic energy will probably fall into two phases. The first, its transformation into controlled mechanical energy; and the second, the harnessing of atomic energy for direct use. The first might have a profound effect upon the mechanical engineering industry, but should not affect the electrical industry's prime position to a great extent. The ability to control atomic energy to do mechanical work might eventually lead to the replacement of prime movers. This might affect the electricity supply industry in so far as turbines, coal and boilers are concerned, and the generating station would be smaller. But the advantage of transmittable and utilisable energy would remain the unique virtue of electricity.

How soon (if ever) the second phase would follow upon the first is hard to predict, but its advent would be the sign for the relegation of electricity to secondary importance. Even so, the application of atomic energy to drive trains; provide light, warmth and heat for cooking, would take quite a long time.

If, and when, atomic energy is developed on these or similar lines, a new industry would be born to support it. Where will this new industry come from? It would be logical to suppose that it would grow from some kindred industry, and the nearest thing to an atomic industry, at present in existence, is the electrical industry. So then, the responsibilities of the electrical industry to-day would appear to be two-fold. First, to sponsor, finance and encourage scientific research into atomic energy; and secondly, to prepare and develop an atomic industry concomitantly with the progress in research. In other words, what is required of the electrical industry is an atomic research consciousness along with a long term, commercial development policy.

District Heating

A Matter for Consideration by Housing Authorities

THE early consideration of district heating in relation to housing schemes was urged by Mr. Donald V. H. Smith, consulting engineer, at a lunch-time meeting in the Town and Country Planning Association's autumn programme on Oct. 25.

The speaker stated that the provision of a supply of heat by means of hot water on tap from a main supply from a central heating station would obviate the necessity for individual central heating installations in public buildings, factories and houses and for fireplaces in all rooms in houses. District heating was urged on the grounds that it would abolish the smoke evil in our cities, increase amenities, improve health, save fuel, effect economy and lessen the labour of the housewife. Some opponents to that system of heating said it was not necessary because we had it in effect in our gas and electricity services. Gas and electricity had great advantages for some services, such as lighting and cooking, but there seemed little likelihood of their totally displacing solid fuel for space heating.

Central Station Service

If any advance was to be made in efficiency now was the time to consider it before the houses were built. One central heating station should be erected to serve all the public buildings and to supply all the basic needs for heat and hot water of the houses to be built in a given area. The effect would be to give at least 50 per cent. more heat to each house, keeping all rooms dry instead of leaving some damp and cold, and through the more efficient combustion of coal the total fuel consumption would be reduced by about one-third. With the background heat from the central station the domestic fire would be needed only in severe weather, and only about one-quarter of the usual amount of solid fuel for space heating. For the householder, on the charges necessary for such a service, it would mean a direct saving of from £2 to £4 a year. The proposal did not ask for any subsidy; it needed no additional rates or taxes. On the contrary, it was a purely business investment which could pay its way and reduce costs. The capital cost would be a little higher than that of ordinary methods, but in running costs, allowing for maintenance and interest on capital, it would be much cheaper if properly done than any other method in use.

Mr. Smith referred to the Dundee scheme, where 1 300 houses were supplied from a central heating station, and said Scotland had two other housing estates similarly supplied from central heating stations and was planning two more.

Replying to a question, Mr. Smith said that existing generating stations were constructed for only one purpose—the supply of electricity—and it would be economically unsound to provide a system of district heating from the waste heat from such power stations. He thought there were cases where a combination of the two—a central heating station and a power station—would be a paying proposition. For the project near Manchester he believed there would be a combined station. For the average small housing estate of up to a thousand houses a combined station would be uneconomical.

Book Review

Electricity and Woman—21 Years of Progress. By WILFRID L. RANDELL. (London: The E.A.W.; distributors, Hodder and Stoughton.) Pp. 86. Price 5s. net.

With the consummate art of a craftsman gifted with a light and airy touch as well as excellent judgment and understanding, the author has penned a vivid picture of the growth to vigorous maturity of the Electrical Association for Women against a romantic background depicting a vista of electrical evolution from the earliest days. As one who was present at the birth of this feminine pioneering body at the house of Sir Charles and Lady Parsons twenty-one years ago, and has watched its steady progress through many vicissitudes to its present well-established position in the electrical world, Mr. Randell is well qualified to write its history. He has done so faithfully and well, and embellished it with anecdotes and humorous sketches that enhance the interest of the story. He has shown us the development of a natural offspring of the electrical industry in an organisation animated with the ideal of service to the community in general, and the housewife in particular, under the direction of a capable, far-sighted woman full of enthusiasm for its aims and objects, and confident of its future success and usefulness.

Refrigerators for Export.—Refrigerators for export are to be manufactured at Barnoldswick (Burnley) by the Grove Engineering Co., Ltd., of Heaton Mersey, who have taken over Butts Mill.

Electrical Consumer Goods

Survey of War-Time Supplies to the Home Market

DURING the war the Government collected a great deal of information about supplies of goods becoming available for the home civilian market. The figures for the more important of those falling within the responsibility of the Board of Trade have for some time been brought together in a series of statistical digests for departmental use, and these have now been made available to the public. Very few of the figures cover any period after V.J. day, and their main interest is therefore in showing what happened during the war.

The information given was collected by various methods, but the figures are based essentially on returns from the producers of the items in question showing the actual number of articles sold on the home civilian market in the period, or, in some cases, the number produced for subsequent sale on that market.

For most practical purposes the returns can be regarded as showing the whole supply, or at least as measuring its fluctuations. Certain very small producers have been exempted, the size limit depending on administrative needs, and the returns have not always been quite complete; but the percentage error due to these factors is never very serious even where the number of producers involve is fairly substantial. The frequency of the returns from producers has depended on the urgency of the administrative need for information about that particular article, and also to some extent on the work involved in collecting it. As a result the statistics have a somewhat irregular appearance in many cases; this simply reflects the fact that the information was collected for administrative purposes, and statistical neatness was a luxury which could not be afforded.

It is important that these figures should not be confused with those given in the Budget White Paper for the same categories. Their basis and purpose is quite different, and it is not to be expected that they should show the same movements. The main points to note are as follows: (a) The White Paper measures the flow of goods at the stage of ultimate purchase, whereas the figures below measure it as the goods leave the manufacturer; hence stock changes are reflected in the former but not in the latter. (b) The White Paper figures cover a wider field, bringing in many minor and miscellaneous items for which figures are available by value but not by number. (c) The White Paper gives figures by value, and then adjusts these for the change in prices of goods of comparable quality. In this way an allowance is automatically made for changes in the average quality of the goods whereas the figures below reflect numbers only.

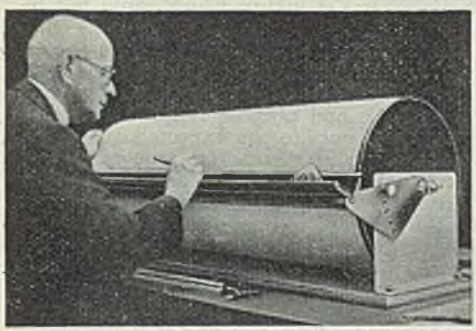
	Household Electrical Goods. Annual Rate : Thousands.											Dry Cell Batteries. Annual Rate : Millions.		
	Cookers. Over 3 kW.	Cookers. 3 kW. and under.	Boilers, Hot Plates, Grillers, etc.	Fires, Radiators, etc.	Water Heaters.	Immersion Heaters.	Kettles.	Irons.	Vacuum Cleaners.	Bed Warmers.	Blankets and Pads.	Flash Lamp*	Cycle Fron Lamp.	Radio.
1937 (approx.) ...		250		1 250			350	1 250	400					
1942	—	—	—	—	—	—	—	—	—	—	—	199	17	9.4
1943	10.1	6.5	0.72	58	4.3	15	28	92	0.24	4.0	4.8	164	28	8.7
1944	15.9	6.4	3.3	56	5.8	26	65	177	0.71	2.8	6.8	155	27	7.8
1945—														
Jan.-June ...	29.9	9.9	17.4	219	10.6	53	109	315	28	3.9	15.5	102	22	7.8
July-Dec. ...														
1943—														
Jan.-March ...	8.8	7.5	0.50	57	4.2	14	33	75	0.36	4.0	5.5	169	25	8.7
April-June ...	9.8	6.7	1.58	56	4.1	17	30	77	0.17	4.0	4.6	127	27	8.2
July-Sept. ...	10.7	6.9	1.23	59	4.3	17	27	93	0.24	4.0	4.8	167	29	8.6
Oct.-Dec. ...	11.0	5.0	0.08	62	4.7	13	23	121	0.19	4.0	4.3	196	31	9.1
1944—														
Jan.-March ...	13.2	4.0	2.2	59	4.6	26	39	149	0.36	2.0	5.9	201	31	8.9
April-June ...	13.6	5.8	3.9	51	7.0	21	67	139	0.50	2.7	4.2	152	29	7.9
July-Sept. ...	13.7	6.9	2.9	52	6.5	20	63	165	0.79	3.0	4.2	121	23	6.7
Oct.-Dec. ...	23.0	8.9	4.1	62	5.2	37	90	257	1.20	3.5	12.8	147	26	7.7
1945—														
Jan.-March ...	34.4	10.6	17.7	229	11.7	73	117	281	8.3	4.0	19	131	24	7.4
April-June ...	25.4	9.7	17.2	228	9.5	56	102	50	58	4.0	12	73	21	8.1
July-Sept. ...														
Oct.-Dec. ...														

* The decrease in 1943 compared with 1942 was due to a reduction in the quantity of No. 8 batteries. There was no fall in light-hour equivalent.

Cylindrical Draughting Machine

By ALBERT M. HAWORTH, A.M.I.E.E.

A DRAWING office appliance of interest to those concerned with the preparation of electrical connection diagrams and similar drawings, has been produced by the Metropolitan-Vickers Electrical Co., Ltd., for use in their own drawing offices; it is, however, not being developed on a commercial basis and the company is not in a position to entertain inquiries in connection with it.



The cylindrical drawing board in use

In the drawing of electrical diagrams the lines are, in general, horizontal and vertical with circular or rectangular symbols, and for these conditions it is possible to draw the lines on the outer surface of a cylinder. The cylindrical draughting machine which forms the subject of this note consists of a 15-in. dia. cylinder closed at the ends and mounted freely on a shaft and supported in end brackets as shown in the picture. A straight-edge along the front of the cylinder is supported by V-bearings in side brackets which can be raised or lowered to suit the draughtsman. Holes are drilled in the side brackets for this purpose. A backing sheet of stiff paper ruled with 1-10th-in. squares is placed on the surface of the cylinder and a sheet of semi-transparent drawing paper is placed over it. Both sheets are fixed to the cylinder by strips of scotch adhesive tape along the upper and lower edges. The lines showing through the drawing paper are guides for the setting out and spacing of the conductors and symbols.

Horizontal lines are made by turning the cylinder to the desired position and drawing along the straight-edge which is parallel to the axis. For vertical lines the pencil point is put on the straight-edge against the paper and the cylinder turned to suit the length of the line. For lines of 45 degrees or 60 degrees a small set-square, bent to the curvature of the cylinder, is used. Two slots at 60 degrees are cut in the 45 degrees set-square. A small vee is cut at the apex of the set square. This is used when making vertical dotted lines, when the set-square is placed on the shelf of the straight-edge and the pencil point placed in the vee. As the cylinder is turned slowly the pencil can be pushed in and out to make the dotted line without any side movement. On the 15-in. diameter curvature, circles up to 3 in. diameter may be drawn with compasses without visible distortion.

The advantages claimed for this type of drawing board are that the straight-edge is always parallel to the axis of the cylinder and it can be removed at any time by lifting it out of its vee bearings, if it is desired to see the whole diagram. The working point of the cylinder is at a relatively constant distance from the eye and the illumination of the surface is also relatively uniform; a small flat hand-rest is placed on the shelf of the straight-edge and provides a satisfactory rest for the hand when printing.

The first sample of the cylindrical draughting machine was made in October, 1944 , and since then many diagrams have been made successfully.

Egyptian Order for British Firm.—The Egyptian State Railways have ordered from the English Electric Co., Ltd., 27 Diesel-electric locomotives, 12 for general service, including express passenger duties, and 15 for shunting. Further orders are in hand for the Great Western Railway and for the Federated Malay States. The design of the shunting engines has been tested so universally that very few modifications are necessary for the Egyptian order. Weighing 48 tons, they are powered by 350 B.H.P. English Electric Diesel engines, and a trailing load of 1 040 tons can be hauled on the level. The general service locomotives weigh 116 tons each, and the Diesel engine develops 1 600 B.H.P. The maximum speed of 75 miles per hour can be attained with an express passenger train. There are six traction motors driving two 3-axle bogies. The control scheme provides for multiple unit working, and there is a driving position at each end of the cab. A welcome volume of peace-time employment has been created by this order, which will be carried out at the Bradford, Rugby and Preston works of the company.

Electricity Supply

Rotherham.—The Electricity Committee is seeking sanction to defray from surplus revenue £63 000 for extensions.

Bradford.—The Electricity Committee is seeking sanction to borrow £10 000 for substations and equipment.

Hastings.—Sanction to borrow £3 000 for electrical apparatus has been obtained by the Electricity Committee.

Poplar (London).—The B.C. Electricity Committee is to effect a change-over in the Fairfoot Road and Archibald Street areas at a cost of £1 420.

Croydon.—The Electricity Committee is seeking sanction to borrow £15 000 for mains and services and £5 000 for substation equipment.

Middlesbrough.—A balance of £5 455 on the working of the electricity department for the year ended March 31 last, has been carried forward.

Croydon.—The Electricity Committee has obtained sanction to borrow £975 for buildings, £5 096 for mains and £2 617 for substation equipment.

Manchester.—The Electricity Committee has obtained sanction to borrow £65 000 for mains and £15 900 for sub-station equipment.

Birkenhead.—Supply is to be provided to the Wirrall housing estates at a cost of £2 407 by the Corporation Electricity Committee.

Bradford.—The Electricity Committee has approved an amended scheme for supply to Tong Village at an estimated cost of £1 296.

St. Pancras (London).—The Electricity Committee reports a profit of £16 603 for the year, as compared with £18 909 during the previous year.

Manchester.—In its next Parliamentary Bill, the Corporation proposes to seek power to supply hot water from electricity generating stations for the heating of buildings.

Morecambe.—The Electricity Committee has approved a scheme for a second feeder to Overton, to link with the existing feeder and extend the area of supply.

Wallasey.—The Electricity Committee is seeking sanction to borrow £2 538 for mains and services to the Moreton housing estate and £2 500 for sub-station equipment.

Cheltenham.—The Electricity Committee is seeking sanction to borrow £5 000 for the purchase of 300 cookers, £2 000 for 350 water-heaters, £1 000 for 250 washboilers and £1 000 for 500 kettles.

Guildford. — The Corporation Electricity Committee recommends a rebate of 50 per cent. of the fixed charge to all consumers taking current on the all-in rate for the December quarter.

Gateshead.—The T.C. has reached agreement with the North-Eastern Electric Supply Co., Ltd., regarding the provision of electric services to houses on the Highfield Estate.

Hastings.—The Electricity Committee is to provide supply to the Rock Lane estate at a cost of £19 468. The proposed 11 000 V cable will be of sufficient capacity to warrant developments in the extended area.

Poplar (London).—The Electricity Committee is seeking power to the establishment of a new generating station, by arrangement with the Central Electricity Board, on a site at the East India Export Dock.

Stockton-on-Tees.—The Electricity Commissioners have authorised the carrying out of works at the electricity undertaking to cost £45 335 in accordance with plans by the Borough Electrical Engineer.

Hull.—At a meeting of the Electricity Committee the General Manager reported upon his negotiations with the City Engineer with regard to bulk supplies for the pumping station, and after consideration of the relative costs between diesel oil and electricity, has decided upon electricity.

Hastings.—The Electricity Committee is to make extensions to supply premises at Brede at a cost of £146; to Park Farm, Crowhurst at £295; to farms at Guesting at £500; to Woodhouse Farm, Mountfield at £85 and to Tillingham Farm, Peasmarsh at £318.

Guildford.—At a meeting of the Electricity Committee the Electrical Engineer reported that all the plant at the generating station in Woodbridge Road had now been put into operation and the station was now generating each day to the requirements of the Central Electricity Board.

Ossett.—At a meeting of the General Purposes Committee letters were received from the Town Clerks of Goole and Margate as to negotiations which those towns had had for the purchase of the undertakings in their areas. The Committee decided to seek a further extension of the period within which the Corporation may purchase the electricity undertaking.

Bexhill.—At a meeting of the Electricity Committee it was reported that owing to shortage of labour, consumers were experiencing some difficulty in having fuses replaced promptly by electrical contractors, and on the suggestion of the Electrical Engineer the Committee recommended that the department should undertake such work at a charge of 3s.

Fulham (London).—The Electricity Committee reports that the surplus for the year is £71 136, but adds that for

various reasons this is not likely to be maintained to the same extent in the future. The Committee recommends a further 5 per cent. discount, making 15 per cent. in all, on the total of accounts.

Sedgefield.—The R.C. has had an interview with the North-Eastern Electric Supply Co., Ltd., regarding the construction of an overhead 20 000 V line between Fishburn and Bishop Middleham. The Council suggested that to preserve the amenities of the district, the line should be underground, but the company would not agree to the proposal.

Warrington.—A surplus of income over expenditure of £95 952 on the electricity undertaking was reported at the T.C. recently. After defraying a capital expenditure of over £10 000, and a contribution of £10 000 towards the rates, the net surplus was over £76 000. The number of units sold last year was 153 000 000 compared with 58 000 000 in 1939. The three extensions, which were expected to be completed next June had cost £1 829 661. In spite of increased expenditure a reduction in the flat rate was contemplated.

Croydon.—The Electricity Committee reports that the Central Electricity Board wishes it to proceed with the second section of the new power station at an estimated cost of £2 204 350 and the Committee recommends the engagement of the following: Messrs. Allott and Sons, as civil engineering consultants; the Chief Engineer, as mechanical and electrical engineering consultant; Messrs. L. G. Mouchel and Partners, Ltd., as consulting engineers for the cooling towers, and Mr. Robert Atkinson, as architect for the buildings.

News in Brief

Polytechnic Modernisation.—The Croydon Electricity Committee is to modernise the electrical engineering laboratory at the Polytechnic at a cost of £4 400.

Guildford Exhibition.—The Housing Committee has arranged for the Electrical Engineer to provide a model kitchen at the forthcoming exhibition at Guildford House.

Electrical Travellers' Meeting. — The Electrical Trades' Commercial Travellers' Association will hold their annual general meeting at the " Feathers " Hotel, Broadway, Westminster, S.W.1, on November 9.

Telephone Service Improvement.—During recent months the Post Office in its efforts to improve the telephone service has provided since January 1, 1945, an additional 2 000 trunk circuits, each more than 25 miles in length, bringing the total into use to 10 700.

Thanksgiving Week Activities. — The Maidenhead electricity department invested £10 000 during Thanksgiving Savings Week. During the Thanksgiving Savings Week at Oxford, a United Services exhibition was staged at the showrooms of the electricity department.

Electricity versus Gas.—An effort to move back a resolution of the Housing Committee that 750 permanent houses at Ribbleton be equipped with cookers and washboilers in a ratio of three houses with electricity to one with gas was unsuccessful at a recent meeting of Preston T.C.

Edinburgh Electrical Education Programme.—The Corporation in co-operation with a representative committee of the engineering trades, including electrical trade representatives, has agreed to operate a one-year full-time day course for prospective apprentices in this field and has begun the classes, in the W. M. Ramsay Technical Institute. Subjects will include engineering, drawing and calculations, mechanical and electrical science, workshop technology and English and physical education.

Wireless Installations.—Owing to the unsatisfactory condition of the wireless sets at the hospital, the Tynemouth Welfare Committee is to obtain estimates for the installation of rediffusion. The Stockton-on-Tees T.C. has been recommended to approve the installation of a wireless relay service in the town.

St. Pancras Exhibition.—The Electricity Committee, which took part in the recent town planning and housing exhibition, reports that an outstanding feature was the fluorescent lighting which in addition to being installed in the model flat was also used to illuminate all the exhibits throughout. The aluminium all-electric kitchen, was loaned by the Aluminium Development Association. A large range of post-war apparatus was on view, including kitchen units and the latest types of electric cookers and washing machines. Over 1 600 persons attended the film shows arranged by the department.

Professional Engineers Appointments Bureau.—The Bureau invites applications for registration for employment from members who, by reason of their engineering qualifications, belong to the Institution of Civil Engineers, the Institution of Mechanical Engineers, or the Institution of Electrical Engineers or persons whose engineering qualifications for election or admission to one of those bodies have been approved by the respective Councils. The necessary forms may be obtained on application to the Registrar of the Bureau, at 13, Victoria Street, Westminster, S.W.1. A stamped addressed foolscap envelope should be enclosed.

Overseas Trade Prospects

Review of Commercial Conditions in Canada and Turkey

TWO further reports by the Department of Overseas Trade in the series of reviews of commercial conditions in the British Empire and foreign countries, relate to Canada and Turkey (Stationery Office; 1s. each).

The review dealing with Canada states that it is in a friendly and co-operative atmosphere that the United Kingdom manufacturers must try not only to recover but to expand their markets in Canada. The task will not prove an easy one because of the great industrialisation which has taken place during the war and because of the greater dependence upon the U.S.A. that has been forced upon Canadian buyers. Nevertheless there seem to be good reasons why they should not be discouraged and why the difficulties to be faced should be regarded not as a deterrent but as a challenge.

The rapid growth of industrialisation in Canada has been greatly assisted by the increased hydro-electric power supply. At the end of 1943 Canada's total hydraulic development amounted to 10.2 million H.P., compared with 8.1 million H.P. in 1939. During the war, Canada became one of the arsenals of democracy. Communications equipment alone, produced up to August 31, 1944, numbered 322 373 units of the total value of $104 000 000.

U.S. Competition

In the period 1937-39, while the U.S.A. percentage share of Canada's import trade was in the 60's and rising, the United Kingdom share was below the 20's and falling, In addition, Canada was becoming industrially more self supporting. The value of electrical apparatus and supplies produced there rose from $99 000 000 in 1937 to $130 000 000 in 1940, and $209 000 000 in 1942, while our exports to Canada of electrical goods in the three years before the war were steadily falling. The value of telegraph, telephone and wireless apparatus exported from the United Kingdom to Canada was £63.0 000 in 1937, £70.3 000 in 1938, and £50.8 000 in 1939, and of other electrical goods and apparatus, £108.6 000 in 1937, £79.5 000 in 1938, and £71.3 000 in 1939.

Details of electrical imports into Turkey in 1937 and 1938 were published in THE ELECTRICIAN on June 7, 1940, and trade prospects at that time were reviewed. The review now published on behalf of the Department of Overseas Trade shows that up to the end of 1939 Germany was Turkey's greatest supplier, with the U.S.A. second, Italy third, and the United Kingdom fourth.

It seems probable, states the report, that Turkey's industrialisation policy will continue after the war and will be intensified up to the limit of the Government's resources, but the influence of further industrialisation need not be regarded as prejudicial to exporting interest in the United Kingdom. Opportunities should occur for the supply of capital goods in connection with various public utility schemes.

Work on the construction of the Catalagzi electric power station, the contract for which was awarded to a United Kingdom firm in 1940, is due to be resumed as soon as possible.

Potential Turkish Expansion Schemes

Other electrical schemes which are under consideration include the following:—Kutahya steam power plant, consuming lignite, to supply power to Kutahya, Izmir, Istanbul. Caglayik:—hydro-electric power plant to supply power to Ankara and suburbs. The contract will include the construction of a dam on the river Sakarya. Adalia:—hydro-electric plant to supply power to the Aegean seaboard. A dam is to be built near Adaba on the river Dediz. Zammah:—hydro-electric plant to supply power to Adana and Kayseri. A dam is to be constructed on the river Zammak, a tributary of the Seyhan.

So far as the long-term period is concerned, it seems that the volume of Anglo-Turkish trade will turn largely upon the question of whether Turkey will improve the quality of her exportable products and offer them at competitive prices attractive to the United Kingdom market. Increased sales of Turkish produce will provide the means for larger purchases from the United Kingdom. If this does not prove to be the case and Turkey adheres to her pre-war system of balanced trading, the volume of Anglo-Turkish trade may decline.

In 1939 Turkey imported from the United Kingdom electrical machinery and apparatus to the value of £65.7 000, from U.S.A. £35.1 000, and from Germany £252.2 000.

A.E.I. News.—The current issue opens with an article headed "Atomic Explosives" in which mention is made of the valuable direct contributions made by the Metropolitan-Vickers Electrical Co., Ltd., and the British Thomson-Houston Co., Ltd., to the development of the atomic explosive.

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.

North of Scotland Hydro-electric Board.—Supply and delivery of creosoted wood transmission line poles. Particulars from Mr. T. Lawrie, 16, Rothesay Terrace, Edinburgh.

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.

Connah's Quay U.D.C., November 6.—Electrical wiring of 60 houses to be erected on Clough's Estate; supplying 60 electric cookers and 60 electric wash-boilers. Particulars from Mr. H. Jones, Surveyor, Council Offices, Connah's Quay, Chester.

Maltby U.D.C., November 10.—Supply of 30 panel electric fires in connection with the erection of houses on the Manor Park housing estate. Specification from Mr. H. Chadwick, Council Offices, Rotherham Road, Maltby, Yorks; deposit, £2 2s.

Plymouth Electricity Department, November 10.—Supply of (a) meters and (b) underground joint boxes. Specifications from the City Electrical Engineer, Armada Street, Plymouth.

Blackpool Electricity Department, November 12.—(1) Supply, laying, jointing and connecting of various types of 3-core and telephone cable; (2) supply and installation at one sub-station of an automatic fire extinguishing system; and (3) supply and delivery to site of two 10 000 kVA, 33 kV/6.6 kV automatic on-load ratio change transformers. Specification from the Borough Electrical Engineer, Shannon Street. Blackpool.

Southwark Electricity Department, November 14.—Supply and delivery over a period of 12 months ending December 31, 1946, of paper-insulated, lead-covered steel tape, armoured and unarmoured cables. Specification from the Borough Electrical Engineer, Penrose Street, Southwark, S.E.17.

Woolwich Electricity Department, November 14.—Supply of h.v. and l.v. cables required during year January 1, 1946, to December 31, 1946. Specification from the Town Clerk, Town Hall, Woolwich; deposit, £1 1s.

Woolwich Electricity Department, November 14.—Supply of electricity meters for the year ending December 31, 1946. Specification from the Town Clerk, Town Hall, Woolwich; deposit, £1 1s.

Woolwich Electricity Department, November 14.—Supply of transformers required during the year ending December 31, 1946. Specification from the Town Clerk, Town Hall, Woolwich; deposit, £1 1s.

Bedwellty U.D.C., December 1.—(1) Supplying and laying approximately 1 000 yards of 3 in. cast-iron main; (2) supplying and erecting 11 000 V switchgear, underground cables, and overhead lines. Particulars from the Electrical Engineer, Electricity Showrooms, High Street, Blackwood.

Newburgh B.C.—Electrical work in connection with the first development of 20 houses. Application for schedule to Mr. L. A. Rolland, 47, High Street, Leven, Fyfe.

Overseas

State Electricity Commission of Queensland, December 10.—Supply, delivery, erection, and setting to work of 7 500 kW 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.

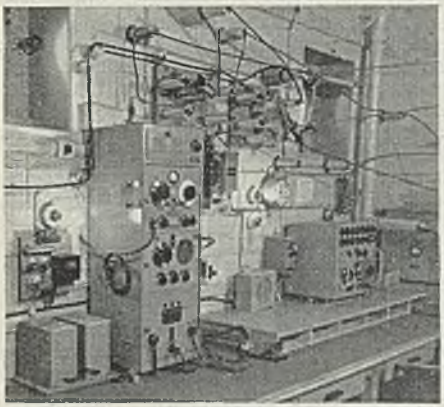
Eire Electricity Supply Board, January 28.—Supply, delivery and erection of the hydro-electric generating plant at Cathaleen's Fall and Cliff stations on the River Erne. Particulars from the Chief Design Engineer, Electricity Supply Board, 26, Lower Fitzwilliam Street, Dublin, C.18. deposit, £5 5s.

Scottish Women Want Cheap Electricity.—A demand for cheap electricity was pressed at a two-day conference of the Scottish Women's Rural Institute held recently in Edinburgh. The Central Council was asked unanimously to press for the provision of cheap power to all the rural areas of Scotland, and that Scottish needs be given a priority.

Industrial Information

Change of Address.—As from October 24, the permanent address of Multicore Solders, Ltd., will be: Mellier House, Albemarle Street, London, W.1. Telephone: Regent 1411.

Merchant Aircraft Carriers.—In our last issue there appeared an article describing some of the features of the merchant aircraft carrier "Empire Macalpine," built by the Burntisland Shipbuilding Co., and



The radio room of the m.v. "Empire Macalpine," the merchant aircraft carrier described in our last issue

on this page is reproduced a photograph of the vessel's radio room.

Exemption from Key Industry Duty.—The question of the renewal of the Safeguarding of Industries (Exemption) (No. 1) Order, 1945, is under consideration by the Board of Trade. Among the articles covered by the Order which exempts them from key industry duty until December 31 next are arc-lamp carbons and sealed cylindrical X-ray tubes having four windows.

Formation of a New Company.—We are informed that Mr. I Mc. G. Phillips, late of the electrical department of Heal and Sons, Ltd., Mr. J. B. Harris, late of Harcourts, Ltd., Mr. N. E. Shephard, late Berkeley Electrical Engineering Co., Ltd., and Mrs. Kemp-Malcolm, qualified interior decorator, have established a business bearing the name Philectric Installations, Ltd., at 15, Craven Terrace, Paddington, London, W.2. In addition to conducting normal installation trade it is their intention to specialise in interior illumination schemes.

Travelling Time and Fares. — The N.F.E.A. announce that at its meeting on October 10, the National Joint Industrial Council agreed the following amendments to the local working rules of Manchester and district, such amendments to come into operation on the first pay day in November, for the pay period covered by that pay day: (a) Clause 5 to be deleted. (b) Clause 6 to be amended to read as follows: "All men working away from the shop, but within a radius of 5 miles shall be paid travelling expenses at the undermentioned rates in lieu of travelling time and fares: Up to 1 mile 2d. per day; 1 to 2 miles 8d.; 2 to 3 miles 1s. 1d.; 3 to 4 miles 1s. 9d.; 4 to 5 miles 2s. 3d.; All men when paid travelling expenses to be on the job at the usual starting and stopping times."

Export Licensing.—The Board of Trade announce that a simplified form of application for export licence will be brought into use as soon as supplies can be printed, and this will call for considerably less information than that necessary during the war years. Pending the introduction of the new form, exporters completing the present application form need no longer answer questions 6, 7, 8, 9, 10, 12, 13, 14, 15. Further, on page 3, the country of destination only need be given instead of the name and address of the consignee as at present. Exporters are reminded, however, that it is an offence to consign goods to a person included in the current Trading with the Enemy (Specified Persons) Orders, or to any territory to which Regulation 7 of the Defence (Trading with the Enemy) Regulations applies.

The B.E.T.R.O.—A meeting of the British Export Trade Research Organisation was held in London, on October 24, when an attendance of 300 heard a report on progress and put forward their own views and questions about the organisation. After introduction by Mr. Ivor Cooper, chairman of the Council, Mr. Arthur Ethell, director of administration, told the audience that the organisation could now offer an intelligence service, and in the beginning of 1946 would be able to carry out specific research on instructions from members. When the meeting was opened to debate, a number of speakers put questions, and among them, Mr. N. E. Woods (Crompton Parkinson, Ltd.), asked whether the organisation would circulate comparative statistics about specific products indigenous to various territories, to show the extent of production and demand. Mr. Ethell said that the Department of Overseas Trade already supplied such figures and, while it might be possible for the B.E.T.R.O. to analyse a further breakdown, they were reluctant to duplicate information available elsewhere. Mr. Reisner (Babcock and Wilcox) asked whether

the organisation would urge buyers to adopt British standards. Before the war they had been frequently asked to tender on German or American standards. It was explained that the B.E.T.R.O. was a fact-finding organisation, and, although it could advise what standards were acceptable, it was beyond its scope to influence buyers. That was the job of the seller.

Fuel Luncheon Club.—The club, which was inaugurated in 1935 to provide a common meeting ground for technical and industrial people interested in various forms of fuel, as users, suppliers or producers, has issued a booklet outlining its objects, and containing the rules, the names of those who have given addresses to the club and a list of members.

Turbine Research.—Research work into the development of the turbine is being carried out at the works of the Parsons Marine Steam Turbine Co., Ltd., by the Parsons and Marine Engineering Turbine Research and Development Association which was formed about 12 months ago. Large premises are to be built for the association adjoining the Parsons' works, but, meantime, experiments are being carried out in the works themselves under the supervision of Dr. T. F. W. Brown. A testing station to be built by the association will be able to test on a single shaft 60 000 s.h.p. A dynamometer brake capable of absorbing this power is being installed. The testing, it is stated, will be on a bigger scale than anything done so far. The chairman of the association Council is Mr. P. B. Johnson, of Hawthorn Leslie and Co., while Mr. F. W. Gardner, of C. A. Parsons and Co., is consulting research director.

Shortage of Electrical Appliances.—The B.E.A.M.A. has issued a statement to the effect that the reason why cookers, water heaters, refrigerators, washing machines and other domestic electrical appliances for which there is an ever-increasing demand, are not available for early delivery, is that for six years the factories producing such apparatus have been occupied making munitions, instruments, apparatus and other equipment of special character for the national war effort. In many instances special machinery and plant has, on the Government's direction, been installed in place of that normally used, and many firms who were previously equipped for manufacturing domestic electrical appliances are not yet in that position. The public have already been advised that for some time they must be satisfied, in the main, with products of pre-war design, but, even so, after complete stoppage of normal production for so long, some time must elapse before anything like the pre-war rate of output can be resumed, as the special plant installed during the war has now to be dismantled and replaced by machinery suitable for peace-time requirements. The greatest problem, however, is the shortage of the right kind of labour in every section of the engineering industry. The electrical industry is not only suffering severely itself from this nation-wide problem, but in other industries, on which the electrical manufacturers are largely dependent for supplies of parts, e.g., refractories and castings, the labour problem is equally acute. Until there is a steady flow of suitable workers back to the industries concerned, the supply of electrical apparatus must lag behind the growing demand for home consumption and export. Although the war is over, many Government contracts, particularly for the amenities for the Forces overseas, continue to occupy considerable capacity in the industry; in this category must be included the production capacity of the refrigeration industry, which is likely to be engaged on urgent overseas needs for the Services until approaching the end of 1946. Meantime, the public are asked to have patience in the knowledge that their urgent need for electrical appliances is fully understood and appreciated by the manufacturers, who are only too anxious to " deliver the goods " as soon as conditions, now beyond their control, permit. It will readily be understood that while these difficulties prevail and the prospect in regard to the availability of labour is so uncertain, it is not possible for manufacturers to assess their costs sufficiently accurately to forecast the selling prices of apparatus of new design.

Production Boards for Industry.—The Regional Production Boards have now been reconstituted by the President of the Board of Trade as regional boards for industry. They will exercise their activity over the whole field of productive industry instead of, as in the past, being chiefly concerned with the production of munitions. Each consists of an impartial chairman, together with three representatives of employers and trade unions, and senior regional representatives of the B.O.T., Admiralty, Ministries of Labour and National Service, Supply and Aircraft Production, Food, Fuel and Power, Town and Country Planning, War Transport, Works, and in Scotland, the Scottish Office. The boards will advise ministers on industrial conditions in the regions, and upon steps which may be necessary to bring regional resources in productive capacity or labour into fuller use. Other duties will include keeping local industry advised of Government policy in relation to industry, and keeping headquarters informed of the views of local industry.

Company News

BRUSH ELECTRICAL ENGINEERING CO., LTD.—Intm. div. on ord. 4% (same).

A. C. WICKMAN AND CO. LTD.—No intm. on ord. or 6% partpg. pref. (last ord. 5% for 1943).

BRITISH ELECTRIC TRACTION CO. LTD.—Intm. div. 15% (same), less tax, on defd. ord., payable Dec. 8.

HUGHES-JOHNSON STAMPINGS CO. LTD.—Fin. div. 5% (same), plus bonus 10% (same), mkg. 25% (same). Net pft. to Aug. 3, £40 096 (£37 096).

CABLES INVESTMENT TRUST.—Income for yr. to June 30, £341 983 (£344 902). Deduct exes. and deb. int. £121 404 (£121 870) net rev. £220 579 (£223 032). To div. 4½% red. pref. £90 000 (same), intm. 2% ord. £40 000 (same), fin. 3% £60 000 (same), fwd. £288 729 (£258 150).

T. M. BIRKETT AND SONS LTD.—Net tradg. pft. to July 31, £75 579 (£82 682), plus other income £28 (£95). To dirs.' fees £1 500 (same), deprecn. £5 767 (£5 618), A.R.P. £87 (£328), taxn. £60 346 (£68 215), lvg. net pft. £7 907 (£7 116). Brot. in £3 996, mkg. avail. blce. £11 903 (£11 121). To res. nil £750), intm. div. 5% (same) £2 125, fin. 10% (same) £4 250, fwd. £5 528.

NEEPSEND STEEL AND TOOL CORPN, LTD.—Fnl. div. 15% (same), plus bonus 20% (same), mkg. total 50% (same), less tax, for yr. ended March 31. Pref. shs. receive additl. 4%, mkg. 10% (same), payable November 8. Net rev. £110 111 (£109 702). To conting. res. £5 000 (same), bringg. same to £35 000, to genl. res. £20 000 (same), raisg. same to £130 000, and to welfare fund £3 000 (£2 000), fwd. £22 517 (£18 425).

WILLIAM DOXFORD AND SONS., LTD.—Tradg. pft. to June 30, after pvdg. for defd. reprs. and taxn. £242 861 (£239 158). To dirs.' fees £2 069 (£2 191), deprecn. £50 000 (same), A.R.P. £3 887 (£9 624), w.d. ins. £2 088 (£4 019), lvg. pft. £184 817 (£173 323). To gen. res. £75 000 (£50 000), to conting. nil (£30 000). Pref. div. £15 000 (same), ord. div. 15% £75 000 (same), and bonus 2½% £12 500 (nil), fwd. £59 332.

ATLAS ELECTRIC AND GENERAL TRUST.—Rev. to Mar. 31 £308 365 (£289 394). To U.K. tax £137 437 (£125 505), lvg. blce. of £170 928 (£163 889). Deb. int. absorbs £18 750 (same), admin. and dirs.' fees £18 134 (£19 663), exes. of Trust's spec. representative in Uruguay £1 800 (£4 326), leavg. net pft. £132 244 (£121 150). Pref. div. takes £111 563 (£112 656), blce. £188 870 (£168 189) carrd. fwd.

JERUSALEM ELECTRIC AND PUBLIC SERVICE.—Operatg. surplus, etc., to Mar. 31 £P.97 706 (£P.86 397). To exes. £P.4 301 (£P.4 133), dirs.' fees £P.2 800 (£P.2 000), taxn. £P.39 000 (£P.30 000), cap. amortn. £P.5 476 (same), plant renewal and deprecn. £P.22 500 (£P.20 000), war conting. £P.2 500 (£P.5 000), leavg. net blce. £P.21 128 (£P.19 786). Pref. div. £P.10 243 (£P.10 518), ord. div. £P.8 129 (£P.8 259), fwd. £P.13 291 (£P.10 534). Div. on ord. 5% (same), less tax.

Company Meeting

HERBERT MORRIS, LTD.—The annual meeting was held at Loughborough, on October 26. In the course of his address, the chairman, Mr. W. H. Purnell, said we were at the dawn of a new era and the transition period into which the country was now entering was by common consent, one of the most vital periods in our history. What it would bring forth depended on the efforts of each and all of us—individually and collectively. With co-operation from the Government, management and employees, the company could look forward to the future with confidence. If everyone concerned appreciated the fact that excessive cost meant an over expensive product which would not sell in a competitive market, and if the Government gave scope for initiative and enterprise, they need not fear their ability to produce the goods for home and overseas markets.

Metal Prices

		Monday, Price.	Oct. 29 Inc.	Dec.
Copper—				
Best Selected (nom.)	per ton	£60 10 0	—	—
Electro Wirebars ...	,,	£62 0 0	—	—
H.O. Wires, basis ...	per lb.	9 7/8d.	—	—
Sheet	,,	11 1/8d.	—	—
Phosphor Bronze—				
Wire(Telephone)basis	,,	1s. 0 7/8d.		—
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. ...	,,	£26 0 0	—	—
Lead Pig—				
English	,,	£31 10 0	—	—
Foreign or Colonial	,,	£30 0 0	—	—
Tin—				
Ingot (minimum of 99.9% purity) ...	,,	£303 10 0	—	—
Wire, basis... ...	per lb.	3s. 10d.	—	—
Aluminium Ingots ...	per ton	£85 0 0	—	—
Spelter...	,,	£31 5 0	—	—
Mercury (spot) Warehouse	per bott.	£31 5 0	—	—

Prices of galvanised steel wire and steel tape supplied by the C.M.A. Other metal prices by B.L 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.

SWARBRICK, Cyril F., Falls View, Linton, Skipton-in-Craven, electrical engineer, £34 19s. 0d. Aug. 31.

HILLIER, Maurice, 486, Kingsland Rd., E.8., wireless dealer. £10 19s. 6d. Sept. 13.

MACLEOD, Alex., 66, Leith Mansions, W.9, B.B.C. engineer. £19 10s. 7d. Aug. 24.

CARLING, R. S. (male), 193, Delaval Rd., West Benwell, Northumberland, radio engineer. £22 11s. 6d. Sept. 13.

Satisfactions

KELLER ELECTRICAL INDUSTRIES, LTD., High Wycombe.—Sat'n. Oct. 3, £1 800, reg. July 8, 1940.

SOUTH WALES ALUMINIUM CO., LTD., London, E.C.—Sat'ns. Oct. 1, £200 000, reg. Sept. 12, 1940, and £100 000, reg. Sept. 9, 1942.

Application for Discharge

CLENDINNEN, Ernest Bertram, 111, Wolverhampton Road, Stafford, wireless dealer. Date of hearing, Dec. 7, 1945, 11 a.m., The Shire Hall, Stafford.

Company Winding Up

AMAZON TELEGRAPH CO., LTD.—Creditors of the above-named company, which is being voluntarily wound up, are required on or before Dec. 31, 1945, to send their names and addresses with particulars of their debts or claims, to Mr. A. C. Dickinson, of Stadium Works, Walton Road, Woking, Surrey, liquidator.

Notice of Dividend

TREW, Donald Archibald McDonald, 36, Binley Avenue, Binley, Coventry, lately carrying on business at 59, Primrose Hill Street, Coventry, as "Trew Electrical Service," electrical dealer. First and final dividend of 6s. 8d. per £, payable Nov. 14, 1945, at office of the Official Receiver, Somerset House, 37, Temple Street, Birmingham, 2.

Coming Events

Friday, November 2 (To-day).

NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS.—Literary and Philosophical Society's Lecture Theatre, Newcastle-upon-Tyne. Andrew Laing Lecture, "Problems of the Metallic State," Sir L. Bragg, F.R.S. *6 p.m.*

Saturday, November 3.

JUNIOR INSTITUTION OF ENGINEERS, N.W. SECTION.—Manchester. "Economics of Industrial Electric Heating," L. G. King. *2.30 p.m.*

Monday, November 5.

I.E.E., MERSEY AND N. WALES CENTRE.—Liverpool. "Excess-Current Protection by H.R.C. Fuses on Medium Voltage Circuits," R. T. Lythall. *6 p.m.*—S. MIDLAND CENTRE.—Birmingham. "A Survey of X-Rays in Engineering and Industry," V. E. Pullin. *6 p.m.*

Tuesday, November 6.

ROYAL INSTITUTION OF GREAT BRITAIN.—London, W.1. Fiftieth Anniversary of the Discovery of X-rays. Lecture I (Course of four lectures). "The Background of Rontgen's Discovery," Dr. A. Muller. *5.15 p.m.*

Wednesday, November 7.

I.E.E., RADIO SECTION.—London, W.C.2. "Radio Measurements in the Decimetre and Centimetre Wavebands," R. J. Clayton, J. E. Houldin, H. R. L. Lamont, and W. E. Willshaw. *5.30 p.m.*—N.E. CENTRE, TEES-SIDE SUB-CENTRE.—Middlesbrough. "Factors Influencing the Design of Electric Lighting Installations for Building Interiors," R. O. Ackerley. *6 p.m.*—S. MID. STUDENTS' SECTION.—Stafford. "Bakelised Paper Bushing Insulators," J. Wainwright.

Thursday, November 8.

I.E.E., INSTALLATIONS SECTION.—London, W.C.2. "Street Lighting," E. C. Lennox. *5.30 p.m.*

INSTITUTE OF WELDING, N.E. TYNESIDE BRANCH.—Newcastle-on-Tyne. "Welding as Used in Modern Electric Power Stations," D. G. Sinfield. *6.15 p.m.*

Thursday, November 8-10.

ROYAL SOCIETY.—London, W.C. Commemoration meetings, Discovery of X-Rays, 50th Anniversary. Inaugural meeting, November 8, *11.30 a.m.*, President, Sir Henry Dale. November 9, *3.30 p.m.*, joint meeting of all participating societies, Phœnix Theatre, Charing Cross Road, London, W.C.2.; address, "The Scientific Consequences of Rontgen's Discovery of X-Rays," Sir L. Bragg, F.R.S. November 10, I.E.E., London, W.C.2., *3.30 p.m.* (a) "The Development of Electrical X-Ray Equipment," Dr. C. C. Paterson; (b) "The Evolution of X-Ray Photographic Materials," H. Baines; *6 p.m.* (a) "Industrial X-Ray Analysis, Past and Present," H. F. Rooksby; (b) "The Growth of Industrial Radiology," W. J. Wiltshire. Exhibition of historical apparatus at the British Institute of Radiology on November 8, 9 and 10, from *10 a.m.* to *6 p.m.*

Friday, November 9.

INSTITUTE OF WELDING.—Birmingham. "Review of the Application and Development of Oxygen Cutting," R. Dore. *6.30 p.m.*

Saturday, November 10.

I.E.E., N. MID. STUDENTS' SECTION.—Visit to works of Brook Motors, Ltd., Huddersfield. Meet at main entrance to Empress Works. *2.30 p.m.*

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