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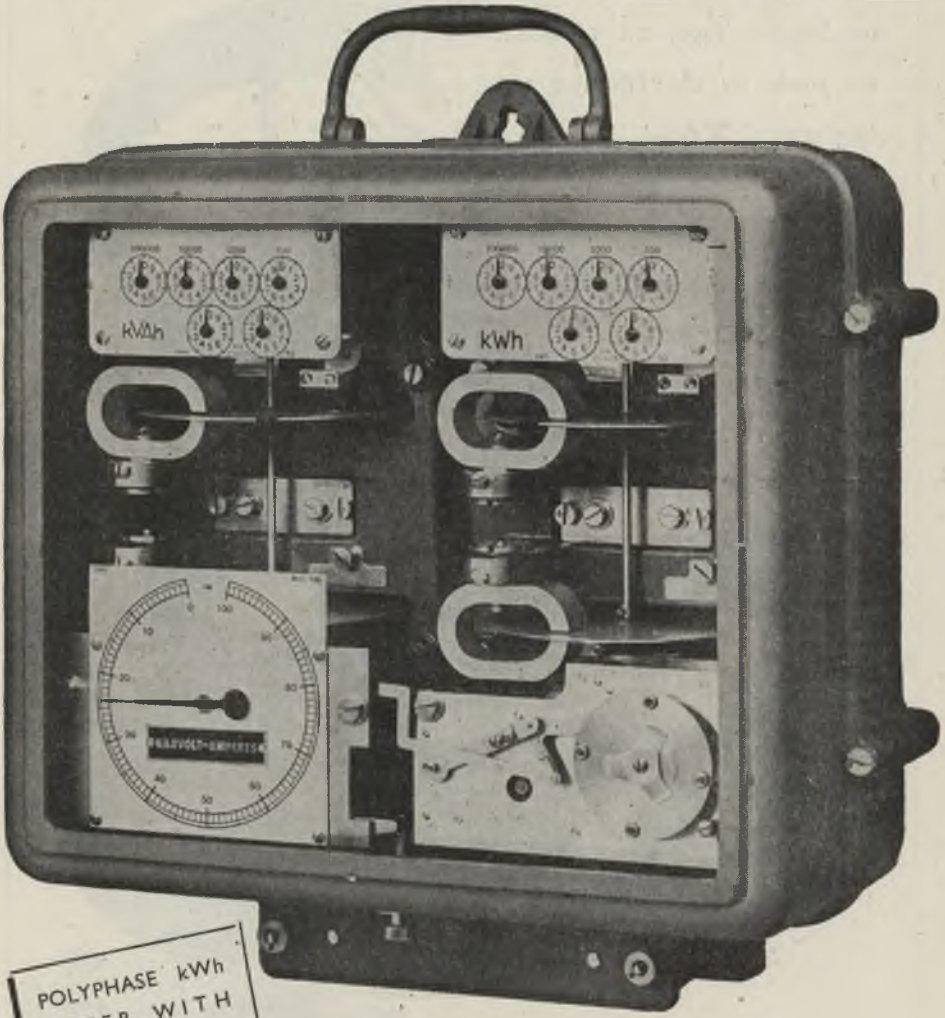

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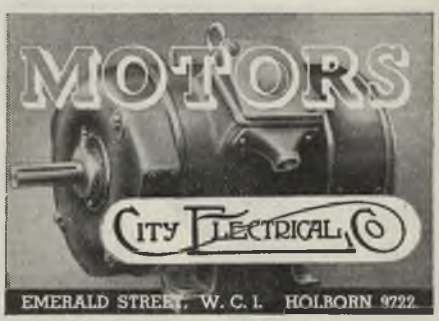

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Radio Industry Council

THE formation of the Radio Industry Council, which was marked by an inaugural luncheon in London last week, co-ordinates the work of the four bodies representing the main sections of the industry—the B.R.E.M.A., the B.V.A., the R.C.E.E.A. and the R.C.M.F.—and aims at a unity of outlook which will bring the maximum benefit to the industry, to those who use its products, and to the nation generally.

Its main object, after facilitating the prosecution of the war to a speedy conclusion, will be to develop the home and overseas markets for sound and television receiving sets, but as the result of war-time discoveries and developments its activities will extend to much wider fields embracing the application of radiolocation, which has played such a vital part in our struggle against the enemy—to transport by air, sea and land, and of other electronic devices to industry.

Like the electrical industry, from which it sprang, the radio industry has had a romantic career and is destined if wisely directed, to not only give employment to a large volume of professional engineers, technicians and craftsmen, but also assist materially in the recovery of our export trade. A substantial contributor to our pre-war success in overseas markets, the radio industry will, after the war, be in the happy position of being able to offer our world customers an experience exclusive to this country, and because of it, should be able to capture many of the markets which before the war were more widely served by countries other than our own. By suitable preparation and anticipation the industry should be able to put to its own advantage, the fact that the German radio industry, badly damaged by air raids, will take some little time to recover before entering into competition, while by the same means it should be able to successfully challenge the sales organisations of the United States operating in the South American continent and elsewhere.

One disadvantage from which the industry suffered before the war was the necessity to provide tuning facilities on what was called a long-wave band, in that nowhere outside Europe was such wave range of any substantial value so far as broadcast reception was concerned. Export receiver design thus became something special, unless the overseas market was prepared to accept the designs used in this country, and the position was thereby complicated when compared with the manufacturing conditions of say, the United States.

This and other things likely to influence the future of the radio industry have not apparently escaped the attention of those who make up its personnel, for speaking at the inaugural luncheon of the Council, the chairman, Mr. F. B. DUNCAN, not only gave some brief

hints of the valuable contributions which the industry has made towards the prosecution of the war, but what is more important for our future existence, he also indicated that the industry is anticipating the adjustments necessary for a successful return to the world's markets when the war is won.

Machinery for Trade Promotion

WITHOUT in any way discrediting the gigantic efforts which the country has made and is still making to bring about the downfall of the enemy, dwelling too long upon the sacrifices made and the weapons invented will avail us little in the years to come, and an assurance of our preparedness in the radio industry will be welcomed by everyone. Fortunately, many of the devices developed for war purposes will also have their uses in times of peace and, so far as radio is concerned all are receiving close attention to that end. The Council has already tackled many problems which face the industry, while much useful work is, too, being done in the development of fields hitherto unexplored. The Council, well aware of the difficulties which have to be overcome, is conscious of both the limitations of the industry and of its wide scope, while it is, too, alive to the fact that it will be of little use to wait for trade to fall into its lap; indeed, so far is it from doing so that machinery for trade promotion is already being designed. With so much in common, the electrical industry will watch its development with interest.

Export Credits Bill

THE industry will have read with special attention the text of the Government Bill to help British export trade, in that Parliament is to be asked to raise the limit of the Government's liability under export guarantees from the pre-war figure of £75 000 000 to £200 000 000; to increase the sums available for the backing of re-export trade; and to abolish certain restrictive conditions which in some instances hampered the operation of the pre-war arrangement. The electrical industry, already devoting a little of its manufacturing capacity to export trade, will, if the Government promises are realised and the labour and materials are made available, thus be able to hope for an early return to its rightful place among the front ranks of world trade. While it is appreciated that the Export Credits Bill is a step in the right direction, however, there is still much that could be done to make things clearer to those who will eventually carry out the business, as for instance what freedom of choice they will have in the selection of markets, and in what details they will be restricted or controlled. An understanding on these points would in no way detract from the war effort and would be most assisting to industry.

Fluorescent Lighting

THE E.L.M.A. Lighting Service Bureau where, since 1924, so many who come in contact with the users of light have received a substantial part of their training, was last week the meeting place for a large number of display men and window dressers in order to hear Mr. J. K. FRISBY speak on the possibilities of fluorescent light as an aid to sales. The Bureau has often witnessed the introduction of novelties in the lighting field and though one constantly reads in the American Press of developments in the United States of such devices as the white fluorescent lamp it must not be overlooked that this lamp like many others is substantially British, and would, but for the war, have been as much developed in this country as in the United States. The reason for this condition of things is that not only are the lamp makers of this country deeply engaged in war production, but they have neither the materials nor the labour with which to develop as much as they would like the various designs and types of lighting which their researches have produced. The latest "warm-white" lamp is a case in point and because in the United States, with a lower war production rate per lamp maker, its development is being pursued, the British manufacturer is not getting for his work and initiative all the credit that is due to him.

E.L.M.A. and the Future

THE Bureau, apart from its activities in the lighting field, is also assisting the various war committees engaged in post-war reconstruction, and as a contribution has in mind the placing in industry of those who will return from

the forces and providing for the training of those who desire to suitably equip themselves for employment as lighting engineers. It has for some time been appreciated that the Bureau in London has not always provided as much accommodation as the E.L.M.A. programmes warranted and, we understand, from Mr. W. J. JONES that it is the intention to so expand the facilities of the Bureau as to include premises of the type at Savoy Hill at many provincial centres. This is a wise move and one which will doubtless result in rich reward for all the work entailed. Discussing the future activities of the Bureau at an informal luncheon last week, it was suggested that the lamp makers have by establishing their own demonstration centre set an example which the manufacturers of other electrical equipment might follow with advantage to both themselves and the public. The suggestion offers food for thought.

A Plan for Coal

THE remarks made by Mr. HAROLD HOBSON, at the Fuel Luncheon Club last week, with respect to electricity supply and the coal industry, lend special interest to the report drawn up by Mr. ROBERT FOOT, chairman of the Mining Association of Great Britain, published on Tuesday, and entitled, "A Plan for Coal." The report is addressed to the mine owners and he urges concerted action to make the mining of coal modern and efficient, to advance the whole technique of production, and to display a full appreciation of the needs of consumers; recommendations which have so long been advocated in the columns of this journal. Mr. FOOT is not a mining engineer and the views he expresses may therefore be regarded as free from bias where technical considerations are concerned, but he, like us, believes that "there is a great deal of leeway to be made up."

Electro-Mechanisation

THE report deals at length with the reconstruction of the coal industry and its operation under a Central Coal Board, all of which, because it is domestic, is outside the scope of the electrical industry; where other matters are touched upon, however, such as modernisation and efficiency, the report makes more intimate reading and lends support to many of the opinions already given by electrical interests, in that though Mr. FOOT, because of his non-technical qualifications, does not make any specific engineering recommendations, he nevertheless points out the weaknesses and omissions which exist in the efficiency curve of coal production; weaknesses and omissions which electro-mechanisation would do much to remedy.

Technical Education

THE meeting of the I.E.E. last week whereat was discussed the second report on Education and Training for Engineers, prepared by the Post-War Planning, Education and Training and Personnel Sub-Committee, proved to be so rich in discussion that a further meeting was held at the institution yesterday, Thursday. One of the most pleasing features of the discussion was that those who took part represented all sections of the industry, together with a number of educational interests. The importance of the subject will be readily recognised when it is noticed that not only was the institution lecture theatre well filled, but that those present should have given two evenings of their time to bring the matter to a reasonable conclusion. The first of the discussions, given in abstract elsewhere in this issue, shows that the I.E.E. membership has some very definite views on what are our educational needs, and by the ventilation of these opinions the industry stands to gain what is most required to keep the electrical star in the ascendant, namely so high a standard of technical skill that the rest of the world can do little else than follow our progress. This is no idle ambition for, as pointed out in the report, this country must, before it can hope to win back all the export trade it has lost, produce not only goods which overseas countries can themselves manufacture, but also equipment which is beyond their scope. We have led the world in many fields in the past, and our ability to do so again has been demonstrated by several war-time developments, but competition in the future will be much keener and the markets will go to those who are best equipped to supply them.

Radio Industry Council

Inaugural Luncheon—War-time Achievements

SOMETHING of the radio industry's war-time achievements and an indication of plans for the future were revealed at the inaugural luncheon of the Radio Industry Council at the Connaught Rooms,

Mr. F. B. Duncan, chairman R.I.C., and Sir Robert Renwick, Controller of Communications, Air Ministry

London, on January 18. This newly formed organisation co-ordinates the work of the British Radio Equipment Manufacturers' Association, the British Radio Valve Manufacturers' Association, the Radio Communication and Electronic Engineering Association and the Radio Component Manufacturers' Federation. Mr. F. B. Duncan (chairman of the Council) presided over a gathering of between 400 and 500.

In the course of his address the chairman said hardly had television begun when the war broke out, but the scientific and manufacturing structure which had been laid down by television, combined with the great work done by the Services in the application of these principles to war needs, made possible the use of radiolocation gear which had helped this country throughout the war. This experience in television technique in the industry also helped largely to provide the scientists, engineers and tradesmen who had made it possible to operate the laboratories, factories, and the big technical units in the armed Forces. By 1942 the industry was 2½ times its 1939 size.

Beginning with the Battle of Britain, radiolocation gear enabled men on the ground to detect and plot the course of enemy aircraft from miles away. The enemy suddenly realised that the British nation was one scientific jump ahead of him. Last year the "Scharnhorst" was sunk at an incredible range of many miles by battleship gun-fire dead on the target, with the help of still more advanced radiolocation gear. "D" Day saw the most pregnant development of all when new and special types of radiolocation enabled our air-borne and parachute troops to be accurately concentrated by radio on minute landing areas in darkness.

Probably the best single contribution from British engineers would ultimately prove to be an item to which they could not now give a name. It was a vacuum device, something infinitely more than a valve, of such delicacy and complexity that only the most skilful hands could make it. This was the heart of many of the most advanced types of radiolocation gear, permitting effective operation on very high frequencies. After the war it will be directly applied to automatic and infallible anti-collision devices, which would ensure the safety of ships and planes all over the world's traffic routes.

Today the radio industry rejoiced in both the opportunities and the applications which its new structure entailed. It was equipped with personnel and resources which qualified it to compete with any in the world, and it was precisely for that object that the new structure of the Radio Industry Council had been erected. The Council had already tackled several problems, and in

Sir Harry Railing, president I.E.E. (left) and Col. Sir Stanley Angwin, engineer-in-chief, G.P.O., who were among the guests

co-operation with the Government, and within the industry, much useful work had already been done, and they were now concentrating on their plans for the reconversion of their industry and the expansion of its exports.

The first post-war receiving sets would be similar to those of 1939, the design and quality of which had already reached a very high standard. Solid developments and improvements in technique there undoubtedly had been during the war which would lead to better transmission and reception, especially on short waves, and to greater reliability. They would also provide freedom of listening to radio broadcasting emanating from any part of the world.

They looked for an improvement in the standards both of programmes and transmission.

With greatly increased resources they anticipated an immediate expansion of work in the field of television. The Radio Industry Council had made its submission to the Television Committee under Lord Hankey, and for a re-starting of the pre-war system of television as soon as the German war shall end, this re-starting to be not only of a station in London but an immediate commencement of work upon the linking up of the whole country by a network of radio which had been envisaged before the war began. The industry aimed to provide good television sets for the largest possible public. They must not expect the price of post-war television to be any lower than that of 1939 in the early stages. A downward price curve would follow an upward demand curve.

Sir Robert Renwick, Controller of Communications, Air Ministry, said this year would see the tenth anniversary of the first successful trial of radiolocation. When the ban was lifted for the public to be told the story, it would be a fantastic one.

Portsmouth Carries On

Extension Completed During Bombing

JUST over four years ago Portsmouth suffered its most destructive air-raid.

Starting soon after 7 p.m. on January 10, 1941, there was a concentrated raid for two hours, followed by a lull and then an attack of equal ferocity which lasted until the early hours of the morning. It is estimated that during the night 300 raiders dropped 25 000 incendiaries and hundreds of high explosive bombs. Although it was difficult to judge with any degree of accuracy because of the intense A.A. fire directed against the raiders, it is generally believed that it was the first bomb sent down that scored a direct hit on the generating station. One of the heavy armour-piercing type, it penetrated the concrete of the turbine house floor, passed through about one foot of concrete in the basement floor and nine feet of the ground below before exploding. The damage was extensive and the supply to the city and surrounding districts was cut off. The foundations of the 30 000 kW alternator set were shifted about 5 in. out of line, but the machine itself was not damaged; three turbine house stanchions were moved out of line; a 10 000 kW set was extensively damaged; long lengths of circulating water piping were destroyed, resulting in the flooding and immersion in sea water of all the auxiliary condensing plant motors in the basement; the windows and a large section of the roof were blown out; the remaining woodwork in the roof was set alight, and all the plant was covered with a heavy thickness of mud and debris.

On the same night a bonding store containing many thousands of gallons of spirits in casks and bottles, adjoining the generating station, was destroyed by fire and a stream of blazing spirit ran down the gutter in the roadway. This had to be dammed with sand to prevent the flaming liquid pouring into the basement of the switch house. The generating station staff got the pumps going and by directing the water on to the wall and keeping it cool saved the switchgear inside. They could not, however, prevent the upper part of the building catching alight. The 33 kV control room was badly damaged and put completely out of action.

The knock-out blow to the generating station having cut off the supply, steps were taken to link up the distribution system to the grid, but although there were three separate connections to meet such an emergency, it was found that each had received a direct hit and had been cut. A fourth alternative was provided by an industrial establishment, which had a connection to the power station and an emergency connection to the grid, and there was a chance of getting some supply from this source. This connection to the station was also broken by a direct hit. Repair parties then set to work to restore the grid supply.

The cessation of supply took place at 19.05 on January 10, and the first reconnection to the grid took place at 05.20

on January 13. Considerable ingenuity was shown by the C.E.B. engineering staff and the electrical staff of the undertaking in fixing temporary control gear. From this time the load was gradually built up again. The ability of factory organisations and other establishments to repair their own damage helped considerably in the restoration of supplies.

Naval and Military Assistance

Some indication of the severity of the raid is given by the fact that 60 per cent. of the mains system was rendered entirely inoperative by hits upon the underground cables. Close on 2 000 openings had to be made in the streets to repair cables and disconnect services which had become welded by the heat of the fires. Some three weeks elapsed before the last consumer was re-connected, although a large proportion was connected again within a week. This work could not have been carried out in the time without the help rendered by men of the Navy and Army and by skilled men placed at the disposal of the electricity department by the neighbouring undertakings, both municipal and company.

The repairs to the plant gave considerable difficulty. A workshop was erected over one half of a wide road running alongside the turbine house, and a temporary entrance was cut in the side of the building. The appropriation of half the public roadway was, of course illegal, but, fortunately, no one raised any objection.

The 30 000 kW alternator foundations had to be rebuilt from the ground. The bomb crater was sheet-piled and filled with concrete. Work was well advanced with the re-erection of the machine when a bad crack developed in the steam end foundation, which had not been replaced. The machine again had to be dismantled. Cementation under pressure into the ground under the basement floor was applied as a remedy, and the steam end foundation was rebuilt.

While the bomb damage was being repaired extensions to the power station and the installation of a second 30 000 kW set, which had been approved before the commencement of hostilities, were expedited and the new plant was put into commission before the old set was restored. By the autumn normal capacity had been reached. In the meanwhile supply was taken from the grid.

On the night of January 10 the administrative offices and all the records were destroyed, and Mr. B. Handley, the chief engineer and manager, and his staff moved into other premises in the High Street.

The next most serious damage was caused on March 10, 1941, when the inside of the turbine house again received a direct hit. This bomb, evidently of a lighter calibre than that dropped on January 10, struck the wall high up near the roof and exploded before reaching the floor level, causing only superficial damage. Unfortunately the connection to the grid was also cut, and again there was complete cessation of supply. This occurred at about 23.00 hours and supply was restored at 14,000 hrs. the following day.

Hundreds of incendiaries were showered upon the power station. Some penetrated the turbine house, but did no harm, although damage was caused elsewhere. The vulnerable parts of the electrical gear in the control room had been protected by an under ceiling of Durasteel, and this proved most effective. A number of incendiaries went through the roof and burnt themselves out on top of this protection without any sign of damage except a dark stain underneath where each one had rested.

The damage to mains and sub-stations on this occasion called for nothing much more than what had become routine repairs.

The industrial undertaking which had assisted the city undertaking with supplies between January and March, was itself knocked out on March 10.

Six Bombs Hit Plant

During the whole of the period in which Portsmouth was subjected to air-raids rather more than 50 h.e. bombs fell in the immediate neighbourhood of the power station, and six actually hit the plant. Four caused damage which could be repaired easily. Three made direct hits on the circulating water system, and one fell in a transformer enclosure, displacing four 5 000 kVA transformers and breaking the connections, but doing little harm. At different times considerable damage was done to superheater tubes, boiler tubes, and steel ducting which were in the yards awaiting erection in the new extensions.

Every one of the half-dozen showrooms distributed over the area has been more or less seriously damaged at different times. It was remarkable that although a number of sub-stations suffered damage, in no case was the switchgear put out of action. The buildings were strongly constructed and stood up well to incendiaries and blast. In addition to underground cables, overhead lines suffered some damage.

The raids reduced the number of consumers from 96 000 in 1939 to 81 000 in 1943-4.

Much credit is due to the generating staff and employees for the way in which they carried out their duties, often in the face of great danger. The discomfort of running a power station without a roof over the turbines, with rain and at one time snow coming through, working in the dimmest of lights and wrapped in overcoats, can well be imagined.

Electrification of Agriculture

By E. W. GOLDING, M.Sc.Tech., M.I.E.E., Mem.A.I.E.E. (Nottingham University)

DURING the last year or two the activities of various bodies of " planners " for the post-war Britain have produced such a multiplicity of reports and have brought forward so many possible schemes relating to the social and industrial life of the community, that perhaps the only safe prediction to be made regarding the post-war period is that conditions will certainly be different from those existing prior to the war. Nevertheless, it is possible to discern with certainty a few general trends, and it so happens that in the cases of the two industries—electrical engineering and agriculture—with which this article is concerned the probable major post-war developments take more definite shape than do those of most other industries. It appears obvious from the reports of various Governmental and technical committees whose work has covered the question of electrical engineering development, and from the public statements, from time to time, of politicians and others responsible for the direction of our affairs, that perhaps the most important post-war development in this field will be much more widespread rural electrification, together with at least some degree of unification of tariffs on an economic basis. Indeed the recent announcement of the projected large extensions of generating plant by the Central Electricity Board serves as a pointer, and indicates that a large increase in the demand for electrical energy in future years is anticipated. While electrification in urban areas has by no means reached saturation point, it is reasonable to suppose that the absorption by rural districts of a considerable part of the output of the new plant is envisaged. Having thus laid the foundation for development in so far as generation is concerned, provided the projected schemes for the co-ordination of distribution materialise, the electricity supply industry will be in a sound position to cater for the rural load.

Labour and Machines

Turning to the agricultural aspect; the very heavy war-time demands which have been made upon farmers with the object of enormously increased food production have inevitably brought about great changes in methods of working. The much larger area of land under active cultivation, including, as it now does, much that would not have been considered economically workable under pre-war conditions, with an abundance of imported produce to call the tune, could not possibly have been cultivated without new methods, nor could the products of it have been dealt with, especially in view of the shortage of labour which has been unavoidable during the war. The answer to the question of how so much more work has been accomplished with a reduced labour supply lies in increased mechanisation. The extensive use of tractors, milking machines, combine harvesters, grain driers, and many other mechanical aids have rendered possible the farmers' magnificent contribution to the nation's food supply for which we cannot be too grateful.

Changing Methods of Farming

It is worth noting, also, that not only the detailed methods but, to some extent, the whole conception of farming has undergone a change. This is especially the case in relation to the question of collaboration between individual farmers and in their acceptance of the principle of combination in the use of large-power plant which would be beyond the financial capacity of the individual. Contract ploughing and cultivating under the direction of the Ministry of Agriculture and the local War Agricultural Committees, and the centralisation of such processes as grain and grass drying have paved the way towards a very necessary reorganisation of British agriculture having great possibilities if followed up. Price controls and agricultural wages awards have naturally played their part, also, in this change of outlook which, although forced upon the agricultural community by exceptional conditions, is not without benefit, and which, if taken advantage of in the right spirit of co-operation, provides an opening for the introduction of future developments in electrically-operated equipment.

While it may be argued that the requirements of war-time are exceptional and form an uncertain criterion for post-war needs, it is a fairly safe prediction that, at least for some years to come, many of the altered conditions, particularly in the direction of increased costs of labour, will remain. It is reasonable to assume, also, that in the post-war period the world-wide food shortage will automatically be reflected in greatly increased requirements of agricultural production in this country. The recent announcement by the Minister of Agriculture of a four-year plan for the fixing of prices of agricultural produce ensures stability during the transitional period between war and peace. Future policy must, of course, be dictated by world conditions at a later date, but it is clear that the future prosperity of our agriculture will be influenced to a great extent by its efficiency expressed

in terms of output per unit of labour and capital employed. We have been producing, during the war, a large percentage of our total food requirements, but to what extent we shall be able to afford to do this post-war in the face of severe foreign competition, will depend, to a much greater degree than is generally appreciated, upon the effectiveness and economy of the mechanical methods employed.

What Can Electricity Do ?

How can the electrical industry, with extensions of rural supply in prospect, play its full part in this mechanisation? If it is assumed that, for the large majority of farms, an electricity supply will be made available, there is little question that the service will be welcomed and that supplies will be taken. The amenity value alone will be sufficient in most cases. But that is obviously only the first step. Lighting and domestic loads alone cannot be regarded as successful fulfilment of the object in view. On the farm, the potential power load must be the main incentive, and ruling out, for the time being, the possibilities of field power as an electrical load, since it cannot be claimed that much progress has yet been made in the development of electrically-operated cultivating machinery, the potentialities in barn, dairy, and other stationary equipment, are very considerable.

One of the first questions to arise is, of course, that of running costs, but, without denying its general importance, there is no doubt that, with the tariffs which are likely to be offered, these costs do not loom very large as an obstacle in these days when the costs of labour are so much greater than they were in pre-war days. Nor are the costs of equipment and of wiring likely to prove insuperable difficulties provided it can be shown that the service to be rendered is really worth the expenditure.

It is in this proviso, however, that difficulties may arise unless the whole question is very carefully considered. There are two aspects of the matter, both of equal importance: the service must, in itself, be effective, practicable, and economical, and also it must be demonstrated to the farmer that it is so.

In the writer's opinion, there have been two important weaknesses in the position of agricultural electrification in the past. Firstly, certain applications of electricity have been recommended without adequate preliminary investigation of their practicability and economy, and without sufficient regard for conditions on the farm on which they were to be used. Secondly, in the case of really practicable applications, either the means of acquainting the farmers with the posibilities have been, generally speaking, inadequate, or they have, in many cases, been installed without sufficient regard for working conditions, or, again, they have been left, after installation, without guidance to the farmer, for him to make the best—perhaps more often the worst—of an unfamiliar piece of equipment. There is no implication of blame to those concerned in the past in such work, nor is there any wish to disparage the excellent research and development which has been done. The faults have been due rather to the fact that the necessary organisation has been absent; but that much improvement in these matters is necessary seems obvious, if agricultural electrification is to become a vital factor in the post-war mechanisation.

The situation has, indeed, already improved very greatly as compared with even the immediate pre-war period. The development, thorough investigation, and testing, of suitable electrically-operated farm equipment is now being undertaken by various organisations such as—to take only one example—the Electrical Research Association, and manufacturers, also, are alive to the possibilities and requirements of agriculture. Thus, on the development side, little difficulty is likely to arise. The position as regards putting the suitable equipment into the hands of the users is not so clear although, here again, there is evidence that some of the supply undertakings appreciate the need for improvement in the methods adopted in the past.

Some Aspects of the Question

Details of the actual procedure likely to be most effective are, perhaps, beyond the scope of the present article and can best be left to those primarily interested, but it is relevant to call attention to some aspects of the question which are not always fully appreciated. (i) Electrical equipment as developed for farm use has often to be designed with the double object of proving satisfactory under the working conditions on a particular farm and, at the same time, taking the maximum advantage of the peculiar characteristics of the electric motor or other apparatus involved. This implies that to be really successful, it cannot always be merely a simple adaptation of existing gear converted to electrical-operation instead of some other form of drive. Again, varying farm conditions may necessitate such modification that the equipment cannot be standardised to the same degree as other industrial plant, nor can simple directions be given for its installation, without taking into account the actual conditions on the site.

(ii) When in operation, the plant is used by reasonably intelligent, but usually non-technical, workers, without experience of its characteristics and with little conception of its capabilities or possible difficulties. In addition, there is usually no possibility of adequate maintenance. There is, there-

fore, a prime necessity for some guidance continuing for an initial period until the user is thoroughly familiar with the equipment, and also for provision for maintenance and repair when necessary, possibly at short notice.

(iii) Farmers, like others in so many walks of life, are so busy with their agricultural affairs that they cannot be expected to learn from their occasional visits to agricultural shows, or, perhaps, to organised demonstrations, sufficient about electrical operation to enable them to judge what applications are available or suitable to their own requirements.

To conclude, there are likely to exist in the post-war period golden opportunities for the farmers and electrical engineers to collaborate in the successful application of electricity to farming, and it would be calamitous if these opportunities were to be lost through lack of attention to a few fundamental requirements.

Coal and Electricity Supply

C.E.B. Chairman on War-time Experiences

SPEAKING at the Fuel Luncheon Club on January 18, Mr. Harold Hobson, chairman of the Central Electricity Board, discussed electricity supply in war and peace, and its relationship to coal.

He said that the Ministry of Fuel and Power had recently issued a statistical digest which showed that the supply industry was to-day the largest single consumer of coal among all the industries of the country. Since 1913, the output of electricity had doubled itself consistently every seven years, which meant that in 1941, the output was about 16 times what it was when we entered the last war. The general trend towards higher efficiency and lower costs was given a marked fillip in the early 1930's, after the coming into operation of the C.E.B. system. The interconnection brought about by the grid, and the reorganisation of the production end of the supply industry which followed, contributed in a valuable way to putting the industry in a position to meet the strain of the present war to far better purpose than was possible during the last war. He knew of no case in which the starting of new war plant, even in remote places, was delayed because the electric power was not available. That was a record of which the industry might well be proud. The siting of industry in new places brought about curious and difficult situations. The most difficult was in the South Wales area, where the demands for power were far in excess of the capacity of the generating plant available. At the same time in London and the Home Counties area there was a substantial surplus capacity available. The problem was to get that surplus capacity to South Wales. Special arrangements were made, with the full support of the Government to put up three main grid lines from London into South Wales. Since the completion of those lines, thousands of tons of coal had been brought from South Wales to London and sent back to South Wales in the form of electricity. It was a thoroughly uneconomic thing to do, but it had enabled war production in South Wales to continue at full speed without any interruption, which was the main objective.

Turning to the question of efficiency, Mr. Hobson said this was where coal came into the picture. They were now back, roughly, to where they were in 1939. That was a disappointing story, because since 1939 there had been more than two million kW of new and comparatively efficient generating plant installed here, and, other things being equal, one would have expected that that would have been reflected in a further improvement in economy, but it had not. He thought it would be generally accepted that the most important single reason arose from the quality of the coal that had been available to generating stations since the war began. At the present moment the single factor—the reduction of boiler availability due to unsuitable fuels—accounted for a loss of something like 300 000 kW throughout the country.

Recently there had been announcements in the Press regarding a £90 000 000 programme for electricity supply extensions. This represented some 3 000 000 kW, and it had been the duty of the Board to try to plan these extensions in such a way that they would increase the maximum overall economy of production. Frankly, they had found it impossible to plan in such a manner as to secure the maximum economy because it had not been possible to get any real information as to price and quality of coal after the war. It was felt that this was a very unsatisfactory basis on which to found the relationship between the coal industry and their largest industrial consumer. Therefore, he urged the coal industry, as soon as possible after the restoration of more settled conditions, to try to evolve some scheme whereby they would sell their products to reasonably accurate specifications, and grade their prices to reflect the differences in the qualities of coal supplied.

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. E. R. Constance has taken up an appointment with Cooke and Ferguson Ltd., as their London electrical representative after serving four years with the Air Ministry Works Directorate. He was formerly with the Metropolitan-Vickers Electrical Co., Ltd.

Mr. E. R. Constance

A dinner was given on January 17, by the directors of the Telegraph Construction and Maintenance Co. Ltd., on the occasion of the presentation to the chairman **Mr. Colin F. Campbell,** of his portrait painted by Mr. James Gunn. The guests included Sir Edward Wilshaw and Colonel Sir Stanley Angwin.

Mr. R. A. Woods, the distribution engineer of the West Midlands Joint Electricity Authority (chief engineer's department) has been appointed distribution engineer to the Birmingham electricity undertaking.

Midland Electric Manufacturing Co., Ltd. announce that **Mr. A. Wynn** has been appointed managing director of the company. Mr. Wynn joined M.E.M. in 1923 and has previously held the position of general manager, being appointed joint managing director in 1940. **Mr. W. L. Barber,** founder of the company, relinquishes his appointment as joint managing director, but continues as chairman.

Mr. A. Wynn

At the last meeting of the board of directors of the British Thomson-Houston Co., Ltd., **Mr. W. W. Vinsen,** manager of the Coventry works, and **Mr. E. S. Little,** comptroller and head of the accounting department, were elected directors. Mr. Vinsen has been appointed assistant director of manufacture.

British Insulated Cables Ltd., announce that **Mr. N. K. Bunn** (works manager) and **Mr. J. L. Harvey** (production manager) are now appointed joint general works managers. **Mr. W. J. Clements** is appointed works manager, Prescot works.

Mr. W. Cyril Williams and **Lieut.-Col. J. A. T. Barstow** have been elected directors of Beyer Peacock and Co. Ltd.

Obituary

Mr. Killingworth W. Hedges, a pioneer electrical engineer who specialised in safety devices, on January 20, aged 92 years. He was the first to introduce electric lighting for dock work, installing Gramme dynamos at Liverpool Docks in 1878.

Fluorescent Lighting

SOME indication of the prominent part fluorescent lighting is likely to play as an aid to the attractiveness of display, particularly in shops and stores, was given in a lecture and demonstration by Mr. John K. Frisby of the British Thomson-Houston Co., Ltd., under the auspices of the British Display Association, at the E.L.M.A. Lighting Service Bureau on January 18.

There were lantern slides showing the effectiveness of various methods of fluorescent lighting adopted in American stores and a restaurant; and in a model shop window dressed with draperies in pastel shades and a vase of mauve chrysanthemums, the results of lighting with daylight, warm white and tinted fluorescent tubes, separately and in a combination of colours, were compared. There was also a demonstration of the use of " black " light for display purposes. It was shown that the fluorescent tube, while not so suitable where sparkle and brilliance were required, was more efficient and also more economical than the tungsten filament lamp for most display purposes.

Mr. Frisby explained the principle on which the fluorescent tube operated and said that while at the present time it was available only in two colours—daylight and warm white—and in 5 ft. tubes, owing to restrictions, there was no reason why it should not be produced in all the colours of the spectrum and in various shapes and sizes. One important advantage of the fluorescent tube was that it was cool and could be used for the display of flowers, fruit, vegetables and other perishable foodstuffs without causing deterioration.

The questions that followed the lecture showed that the audience was keenly interested in the subject, and some of those present were eager to know more of the possibilities of " black " lighting.

Part-Time Further Education

I.E.E. Discussion on Second Report of Planning Committee

THE meeting of the Institution of Electrical Engineers on January 18 was devoted to the discussion of the report of the Post-war Planning Committee on "Part-time Further Education at Technical Colleges."

The president, Sir Harry Railing, occupied the chair, and Sir Arthur Fleming presented the report for discussion.

Lord Hankey (Hon. Member) said that the education plans obviously called for the co-operation of the Ministry of Education, the local education authorities, the technical colleges, the universities, the technical institutions, industry and the people to be educated. One of the principal beneficiaries of the scheme was industry, since it was the user of the products of the education; but the largest group of beneficiaries was that comprising the young people who were to be educated. It was necessary and very important to persuade them that the plans put forward were in their best interests, but he hoped that all parties would consider it in the light, not of 1939 standards, but of post-war conditions, which called so clamantly for the highest possible development of all sections of industry, if our national economy were to be maintained at the level which the insistent needs of our post-war situation would demand.

Sir Robert S. Wood (deputy secretary, Ministry of Education) said he was glad that emphasis had been laid on the responsibility of industry. The most important material that went into any factory or workshop was the human material, which had not always had the same consideration as had some of the material which it had had to use. Industry and educational work had come closer together; they would have to get much closer together.

Mr. J. C. Jones (principal Regent Street Polytechnic) referring to the order of grading adopted by the institution, said that certain types of employment now to be regarded as non-professional in the electrical engineering industry were accorded professional status by other and allied industries. Joint discussion would seem desirable between the several professional bodies concerned before final action was taken. As to the character of the technical courses appropriate to each grade, it might not be inappropriate to urge the need for caution in putting forward any schemes which tended to harden the divisions between the craftsman, technician and professional man, and to make virtually impossible the transfer of a person from one grade to another.

Although not all students in the present National Certificate courses were likely to attain ultimate professional status, the necessary distinction could not and should not be made at the normal school-leaving age. Most educationists would agree with the institution's wish to broaden the basis of engineering studies and would be prepared to apply that conception to both technician and professional groups. The solution of the difficulties would seem to lie in the adoption of an Ordinary National Certificate course embodying the broader concepts referred to and common to both groups. Mr. Jones gave a suggested lay-out of such a course.

Dr. W. E. Fisher (principal, Wolverhampton Technical College) said the report encouraged the present highly appreciated tendency of industry to extend the practice of part-time day release. The colleges must meet every such concession; but they would still have the evening students, so that the multiplication of courses might be very difficult even for a local technical college.

Mr. G. Wansbrough (A. Reyrolle & Co., Ltd.) referred to the report as a landmark in technical education. The supremely important new attitude it took was the necessity for differentiation between the three grades; that would give much more satisfactory education for 80 per cent. of the students if the courses they took were designed specifically to produce a craftsman, or a technician, or a professional engineer. At the same time, he felt that the report did not touch sufficiently on the difficulties involved in that clear differentiation. There must be good arrangements for transfer of students, by reason of their ability, from a lower group to a higher one.

Dr. P. Dunsheath (W. T. Henley's Telegraph Works Co., Ltd.) emphasised the complexity of the training for the modern electrical engineer, and said the Committee responsible for the report had achieved a very great step forward in introducing particularly the classification of the three types of students concerned. He was of opinion that so much was required of the professional engineer today that it was hopeless to try to crowd it into a part-time course.

Mr. H. Faulkner (Post Office) said he could see very little, in the courses set out in the report for the Ordinary National Certificate, to cover the tele-communication and the expanding electronics industry.

Major H. R. Walters (Ministry of Labour

and National Service), discussing re-settlement, said that during the war the numbers on the power side of the electrical engineering industry had remained appreciably constant. But there had been a substantial war-time increase in the tele-communications side. Accordingly, the problem would split very conveniently into two parts.

Mr. L. H. A. Carr (Metropolitan-Vickers Electrical Co., Ltd.) referred to a report published in the north of England during the last two months, which dealt principally with craft entrants into industry and said it did not overlap the report of the I.E.E. in respect of workshop training; but on the technical college side it did overlap, and it was most remarkable that the two reports, drawn up by two entirely differently constituted bodies, were almost identical. The Manchester Committee had based their scheme eventually on two days' release per week up to the age of 18 years.

Mr. C. Grad (British Thomson-Houston Co., Ltd.) stressed that the part of the I.E.E. report dealing with the training of craftsmen was the part which would be welcomed most by the industry.

Mr. C. F. Partridge (Electrical Engineering Dept., Central Technical College, Birmingham) commented on the difficulty of dividing students into technological and professional groups; it was only in the large firms, he said, where clearly defined groups occurred, and the number of large firms in the country were not great. Thus, the line of demarkation would be hazy, particularly to the technical college teacher who had to recommend the student of 16 or 18 years of age as to the course he should take.

Mr. E. S. Byng (Standard Telephones and Cables, Ltd.), recalled that three years ago the Council of Sydney, New South Wales, in advertising for their chief engineer and manager, had stressed particularly that the technical abilities were not considered so much as the administrative and organising abilities. During the last year or so in this country there had been a trend in the same direction; therefore, he was glad the institution visualised that those further qualifications would be necessary after the war for chief engineers.

Sir Arthur Fleming, in a brief reply to the discussion, said there seemed to be an idea that the report proposed to put men into three water-tight channels. But the report showed a number of means whereby a student could transfer from one group to another if he had the ability.

The President, dealing with the question as to how widely the doors of the universities should be opened, said the deciding factor was the quantity that could be placed after leaving the universities. If occupations were available to them he would open the universities as widely as possible; if the numbers became too great, he would make entry to the universities more difficult. He would prefer two days release per week, rather than one, for part-time study on the part of deserving cases.

(The discussion was continued yesterday, Thursday, an abstract of which will be given next week.)

Insulating Varnishes

An interesting survey of the manufacture and uses of insulating varnishes was given to the London Students' Section of the I.E.E. on January 15, in a paper by Mr. W. P. Walters.

The author dealt with the two most common types of varnishes, namely, those having a resin-oil base and those with a bitumen-oil base, either type being dissolved in linseed oil or chinawood oil, or both. He said the manufacturing processes were, selection and cleaning of resins, grading, heating or " gum-running " to bring the hard resins to the desired solubility, addition of oils which were usually pre-boiled and contained metallic driers, and addition of thinners. Finally, the varnishes were carefully filtered and strained, and allowed to stand in settling tanks for several months. These varnishes were employed for bonding purposes, i.e., in the manufacture of flexible micanite, or for impregnation which might be plain dipping, a pre-treatment process, or a vacuum impregnation. The paper concluded with a description of the physical, chemical and electrical properties of insulating varnishes illustrated with numerous graphs.

About a dozen speakers joined in the discussion which followed. Questions were answered competently on solvent and acidity troubles in oil immersed transformers, pre-impregnation of winding wire, action of solvents such as benzine and toluene on enamelled wire, use of thermo-setting varnishes, and the possibilities of solvent-less varnishes. The necessity for careful removal of solvent at a moderate temperature before polymerisation of the varnish was particularly emphasised, and the author did not favour vacuum drying of windings after impregnation, since varnish as well as solvent was liable to be removed.

Torquay.—A disagreement which has arisen between the Corporation and the Salcombe Gas and Electricity Co. as to the terms for bulk electricity is to be referred to the Electricity Commissioners.

Stourport "B" Power Station

Outstanding Features of Boiler and Generating Plants

THE new power station designed and to be constructed by Edmundsons Electricity Corporation, Ltd., for its subsidiary, the Shrops., Worcs. and Staffs. Electric Power Co., and referred to as Stourport 'B,' will be erected on the River Severn at Stourport, on a site adjacent to the existing generating station.

The first section will consist of one boiler with a maximum continuous rating of 525 000 lbs./hr. and one 60 MW turbo-alternator. The addition of a further 60 MW of new steam raising and generating plant as directed by the Central Board will raise the total capacity of the station to approximately 240 MW.

The scheme provides for the steam raising and turbo-alternator sections to be installed as a complete unit, and in accordance with Edmundsons's latest practice there will be no dividing wall between the boiler house and turbine room.

The boiler has been designed for a m.c.r. of 525 000 lbs./hr. at a pressure of 1 275 lbs. per sq. in. at 975° F. at the outlet of the secondary superheater with feed water entering the economiser at 460° F. The gas temperature leaving the air heaters will be approximately 325° F. at m.c.r. The complete unit has been designed to operate under base load conditions for periods up to fourteen months with only routine cleaning by soot blowers.

Boiler Drum

The boiler drum, of forged and welded construction, will have an internal dia. of 5 ft. 6 in. and each end of the drum will accommodate a single down-comer of a diameter to permit full circulation of the boiler water to the furnace walls and heaters. Provision is also being made for suitable branches for connection of an electrically-driven steam pump to be fitted, should it be required for circulating steam through superheater tubes when raising steam or laying off the boiler.

To reduce the water entrained with the leaving steam, a special baffle and cyclone separators will be fitted, so arranged that no portion of the mixed steam and water rising in the circulating tubes can enter the main body of water in the drum without previous separation in the cyclones. A steam drier will be embodied, and a continuous blow-down system will be installed.

The complete superheater will consist of primary and secondary units with an automatically controlled inter-pass attemperator. The attemperator and automatic controller is designed with a wide range of regulation in order that the final steam temperature may be controlled and the boiler operated at a reduced final temperature of 940° F. in addition to the specified maximum temperature of 975° F. when the unit is operating over a wide range of evaporation.

Combustion Chamber

The combustion chamber will be of the wet-bottom or continuous slag tap design, so proportioned that the heat released at maximum continuous rating will not exceed 21 000 B.T.U.'s per cu. ft. The chamber will consist of a primary and secondary furnace, with a water-cooled slag screen interposed.

Both the primary and secondary furnaces are to be entirely water-cooled, each being of special construction. The primary furnace will be lined with 4 in. outside dia. steel tubes arranged at 6 in. centres. The secondary furnace will be lined with water wall tubes of 3¼ in. outside dia. set at 3⅜ in. centres, thus forming a complete water tube box. These tubes will be approximately 68 ft. long between headers, and since it is not likely that they can be transported and erected in their full length, the tube sections will be butt welded *in situ*. There will be no intermediate headers.

The whole of the circulatory system has been designed to ensure full and free circulation through the convection and radiant sections of the boiler.

For disposal of fly ash provision is being made for the re-introduction of fly ash into the furnace where it will be fused and run through the slag tap with the other slagged ash. It is hoped that by the adoption of this arrangement many of the dust disposal troubles usually associated with pulverised fuel will be eliminated.

The economiser will be of the steaming type, designed to absorb from the hot gases the correct amount of heat when passing all quantities of feed water up to the amount exceeding the m.c.r. rating by 15 per cent. The inlet feed temperature at m.c.r. will be 460° F. at the inlet flange.

Two separate air heaters will be installed. The first, in the hottest gas pass, will provide the heat for the primary air to the pulverising mills. The second, in the cooler gas pass, will provide the heat for the secondary air required to complete the combustion of the fuel.

The boiler, combustion chamber, superheater, economiser, and air heaters will be provided with steam soot blowers of the

remote-control and visual indication type. Four pulverising mills will be provided of sufficient capacity to maintain full output at all times with a repair cycle of one mill in every four months. Each pulveriser will be fitted with an automatically adjustable raw coal feeder and rotating classifier.

Special consideration has been given to the lay-out of the fuel pipes between the pulverising mills and the burners. These will be arranged in the most direct manner from the mills to the burners, eliminating as far as possible the crossing of one pipe over another.

Boiler Starting Equipment

The boiler will be provided with an oil lighting-up equipment of the pressure type. Burners will be of the automatic electric ignition type, permanently fixed to the boiler casing and fitted with automatic injection and withdrawal mechanism.

The boiler unit will be provided with duplicate forced draught, induced draught and mill primary air fans. The forced and induced draught units will be driven by variable speed commutator motors. The speed variation will be carried out by remote controlled induction regulators.

With regard to the fan units, consideration has been given to the maximum continuous output under adverse conditions when burning the lowest grade fuel. Arrangements have, therefore, been made for higher speeds to meet such abnormal conditions. In all cases, the fans at the lowest speeds have been designed to deal efficiently with a boiler output of not more than 100 000 lbs. of steam per hour.

All the gas and air ducts will be of welded construction throughout, and all joints will be seal welded to provide a complete gas and air tight system. Dust hoppers will be provided at the bottom of all vertical gas ducts and adjacent to all dampers. Asbestos curtain type dampers will be provided in the induced draught ducting for sealing off the boiler under standby conditions.

The boiler unit will be provided with a complete electrostatic precipitator plant, arranged outside the boiler house. The design will be such as to maintain an efficiency of not less than 92.5 per cent. when the boiler is operated at m.c.r. The concentration of dust particles remaining in the gas passing to the chimney will not exceed 0.4 grains per cu. ft.

A complete automatic combustion control system of the boiler will be installed consisting of combustion control to vary the fuel and air flow in accordance with the load. Embodied in this system will be included a three element water level control, and coupled with this a water level recorder will be included.

The operation of all controls will be so arranged that immediate change-over can be made from automatic to manual or *vice versa*, of all or each part of the equipment. The system will be operated by compressed air. All instruments, controls associated with the boiler, turbo-alternator, feed pumps and oil fuel pumps will be mounted on what is known as a unit control board. Assembled on this will be the whole of the remote-control switches and indicators for the fans and all associated ancillary plant including the sequence-operated soot blowers, together with the steam flow meter, feed flow meter, blow-down water meter, continuous blow-down meter, CO_2 recorders, draught gauges, distance indicating and recording pyrometers, superheat indicator, pressure gauges, smoke density indicators and tachometers.

The turbine will be of the multi-cylinder type running at 3 000 r.p.m. It will be supplied by steam from the unit boiler at a pressure of 1 250 lbs. per sq. in. and at 950° F. temperature at the stop valve. There will be five stages of feed heating made up of two direct-contact heaters and three surface heaters. The surface heaters will be installed inverted with hand bye-pass valves situated at basement level.

No automatic bye-pass valves will be fitted and all float control valves will be contained in accessible chambers outside the heater bodies.

In place of the usual atmospheric exhaust valve and exhaust pipe, explosion diaphragms will be provided on the low pressure turbine casings.

The main turbine oil tanks will be situated in the basement. It is not proposed to fit an oil pump driven from the turbine shaft, but there will be installed two a.c. motor-driven oil pumps and one d.c. motor-driven oil pump supplied from the station battery. Normally, one a.c. motor-driven oil pump would be used but should this fail the second a.c. pump would come in automatically, and should there be total failure of a.c. supply, then the d.c. motor-driven pump will come into automatic operation.

Condensers

There will be two condensers, each of the divided two-flow type with the air and condensate extraction systems maintaining at the turbine exhaust flange as the normal duty, a vacuum pressure not exceeding 1.25 of mercury when the turbo-alternator is developing its normal output of 60 MW.

The condensers will be of the continuous service type so arranged that one half of the tubes can be cleaned while the other half is in service with the turbine carrying at least 30 MW load. The condenser

tubes will be expanded into the tube plates at each end.

Each condenser will be equipped with a vertical spindle condensate extraction pump and on the circulating water system each condenser will be provided with an independent vertical axial flow circulating water pump.

In connection with the turbine a special feature is being made of instruments that will assist the operating staff to check vibrations, expansions and deflections.

There will be three boiler feed pumping units, two electrically-driven and one steam turbine-driven. Each pumping unit will be capable of delivering to the boiler 650 000 lbs. of feed water at 1 840 lbs. per sq. in. pressure and 460° F. temperature.

The controls will be so arranged that if the electrically-driven feed pump drops out, the control will operate on the falling line pressure and the steam-driven pump will be automatically brought into service.

Each electrically-driven pumping unit is composed of a variable speed pump and a constant speed pump connected in tandem; each pump will develop approximately half the feed line pressure at the full output of the pumping unit.

Alternators

The turbine will drive main and house alternators through a flexible coupling housed in the exhaust end bearing of the turbine. The main alternator will be wound for a terminal voltage of 11 kV and will be of the hydrogen-cooled type. The circulation of the hydrogen is to be effected by propeller type fans mounted on the main shaft, the water coolers being mounted longitudinally in the alternator housing above the windings. Special provision is to be made for sealing the shaft where it leaves each end of the alternator. Special oil circulating pumps and degasifiers are to be employed for this service.

The stator core and windings will form a sub-assembly and are to be spring-mounted within the main alternator frame in order to eliminate as far as possible dual frequency vibration.

The rotor windings will be specially designed to prevent copper distortion and all turns will be fully insulated with glass and mica insulation.

The house service alternator will be of the normal air-cooled design, with a water cooler fitted in the foundation beneath the machine. Propeller type fans will be provided on the main shaft for circulating the air. A special feature of the turbo-alternator will be the absence of any direct-coupled exciters. The exciters will be of the motor-driven type and will be provided in duplicate, each main driving motor being direct-coupled to a main alternator exciter, a house alternator exciter and a pilot exciter.

The output of the main alternator will be taken at 11 kV by bare copper connections to a main transformer step-up output to 66 kV. The transformer will be housed in a cubicle accessible only from the outside of the building so as to minimise any possibility of spread of an oil fire.

The output from the transformer terminals will be taken by bare copper connections to the switchgear situated in an annex to the main engine room.

The switchgear annex will comprise four floors. The two upper floors will contain the main and auxiliary busbars together with their associated isolating switches. Below the busbars will be an isolator compartment containing feeder and potential transformer isolators and earthing switches and on the floor below will be the main circuit breakers.

The partitions dividing the circuits, and also those between the switchgear and walkways will comprise wire mesh screens so that the whole of the switchgear can be inspected whilst it is alive.

The circuit breakers will be of the air-blast type having a short circuit rupturing capacity of 1½ million kVA. As compressed air is used for the circuit breakers advantage of its presence has been taken in order to provide remote-control of the isolating switches.

The outgoing connections from the feeder circuit breakers are to be taken through bushings in the main wall of the building to outgoing overhead lines strained off the wall of the building. It will thus be seen that no cable connections will be employed either for the generators or feeder circuits. The only 66 kV cable being used in connection with this new extension will be that forming the connection between the new and the existing 66 kV switchhouse.

Supply for Auxiliaries

A 6 000 kVA transformer stepping-down from the 66 kV busbars to the station auxiliary voltage of 3.3 kV, together with a house alternator mounted on the main shaft and wound for 3.3 kV, will provide the supply for all auxiliaries. The main 3.3 kV switchboard will comprise truck-type switchgear equipped with solenoid-operated air break-circuit breakers.

The larger motors will be fed direct from the 3.3 kV switchgear and further, transformers, all of which will be mounted in cubicles accessible only from the outside, will be provided for supplying the smaller auxiliary motors at 400 V.

In general all motors above 200 H.P. including the exciter motors will be wound for 3.3 kV operation and in the lower horse-power category 400 V.

News in Brief

Tynemouth Clock Lighting.—The Watch Committee has authorised the lighting of all public clocks.

Social Item.—A successful children's party was held in the works canteen of Southern United Telephone Cables, Ltd., on January 20, under the auspices of the Dagenham Cables Sports Club. Approximately 200 employees' children were entertained to tea followed by an excellent concert.

Change of Name.—Exeter Radio and Television Services, Ltd., announces that as from January 1, the trading name of the company has been changed to R.T.S. Electronics, Ltd.

Improved Housing Estates Lighting.—The Bermondsey Housing Committee has arranged for the electricity department to improve the lighting of staircases and courts on its housing estates at a cost of £90. The cost of the extra current for three months is estimated at £204.

TWENTY-FIVE YEARS AGO

FROM THE ELECTRICIAN *of January 23, 1920: In the joyous comedy at the Criterion Theatre, we have a kitchen scene where the equipment is all-electric, and repartee in which a coal stove is stated to be worse, and a gas stove the worst possible. Nor do we stop there, for in the opening scene Mr. Cyril Maude is revealed in the act of taking an electric light bath.*

New Sub-station.—Plans have been approved for the erection of an electricity sub-station in Scholes Park Road, for the Scarborough electricity department.

Liverpool Heating Plans.—A joint report is being prepared by the Liverpool City Electrical Engineer, the City Engineer and the Director of Housing on the question of supplying heat for the central heating of buildings from a central distributing station.

Street Lighting Conversion.—The South Shields T.C. has adopted in principle a plan by the Borough Engineer for converting gas lamps to electricity for street lighting. The cost will be about £25 000, and the work will include the conversion to the automatic system of 500 hand-switch electric lamps and nearly 1 500 gas lamps. The Electricity Committee is to bear the cost.

U.S. Synthetic Rubber Programme.—According to the Defence Plant Corporation, America's synthetic rubber programme is being expanded by the construction of new facilities, and the expansion of old facilities at a total cost of $37 000 000 (about £9 250 000) which is being advanced by the Corporation for this purpose.

Newcastle-on-Tyne Lighting.—It was reported at a meeting of the City Council that 917 electric lamps, not including electric lighting on the tram routes, had been put into operation.

Electrical Purchase.—The Essex C.C. is to purchase a Morrison electricar of 10 cwt. at an estimated cost of £377.

Edinburgh All-electric Houses.—The Housing Committee has decided to recommend that 810 temporary houses on the three sites in the city should be all-electric in their servicing.

Electrical Firm's Development.—It is announced that Smiths English Clocks, Ltd. has purchased 85 acres of the Ynysceedwyn Estate, Swansea Valley, for the purpose of factory development.

Temporary Housing Installations.—The Chesterfield Housing Committee has requested the Gas Engineer and the Electrical Engineer to submit detailed reports and estimates dealing with the comparative costs and the merits of operating domestic cookers and wash boilers by gas and electricity in 150 temporary houses.

ELECTRICITY IN TASMANIA

THE report of the Tasmanian Hydro-Electric Commission for the year ended June 30, 1940, states that whilst the programme originally planned for the extensions of the power system had necessarily been varied, additional generating plant had been erected at both Tarraleah and Waddamana stations and had enabled all demands for energy to be met. The anxiety that had been felt at heavy peak periods during the last few years had been relieved by the placing into commission of new power units at those stations. The new power station at Waddamana will ultimately contain four units. As the units generated last year totalled 698 472 600, the output had increased by 4.72 per cent. The system peak load was 151 286 H.P. and the annual load factor 73.9 per cent., compared with 143 500 H.P. and 74.5 per cent., respectively, last year.

Extensions to the distribution system had been mostly small, but the number of new consumers connected in the rural areas was nearly five times the number connected in the Hobart Metropolitan area.

Electrical Measurements

The Fixing of Confidence Limits

AT the meeting of the I.E.E. Measurements Section on January 19, Mr. H. J. Josephs read a paper on "The Fixing of Confidence Limits to Measurements," of which the following is a summary:—

The idea of significance testing underlies most practical applications of probability theory to electrical measurements. This paper discussed the problems involved in the application of simple tests of significance to small sets of measurements. It opened with an account of the *w*-test, which is designed to apply to normally distributed variables. This was followed by a description of the *t*-test, which is of particular use in dealing with a small number of observations. A method of rapidly applying this test was given, and it was shown that if the true mean value of a physical quantity is unknown the confidence limits to be attached to an estimated value obtained from the measurements may be easily determined. The paper described a rapid method of estimating the standard deviation of a set of measurements; it was shown that for very small samples the extreme-mean or median formed a good alternative to the arithmetic mean and was often easier to calculate. Pearson's X^2 test of goodness-of-fit was explained and illustrated. Emphasis was placed on the flexible nature of this test and its relationship to the *w*-test.

Discussion

Sir Charles Darwin, F.R.S. (N.P.L.), said the field dealt with in the paper had an application in all branches of science and industry, and particularly engineering production, but the electrical industry was one in which the methods described were probably pre-eminent. Its industrial use was begun in the laboratories of the General Electric Co. here and of the Bell Telephone Co. in New York. He wanted to urge that everybody ought to have a feeling for this subject, although he did not suggest that everybody should strive to master the technique. For instance, in the design of a new form of electric motor, there should be one particular man in the team who was expert in how to distribute the windings and how to place the copper on the armature, and although the rest of the team need not be experts like that, every single one of them should have a feeling for the subject. It was hoped at Teddington, in the not too distant future, to embark on a much deeper interest in statistics than in the past. He felt there was room for statistics of the statistics and in that way it should be possible to have a fairly good knowledge of what machines would do under the conditions in which they were to be employed. It would then be found that certain machines would not need to work to such fine limits or tolerances as others. In radio engineering, the very important quantity which was perpetually discussed was signal noise ratio. The signal was what was wanted and it was desired to get rid of the noise which caused all the trouble, and the method described in the paper would help materially to achieving that object.

Mr. K. G. Hodgson (Standard Telephones and Cables, Ltd.) said he was not a statistician but an engineer interested in the use of statistics, for he appreciated the great help which statistical methods could be in engineering. It was a valuable tool which should be used as fully as possible. There seemed to be what he might call considerable "sales resistance" to the adoption of statistical methods on the part of engineers, partly due to the fact that statistics was a subject which had been largely neglected in the training of engineers—at any rate in this country—and also, perhaps, partly due to the fact that some of the terminology was, at first, rather liable to lead to trouble. The idea of "probability" to a man who was accustomed to dealing with definite things was rather a shock, and attempts should be made to ease the way in that respect. One of the main functions of statistical methods was to obtain the maximum possible amount of information from the smallest possible quantity of data, but some propaganda would be necessary to encourage that idea as distinct from the one which was associated with masses of figures. Once the initial resistance to statistical methods had been overcome, and they had been tried out and found to be very useful, there might be a tendency, which would have to be checked, to think that statistics would do everything and be capable of solving every problem. Nevertheless, the value of statistical methods could not be denied. The use by the engineer of statistical methods did not in any way absolve him from exercising his engineering judgment to the fullest possible extent. Engineering judgment by itself could go a long way; statistics by themselves got nowhere, but the engineering judgment reinforced by statistical methods would go a very long way indeed.

Mr. E. G. T. Emery (London Power Co.,

Ltd.) dealt with a few aspects of statistical methods which he had found presented difficulty, and asked if the author could suggest some better methods which did not involve too much calculation. He also criticised the point that the devices mentioned in the paper were applicable only to small samples and expressed the view that, as a general rule, statistics should be based on the whole of the available data. In the electricity supply industry, use was made of the statistic known as the load factor, which was the ratio between the half-hourly load and the average of all the half-hourly loads occurring during the period under review. Obviously, the longer the period the more likely it was that an extreme value would be obtained, so that the set of weekly load factors occurring in any year were vastly different from the monthly load factors calculated for the same year. The annual load factor was obtained in a similar manner, and it semed to bear no relation to either the weekly or monthly values.

Mr. D. J. Desmond (J. Lucas, Ltd.) spoke of the application of statistical methods to magnetic measurements, and pointed out how, in this way, it was possible to ascertain differences between one operator and another. He also said that the results were calculable by a more powerful technique which the author had not mentioned, and concluded by impressing on engineers the value of the technique outlined in the paper.

Mr. G. O. McLean (Edmundsons Electricity Corporation, Ltd.) said the average engineer like himself found some difficulty in interpreting the figures obtained by the statistical method. Engineers had to make decisions on what they thought the figures meant and desired to know what confidence could be placed in them. Was it possible to apply any test to know whether they followed any known or assumed law ? The paper indicated how to answer these questions and it would have been of great value to have had this paper earlier. He added the view that the paper was of such importance that it should have been read before a meeting of the full institution and not a section.

Diesel-Electric Shunting Loco' Design

A CONSIDERABLE amount of work in the development of the Diesel-electric shunting locomotive has been undertaken by Crompton Parkinson Ltd., and it is their experience that a 3-axle locomotive weighing approximately 50 tons capable of a maximum tractive effort of

Armstrong-Whitworth-Crompton-West locomotive operating on the Bombay Baroda and Central Indian Railway

30 000 lbs. and equipped with an engine of nominal rating of 350 H.P. running at relatively low speed meets the general needs.

Most of the variations in the design of such locomotives have been concerned with the form of drive. Originally two types were tried; in the first, two single reduction axle-hung motors were located on the outer of the three axles by coupling rods. Since the motors required the maximum space axially on the axles, the frames were arranged outside the wheels, and accordingly cranks were necessary outside the axle boxes for the coupling rods.

The other initial design had the three axles coupled and driven from a jack-shaft, in turn driven from a single motor, frame-mounted, through double-reduction gearing. The principal reasons why the latter design was preferred were the better location of the motor for inspection, ventilation and freedom from, for example, track flooding, The motors too could be provided with forced ventilation, and the air input to the motors could, if desired, be readily filtered.

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

There is evidence, however, that attention is now being given to further developments in the design of this type of shunter; in one case using two axle-hung motors but of the double reduction geared type with coupling rods. The principal objectives appear to be to simplify, lighten and reduce the cost of the electrical equipment; to cheapen the costs of the mechanical parts and to make the mechanical design suitable, with the minimum of alteration, for application on the various export market railways.

Electricity Supply

Middlesbrough.—The T.C. is to spend £42 rewiring the stables at Sandy Flats farm.

Lichfield.—The Electricity Committee is to provide supply to certain farms at King's Bromley.

Preston.—The T.C. has decided to have power systems installed in Council houses for heating and cooking.

West Hartlepool.—Seventy temporary houses to be built for the T.C. are to be supplied with electricity and 46 with gas.

Darlington.—The Electrical Engineer is to report to the T.C. on the question of reducing the condensation from the cooling towers at the electricity generating station

Mansfield.—The Corporation Electricity Committee has obtained sanction to borrow £405 for the provision of additional supply to Messrs. Barringer, Wallis and Manners Ltd.

Easington.—The R.C. is seeking a considerable reduction in electricity charges for the district, and also an improved supply. It is intended to meet representatives of the electricity undertakings to discuss the matter.

Liverpool.—The Economy (Special) Committee of the Corporation has approved the extension of the existing supply of electricity to the L.M.S. Railway Company's Liverpool-Southport line. The cost of the project is estimated at £25 000.

Lichfield.—The Electricity Committee is to meet a deputation from the R.D.C. to discuss the future development of electricity in the rural district, and other matters of interest to the City and Rural Councils.

Morpeth.—The T.C. is in touch with the North-Eastern Electric Supply Co. Ltd., regarding the supply of electricity to temporary houses to be built at Stobhill Gate. The firm's offer of a fixed charge per quarter is considered too high by the Council and further consideration is to be given to the subject.

Lincoln Cooling Towers.—At a conference held in Lincoln Guildhall last week to discuss the suggestion put forward by Sir Robert Pattinson that the necessary water for cooling purposes might be obtained from the River Trent, instead of erecting cooling towers in Lincoln, it was agreed that Mr. C. E. Farran, consulting engineer, should prepare and submit a full report on the scheme, and any other relevant matters for consideration by the Electricity Committee.

Glasgow.—The Gas Committee has arranged for the electricity department to reconstruct and extend the main switchboard at the sub-station and run duplicate power and lighting cables to the new retort house at Tradeston gasworks at an estimated cost of £3 500, and to supply a hoisting motor for telpher at Dawsholm gasworks at a cost of about £240.

Southwark (London).—The Electricity Committee reports that it is necessary to provide for all possible facilities for cooking and heating under rehabilitation schemes. Unfortunately, whilst the undertaking is in a position to provide most of the requirements, there are no kettles in stock, many having been lost through war damage. There is now a possibility of being able to purchase 500 kettles at 36s. each and the Electrical Engineer is to make every effort for the acquisition of kettles. The Committee is to seek sanction to borrow £1 000 for kettles for hire, and also for £3 000 for the purchase of meters.

In Parliament

The following are replies to recent questions in the House of Commons:—

Electricity Generating Stations (Plant).—Replying to Mr. Higgs who asked what new capacity had been added to the selected generating stations since 1939, Major Lloyd George said the new plant which had been brought into commission between January 1, 1940, and December 31, 1944, was approximately 2 650 000 kW. This was about equal to the increased demand since the war, but difficulty arose owing to the fact that the labour for maintenance was not as great as it was before the war.

Electricity Supplies.—The Minister of Agriculture, in reply to Brig.-General Clifton Brown, said that county war agricultural executive committees were informed recently that applications for installing electricity on farms should be supported where the supply would result in increased production or economy in labour, provided the outlay was reasonable having regard to the use which would be made of the supply. He was not aware that proposed installations falling within these terms were being held up by committees. The only restrictions on the installation of electricity on farms were those imposed by the limitation of supply of material and labour.

Coal, Gas and Electrical Industries (Co-ordination.—In a written reply to Mr. Ness Edwards, Major Lloyd George said the future organisation of the whole of the coal, gas and electricity industries was at present receiving consideration, and it would be premature to consider regional plans such as those suggested.

Industrial Information

B.E.A.M.A. Contract Price Adjustment Formulæ.—For purposes of calculating variations in (a) rates of pay, the rate of pay for adult male labour at January 20 shall be deemed to be 90s. 6d.; (b) costs of material, the index figure for intermediate products last published by the Board of Trade on January 20 is 176.2 and is the figure for the month of December, 1944.

Little Barford Power Station.—With reference to the description of the Little Barford power station which appeared in our last issue, we have been asked to point out that the wagon tipper, together with the whole of the conveying and crushing plant for the coal was designed and built by Spencer (Melksham) Ltd.

A Plan for Coal.—The report to the colliery owners by Mr. Robert Foot, chairman of the Mining Association of Great Britain, embodies the results of his investigations during a tour of the mining districts and contacts with those engaged in the industry and his recommendations for the future prosperity of the industry. The report is published by the Mining Association of Great Britain, 53, Parliament Street, London, S.W.1.

Notes for Contractors.—The Joint Apprenticeship Committee of the N.J.I.C. is considering the first report of the Building Apprenticeship and Training Council with a view to formulating a comprehensive apprenticeship scheme for the electrical contracting industry. It is essential that the Committee shall be in possession of up-to-date statistics concerning both indentured and Category II boy labour at present within the industry, and members of the National Federated Electrical Association are asked to complete a form of questionnaire and return it to the director and secretary, Mr. L. C. Penwill, as early as possible.

The Cost of Living (War) Addition Declaration for the three months from the third pay day in January to the second pay day in April, 1945 (and for the pay period covered by those pay days) remains unaltered.

Attention is directed to a decision made by the E.L.M.A., with effect from January 1, 1945, that the list price of 80 W 5 ft. fluorescent lamps has been reduced from 30s. to 24s.

Amendment slips have been issued by the British Standards Institution to the following specifications: P.D. 295 to 587, 1940, Motor Starters and Controllers. P.D. 296 to 741, 1937, Flameproof Electric Motors. P. D. 298 to 170, 1936, Transformers for Power and Lighting. P.D. 299 to 168, 1926, Industrial Electric Motors and Generators.

Contracts Open

West Lothian C.C.—Electrical work required in the completion of 42 partly built houses in 11 blocks at Winchburgh. Particulars from Mr. J. G. B. Henderson, County Clerk, County Buildings, Linlithgow.

Belfast T.C., January 29.—Supply of four electric truck batteries, each of 20 cells, for the gas department. Particulars from the Manager, Gasworks, Ormeau Road, Belfast.

Eston U.D.C., January 29.—(1) Supply, erection and setting to work of a steel kiosk sub-station, complete with one 300 kVA power transformer and h. and l.t. switchgear; (2) supply and laying of about 600 yds. 15 l.t. 4-core cable. Particulars from the Electrical Engineer, Middlesbrough Road East, South Bank, Middlesbrough.

Frome U.D.C., January 31.—Supply and installation of an electrically driven centrifugal pump set capable of delivering 40 000 gall. per hr., together with electric motor, starting gear, etc., at Egford Waterworks. Particulars and form of tender from Mr. B. H. Parkes, Public Offices, Frome; deposit, of £2 2s.

Dundee T.C., January 31.—Supply of multi-core h.v. and l.v. paper and insulated cables. Particulars from the Corporation, City Chambers, Dundee.

Gellygaer U.D.C., February 3.—Supply and delivery of (a) indoor and outdoor transformers; (b) kiosk complete with switchgear and accessories; (c) e.h.t. and l.t. cable; (d) overhead line equipment and (e) wood poles. Specification from the Electrical Engineer, Electricity Offices, Hanbury Road, Bargoed, Glam.

Beverley C.C. February 13.— Supply, laying, jointing, connection to mains and sundry work in the installation of a new electric ring main cable to serve the Beverley Emergency Hospital. Particulars from County Architect, County Hall, Beverley.

Overseas

Galway, C.C., February 1.—Electrical installation at nurses' home extension, Central Hospital, Galway. Particulars from J. P. Tierney and Co., 44, Kildare Street, Dublin.

Company News

BENNIS COMBUSTION, LTD.—Intm. div. 5% (same).

BELFAST ROPEWORK CO. LTD.—Fin. div. on ord. 4½% (3½%), makg. 8% less tax (7%).

ANGLO-AMERICAN TELEGRAPH CO. LTD.—Blce. div. on ord. 1½% (same) for yr., mkg. 3¾%, and fst. and fin. on defd. of 1½% (same).

R. A. LISTER AND CO. LTD.—Fin. div. on ord. 5% (same) and bonus 6% (same) makg. 16% (same), less tax, for yr. to Sept. 30, 1944. Yr's. net pft. is announced as £127 735 (£136 839)

ELECTRICAL APPARATUS CO. LTD.—Net pft. to Aug. 22, £19 856 (£14 517). Gen. res. £5 000 (£5 500), pref. divs. £3 422, ord. div. 15% (same) £4 549, fwd. £30 290 (£23 405).

AMERICAN TELEPHONE AND TELEGRAPH CO.—Net income for qr. ended Dec. 31, of $41 119 000 ($2.13 per sh.) ($41 604 457, or $2.22 per sh.) Prelimy. report for 1944 shows net inc. $163 138 000, or $8.54 per sh. ($168 530 764, or $9 per sh.).

REDFERN'S RUBBER WORKS, LTD.—Fin. div. on ord. 6¼% and bonus 2%, mkg. 12% less tax for 1944 (same). Tradg. pft. for 1944, according to prelim. statemnt., £85 844 (£67 661). Net pft. after tax, was £18 210 (£19 334).

BENN BROTHERS LTD.—The directors of Benn Brothers, Ltd. (publishers of THE ELECTRICIAN) have declared a dividend of 3% on pref. shs. for the half-year ended December 31, 1944, and intm. div. of 5% on ord. shs. (same) both less tax, payable Feb. 15.

J. SAMUEL WHITE AND CO. LTD.—Tradg. pft. to Sept. 30 (after deprecn. and taxatn) £58 374 (£58 590), plus rents and transfr. fees £319 (£400), mkg. £58 693 (£58 990). To dirs.' fees £2 750 (same), net pft. £55 943 (£56 240). To war damage £2 966 (£2 244), defd. repairs £3 000 (£18 000), to genl. res. £25 000 (same). pref. div. £4 200, ord. div. 6½% £18 200 (both same) fwd. £12 126 (£9 549).

MANAOS TRAMWAYS AND LIGHT CO. LTD.—Operatg. recpts. to April 30, 1934, £87 092 (£93 690), plus exch. diff. nil (£125), int., etc., £228 (£664), debts written off now recovered £755 (£1 386), mkg., with £2 736 carried to blce.-steet, total £90 811 (£95 865). Operating exes. £84 746 (£77 109), renewals nil (£8 000), exch. diff. £494 (nil), London exes. £1 488 (£1 247), dirs.' fees £850 (same), taxatn. £1 954 (£7 394), deb. redemptn. £1 279 (£1 265), deb. int. nil (same).

E. K. COLE LTD.—The annual meeting was held at Aston Clinton on January 16. In the course of his address, Mr. W. S. Verrells, the chairman and joint managing director, said the accounts for the financial year ended September 30, reflected substantial progress in the activities of the company. The Ekco radio equipment had earned a high reputation both in the Supply Ministries and the operational services. During the past year the radio and television division had also joined in the co-operative effort between the radio industry and the Board of Trade in the manufacture and distribution of the company's quota of the "civilian war-time receiver." Closely allied with the radio work of the company was their plastics division, which had been expanded to meet the demands for component parts, not only for their own equipment but for that of many other contractors. The directors were mindful of the fact that before the war the radio industry as a whole, with the exception of one or two of the longer established companies, gave comparatively little or no attention to the development of export markets. Realising that in the national interest, for the welfare of industry as a whole, as well as in their own company's interest, post-war export trade must be developed to the utmost, the management intended to devote much of its energy to this end.

Metal Prices

Mon day, January 22.

	Price.	Inc.	Dec.
Copper—			
Best Selected (nom.) per ton	£60 10 0	—	—
Electro Wirebars ... ,,	£62 0 0	—	—
H.C. Wires, basis ... per lb.	9 5/16d.	—	—
Sheet ... ... ,,	10 7/8d.	—	—
Phosphor Bronze—			
Wire(Telephone)basis per lb.	1s. 0 1/16d.	—	—
Brass (60/40)—			
Rod, basis ... ... per lb.	—	—	—
Sheet ,, ... ,,	—	—	—
Wire ,, ... ,,	10 7/8d.	—	—
Iron and Steel—			
Pig Iron (E. Coast Hematite No. 1)... per ton	£6 18 6	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ... ,,	£27 10 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 ... ... per ton	£26 10 0	—	—
Foreign or Colonial ,,	£25 0 0	—	—
Tin—			
Ingot (minimum of 99.9% purity) ... per ton	£303 10 0	—	—
Wire, basis... ... per lb.	3s. 10d.	—	—
Aluminium Ingots ... per ton	£110 0 0	—	—
Spelter... ... ... ,,	£25 15 0	—	—
Mercury (spot) Warehouse ... ...per bottle	£69 15 0	—	—

NOTE.—Above prices are nominal only, no allowance being made for tariff charges, charges for insurance, etc. Prices of galvanised steel wire and steel tape supplied by Cable Makers Association. Other metal prices by British Insulated Cables Ltd.

Commercial Information

Mortgages and Charges

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

NATIONAL FIRE PROTECTION CO., LTD., Richmond (Sy).—Dec. 14, assignment, securing to Barclays Bank Ltd. all moneys due or to become due to the Bank; charged on contract moneys. *£38 685 Oct. 13, 1943.

DOWSING CO. (ELECTRICAL MANUFACTURERS) LTD., London, S.E.—Jan. 5, assignment, securing to Barclays Bank Ltd. all moneys due or to become due to the Bank; charged on contract moneys, *£500. June 20, 1944.

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.*

WARNER, Leslie C., Ashleigh, Penn Road, Penn, Wolverhampton, radio engineer. £20 11s. 10d. Nov. 14.

FEAVER, H. G. (male) 19, Stonecot Hill, Sutton (trading as British American Radio Service). £28 11s. 3d. Nov. 6.

COCKRILL (male), 46, Lea Hall Road Birmingham, electrical engineer (trading as Electrical Installation, (Birmingham)). £17 6s. 4d. Nov. 16.

JOSEPHS, J. (male), 34, Arnyards Road, Cobham, radio dealer and electrical engineer. £56 16s. 3d. Nov. 28.

Notices of Intended Dividends

WHISTON, George Stanley, 112, West Street, Crewe, Ches., electrical engineer. Claims to be sent by Jan. 29, 1945, to the trustee, Mr. Percy Manley Milward, 12, Lonsdale Street, Stoke-upon-Trent.

WAINWRIGHT, Basil Josolyne, 2, Hillcrest Gardens, Dollis Hill Lane, Cricklewood, N.W.2, lately carrying on business as "Wainwright Neon Displays," at 197, Wells Road, Shepherds Bush, previously at 14, St. Thomas' Road, Harlesden, N.W.10, electrician. Claims to be sent by Jan. 30, 1945, to the trustee, Mr. Percy Philips, 76, New Cavendish Street, London, W.1.

GLOSSOP, Arthur Austin, 33, Parkhead Crescent, Ecclesall, Sheffield, lately carrying on business at 7 and 12, Norfolk Market Hall, Sheffield, radio service engineer and radio dealer. Claims to be sent by Jan. 30, 1945, to the trustee, Mr. Arthur Harold Ward, 55, Queen Street, Sheffield, Official Receiver.

ELECTRICAL UTILITIES LTD., Rosedale Works, Rosedale Road, Richmond, Surrey. Claims to be sent by Jan. 31, 1945, to the liquidator, Mr. C. L. Walker, 10-11, Park Place, St. James's Street, S.W.1.

Coming Events

Friday, January 26. (To-day.)

I.E.E., N.W. CENTRE, RADIO GROUP.—Manchester. Informal discussion, "High Frequency Heating." *6 p.m.*

ILLUMINATING ENGINEERING SOCIETY (Birmingham Centre). — Imperial Hotel. "Trains Trust." *6 p.m.*

Saturday, January 27.

ASSOCIATION OF SCIENTIFIC PHOTOGRAPHY.—Caxton Hall, Westminster, S.W. "Electric Discharge Lamps for Photography," H. K. Bourne. *2.30 p.m.*

Monday, January 29.

I.E.E., S. MID. CENTRE, RADIO SECTION — Birmingham. "Television," Dr. D. C. Espley. *6 p.m.*

Wednesday, January 31.

I.E.E., N.E. STUDENTS' SECTION.—Newcastle-on-Tyne. Joint meeting with the N.E. Coast Institution of Engineers and Shipbuilders. "A Soviet Steel Works During the First Five Years Plan," Mr. Lasylo. *6.30 p.m.*

INSTITUTE OF WELDING.—Institution of Civil Engineers, Westminster, S.W.1. Discussion, "Welding in Higher Technical Education," opened by Prof. H. Wright Baker and H. Martin. *6 p.m.*

Thursday, February 1.

I.E.E.—London, W.C.2. "A Survey of X-Rays in Engineering and Industry," V. E. Pullin. *5.30 p.m.*

Friday, February 2.

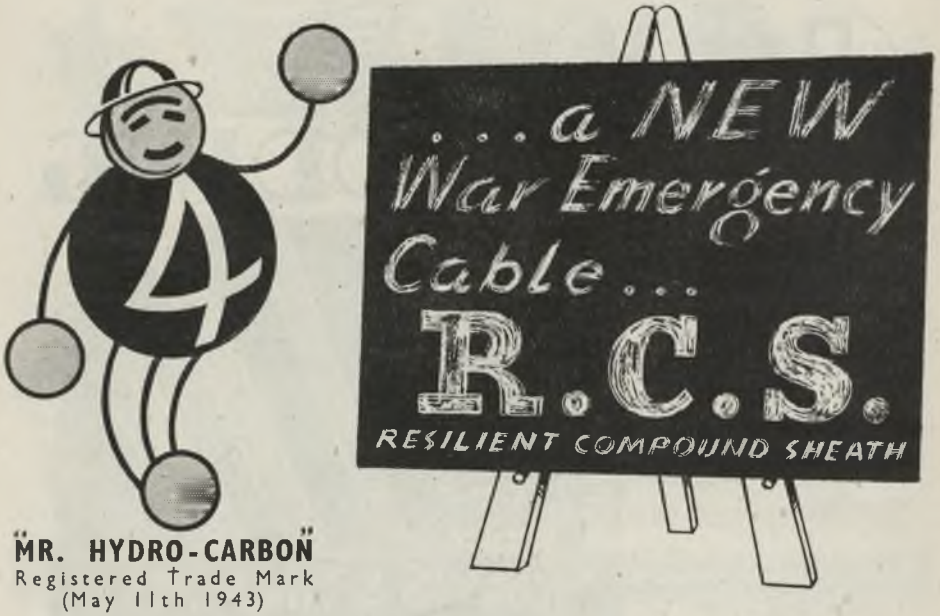
I.E.E., N.E. STUDENTS' SECTION.—Newcastle-on-Tyne. "Carrier Wave Telephony," C. A. W. Marriott. *6.30 p.m.*

ROYAL INSTITUTION OF GREAT BRITAIN.—London, W.1. "Metal Crystals and Crystal Strength," E. N. da C. Andrade, F.R.S. *5 p.m.*

Saturday, February 3.

I.E.E., LONDON STUDENTS' SECTION.—Lecture and demonstration of stage lighting at the Strand Electric and Engineering Co., Ltd., Floral Street, W.C.2. *2.30 p.m.*—I.E.E., N.W. STUDENTS' SECTION, Manchester. "The Students' Lecture," "The Cathode-Ray Tube and Its Applications," Dr. W. Wilson.

JUNIOR INSTITUTION OF ENGINEERS, N.W. SECTION.—Manchester. Annual general meeting. "Factory Management," F. Burgess. *2.30 p.m.*



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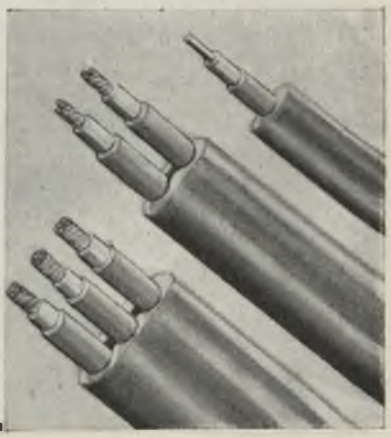

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