THE
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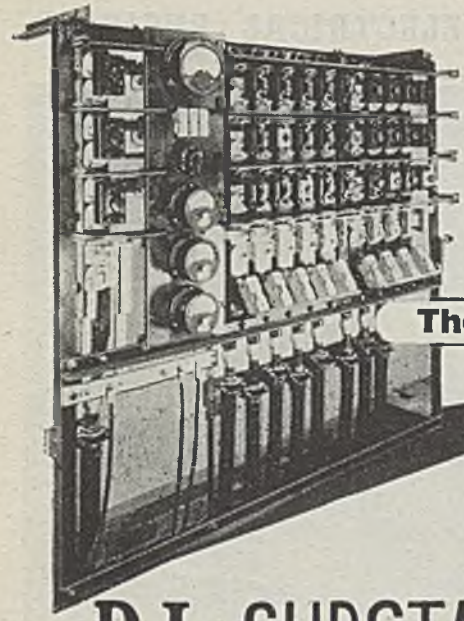

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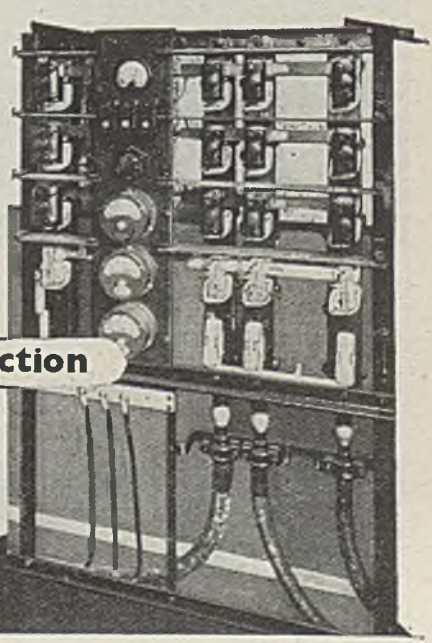

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Electrical Power Engineers' Association,
102, St. George's Square,
London, S.W.1,

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*CHIEF CONTENTS OF THIS ISSUE.*



## Coal Mining Report

THE electrical industry has for years advocated a more extensive use of electricity in the coal mines, and if any evidence is needed in support of that point of view, the Coal Mining Report published last week will supply it in plenty. The report has the distinction, compared with other recent publications on the same subject, of having been drawn up by a technical committee of mining engineers whose conclusions and recommendations are based on professional considerations, to the exclusion of political motives. For this reason the findings deserve more serious attention by the electrical industry than do most other reports on the coal mining situation, in that the conclusions reached are based primarily on sound engineering.

The report lends support to a degree greater than many may have expected, to the extension of public supply in substitution of generating stations serving individual mines, and says positively that new mines should be laid out on an all-electric basis, with consideration being given to the complete electrification of existing mines in the future. The wider use of electric drilling is advocated, though criticism is made of the design of plug connectors used with these drills. Electric and battery-driven locomotives find favour, and a recommendation is made for the removal of the embargo upon the former, imposed by the Electricity Regulations made under the Coal Mines Act of 1911. The present system of permitted underground lighting comes in for severe and well-deserved criticism, and a standard of lighting of the order of 0.4 f.c. in the general working is recommended, with a system of general lighting by power-fed lamps, supplemented by cap lamps, for lighting at the coal-face.

From the details given on p. 303, it will be appreciated that the recommendations directed towards the increased introduction of machinery, both at the coal-face and elsewhere below ground, involve the greatest use of electrically-driven machines, and this, it is anticipated, will lead to complication of the electricity distribution system. The present most common underground transmission voltage of 3 300 V may be sufficient to meet the growing load demands without undue losses at the coal-face, but there are circumstances in which an increase to 6 600 V may be beneficial; the variety of working voltages at present in use is, too, an economic disadvantage. Some form of standardisation on these points would not only permit the manufacturing costs of such equipment as motors and transformers to be reduced, but a greater degree of interchangeability of equipment between neighbouring collieries would be secured. The two most common medium pressure voltages now in use are 440 and 500 V, and the committee suggest that consideration should be given to the

adoption of one of these as standard. The report draws attention to the fact that though frequency has been largely standardised at 50 cycles, a number of installations still retain non-standard frequencies of 40 and 30 cycles.

### Coal-face Switchgear

THE chief problem to be solved, however, is distribution at the coal-face, for as the number of gate-end switches increases, their present design, it is claimed, will constitute a serious disadvantage. For example, a group of gate-end switches necessary to supply a double-unit conveyor face may weigh as much as 3 tons, and, when assembled, as is common practice, in one unit, cannot be moved without mechanical aid, and then only at the cost of considerable time and labour. The weight and dimensions of such switches have, in the view of the committee, generally been carried beyond reasonable bounds, and the provision of lighter switchgear for use at the coal-face is urgently necessary.

### Omissions of the Past

THE report makes it clear that the coal mining industry is now suffering from its failure to advance with the progress of engineering, and a vast programme of reconstruction of existing mines and the sinking of new ones is required. Its chief competitors are the Continental industries, and since these, for reasons which need not be gone into, have been able to command adequate financial resources, they have been able to carry out major technical improvements in coal winning. The British industry as a whole has been in a perpetual state of financial embarrassment, and the long-standing uncertainty surrounding the future ownership of the industry has not been conducive to expenditure on the long-term improvements necessary to raise the general efficiency of the industry. The failure of the industry to make suitable provision for the training of entrants, as is done in Holland and Germany, has also reacted against economic stability. However, with the Continental mines largely inoperative at their pre-war efficiency for some time to come, the British industry is presented with an opportunity for putting at least some of its house in order, and by giving favourable attention to what the engineering world has to offer, the opportunity may be enlarged upon before the Continent once again enters the market to any serious extent.

### Supply Cost Allocation

THE present instability of peak incidence lends special interest to a report which the E.R.A. has published on the subject of methods for allocating to classes of consumers the demand-related portion of the standing cost of electricity supply, and elsewhere in this issue will be found a communication from the association giving the substance of the report. In the early days of public electricity supply the capacity of a generating station was determined by the demand made by individual lighting consumers after dusk, when the collective demand reached its peak. Originating from Hopkinson's realisation of the dualism of the cost of standing and running charges of supply, what was called the peak-responsibility method, allocated demand-related cost according to the contribution of consumers to that peak. This method worked well until, owing to the appearance of peaks in the morning, or at mid-day, the concept peak became indeterminable. In the course of time many methods for meeting the difficulty were suggested, all of which were the subject of an earlier E.R.A. report which became the basis for the deliberations of a sub-committee of the association. The present report is the result of those deliberations and includes a new method which, it is claimed, is a refinement upon its predecessors.

### Two "Peak" Periods

CONSIDERABLE confusion has been caused at times by efforts to preserve a reasonable balance between equity and economic cost in allocating to classes of consumers the demand-related portion of the standing cost of electricity supply, and in order to translate as much as possible of the economic charge into a workable formula, in the E.R.A. method, only two sorts of period have been postulated, namely, an off-potential peak during which an absolute peak is unlikely, and a potential peak during which a uniform peak potentiality is assumed. This simplification of the facts is said to be justified on the grounds that it makes possible an easily workable

scheme superior to any employed hitherto, for arriving at cost allocation for internal costing purposes, and it is presented in the hope that it will promote healthy comment.

### A Revolutionary Proposal

THE highly developed overseas communications system in the United States depends for its efficiency as much upon private enterprise as does our own. The systems in both countries were conceived by private enterprise and their development made possible by commercial experimentation. That being so, the revolutionary proposal made by the Secretary of the U.S. Navy recently, that all overseas communication systems in the United States should be merged into one Government-supervised corporation, is likely to be unpopular. The reason for the proposals is based on an assumption that the success and security of diplomatic and military affairs depend so vitally on international communications, that a purely private corporation should no longer be allowed to handle official traffic. The proposed corporation would not apparently own domestic communication facilities, it would not engage in domestic operations, nor would it take part in the communication business of any foreign country, meaning we presume, that the whole of the traffic handled would be diplomatic or military in character. The proposal has about it a suggestion which the companies concerned must understandably resent.

### Scottish Power and Hydro Board

THE remarks made by Mr. WILLIAM SHEARER at the meeting of the Scottish Power Co., last week, included in addition to a review of the company's affairs, a criticism of the schemes projected by the Hydro-Electric Board of Scotland, and since the latter will affect the company's Grampian undertaking, the criticism was not altogether unexpected. The record of the Scottish company shows that it has steadily and economically extended its supplies and progressively reduced its tariffs, and any interference which may lead to disturbance of that progress is to be deprecated. Policy has been directed towards the elimination of less efficient undertakings, and the co-ordination of supplies in an area of some 13 000 square miles and the result has been lower charges despite heavily increased costs, especially as regards coal. Since the beginning of the war the capacity of the company's generating stations has been increased from 115 800 kW to 165 500 kW, and compared with 319 million units in 1938 the units sold during the war years have averaged 420 million per annum. The figure was over 516 million in 1943 and 468 million last year. Development after the war will be dependent upon the freedom of action accorded to the company, but commonsense dictates that its wide experience of supplying sparsely populated areas should be drawn upon to the full.

### Outlook of Grampian Company

AS the Grampian Company is among others, now prohibited from establishing any large new generating works on its own account, it is clear that in course of time it will be dependent upon the resources of the Hydro Board for such additional supplies as it will require to meet the demands of consumers. The future outlook, therefore, in regard to additional supplies is by no means free from anxiety. The Tummel-Garry project of the Hydro-Electric Board lies within the 1922 area of supply of the Grampian Co., and is designed to take advantage of the water control the company has established at considerable cost in its catchment areas. By all the laws of equity the substantial benefit which will accrue to the Board through the company's work and operations should therefore be recognised if the development is proceeded with.

### Contract for Loch Sloy

THE views expressed above with respect to the Scottish Power Co. and the Hydro-Electric Board, lend special interest to a report that a provisional contract of over £500 000 has been placed with the English Electric Co. for the main water turbines and generators for the proposed power station at Loch Sloy, Dumbartonshire. The company, it is understood, is already engaged on the design of these machines and arrangements are being made with it for supply of materials and manufacture of component parts to be put into the hands of Scottish firms to the maximum extent. Loch Sloy, it will be remembered, is intended to supply not only local requirements but to export power to the Lowlands through the grid.

# Electrical Affairs in South Africa

## Views on Local Industry—Orlando Power Station

THE low net annual output per worker in South Africa compared with other Dominions was commented upon by Mr. L. H. L. Badham, in his presidential address to the annual meeting of the South African Institute of Electrical Engineers in Johannesburg on January 25, 1945. Quoting from a table published in the official year book for 1941, giving an international comparison of factory returns, he said that in the Union the figure was £261 for the year 1938-39, against £366 in New Zealand, £360 in Australia, and £457 in Canada. The average wage for Europeans in the Union exceeded that of the others, while the average wage for all races was much lower, the non-European frequently being inefficiently employed at a very low wage.

### War-time Revelations

South African industry must take stock of itself to determine how to improve its overall efficiency. Unspecialised services and products should be the goal of the small factory, by which means concentrated experience became available. The engineering industry of South Africa had shown during the war what was possible with a comparatively small nucleus of skilled personnel. The Union, however, had not been able to keep fully abreast of the latest technique, and it would be necessary to exchange skilled men with other countries. The practical training of the university graduate who desired to enter the engineering industry had not received sufficient attention in South Africa.

Information has been received from the South African High Commissioner in London that United Kingdom authorities have authorised the release of plant with a total capacity of 186 500 kW which is required in the Union by 1947. Since the war began supplies of heavy plant from the United Kingdom have been restricted. Other sources of supply, owing to their geographical position were unable to fulfil their orders to the Union, with the result that plant in most of South Africa's large undertakings is in need of replacement. A committee to be known as the Electricity Generation and Distribution Committee has been formed, with the collaboration of the Director-General of Supplies to co-ordinate the Union's war-time requirements of generation and distribution plant and to assess post-war needs.

Work is proceeding with the construction of a new h.t. transmission line between the Witwatersrand and Pretoria, and it is understood that the supply is to ease the steadily increasing load on the generating facilities in Pretoria.

In a paper presented to the South African Institute of Electrical Engineers, Mr. G. J. Privett said that Johannesburg's Orlando power station was designed at an estimated total cost of £2 438 050, to meet the growing needs of the Union's largest city. The station has been designed to attain a reasonably high degree of efficiency with the class of coal obtained from the Witbank and district coal fields. The steam conditions are 600 lb. per sq. in. and 800° F. at the turbine stop valve. The station itself is on the north side of the dam, the basement level of turbine and boiler houses being 32 ft. above " full " level of the dam. The site and surrounding land being municipal property, there was no restriction on the area required for the layout and the plans prepared allowed for extension as required. The present section is a part of what is termed the " first half " of the station and certain civil engineering works have been carried out to fit in with the completion of this first half, which is of a designed capacity of 150 000 kW. The second half, should it eventuate, could be constructed as an extension to the existing plant, or departures made to include any improved features in line with future developments in power station design. The turbo-generation plant consists of three 30 000 c.m.r. turbo-alternators, each with a short-period rating of 37 500 kW for one hour once in 24 hours. The normal running conditions are 3 000 r.p.m.; 50 cycles and 0.8 p.f. (lagging). After a number of setbacks due to losses of components at sea, the first set went into service early in 1942 but it was not until October, 1943, that the second set was commissioned. The condensing plant, alternator and various other parts of the third set, have been on site for some time and completion of this set awaits the arrival of the turbines.

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**Dismantling Air-raid Shelters.** — The question of dismantling electrical equipment in 200 air-raid shelters is being considered by the Stockton-on-Tees T.C. The Electrical Engineer has suggested that the internal wiring should be removed and the underground cables from which the supplies were taken, be made good. The total cost would be about £800. The Civil Defence Authorities, it is stated, proposed that only the meters should be taken from the shelters and the electrical cables left in position. The Council has drawn the attention of the Civil Defence Authorities to the danger of carrying out this plan.

# Standing-Cost Allocation in Supply

## Communication from the E.R.A

THE cost of electricity supply can be related to a number of different quantities. Some items, such as fuel or losses in distribution, are approximately proportional to the number of kWh. Some, such as metering and servicing, can be related to the number of consumers, others to distance, etc. But a considerable portion of the cost is directly proportional to the maximum demands made upon the generating, transmission, and distribution systems. The correct allocation of this portion is, therefore, of great importance.

However, it is also of special difficulty, not found with any of the other allocations. Cost proportional to system kWh is naturally allocated to the kWh taken by the consuming party, with a suitable allowance for losses. Since these kWh are usually metered, no difficulty or ambiguity can very well arise. Cost related to the number of consumers can be allocated *per capita* for all consumers of a given class, and so on. But cost related to system m.d. cannot be so allocated, since no one knows exactly what is the contribution to system m.d. of any particular consumer or class of consumers. If one allocates it to the individual m.d., this is merely begging the question, not answering it.

The question is—what is the effect on the system m.d. of a particular component load, and how is that amount of cost which is a function of system demand to be allocated amongst the contributing loads? An attempt to answer this question is contained in a report* just published by the British Electrical and Allied Industries Research Association.

### Cost and Maximum Demand

It deals exclusively with demand-related cost, or more precisely cost directly proportional to the m.d. on a supply system or part of a system, and attempts to allocate this cost amongst the chief classes of consumers making up the total load.† It does this on a purely scientific (i.e., objective) cost basis, that is, it endeavours to find what expenses the undertaking is really put to by the load in question. It presents the results by way of a formula, but makes no suggestions as to what use should be made of it. Above all it does not concern itself in any way with tariffs.

The history of the subject is briefly dealt with and reference made to the very detailed résumé of past methods published by the association simultaneously.‡

The report points out that in the days when the annual peak resulted from the simple overlap of domestic lighting and industrial power, its occurrence could be foretold both in time and magnitude with some accuracy. Under such circumstances the " peak-responsibility " method was perfectly satisfactory. Loads occurring or liable to occur at this time were allocated their share. Off-peak loads were defined with equal ease, and carried no allocation of demand-related cost.

At the other extreme, if the m.d. on the system is just as likely to occur at any one moment as at any other, the " demand " method can be used with perfect correctness, and has the advantage that it is extremely simple to implement. Each component m.d. is then measured just whenever it happens to occur, and cost is allocated to it at a uniform rate per kW or kVA. This rate is, of course, lower than the rate per kW or kVA of system m.d. in the ratio of the collective diversity factor.

### A Wrong Supposition

It is easy to see that neither of these simple hypotheses corresponds in the least to the facts in modern supply systems. Ignorance of when the peak will occur completely invalidates the " peak-responsibility " method, and on systems with well developed domestic loads the peak may occur at any time during waking hours from December to February, even, on a Sunday. On the other hand, it is just as wrong to suppose that every hour of the year is equally dangerous, and that 2 a.m. in June is as likely to conjure up a peak as 8 a.m. in January. Yet the " demand " method is based on just this supposition, and however convenient it may be as a device for sharing-round the expenses, it is in no sense a cost allocation.

After reviewing these and a number of other methods (some of which seem to be based on subjective considerations, such as " equity " or " fairness," and not on cost at all) the report proposes a method

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* Ref. K/T109: " An Improved Method of Allocating to Classes of Consumer the Demand-Related Portion of the Standing Cost of Electricity Supply." Price 9s.

† The report does not actually deal with the individual consumer in the class, but once the class allocation is determined it is a comparatively simple matter to employ similar methods in order to break down this total into the individual allocations.

‡ Ref. K/T106: " Methods of Allocating to Classes of Consumers or Load the Demand-Related Portion of the Standing Costs of Electricity Supply." Price 13s. 6d.

of allocation embodying two main principles, namely "potential peak-responsibility" and "consumption responsibility."

The argument underlying the first principle is that which is commonly used to justify the simple "peak-responsibility" method. Putting aside all ulterior considerations, such as justice or expediency, the simple cost criterion is: Does an additional kW or kVA at the point in question put the undertaking to extra expense or does it not? At first sight this appears to lead unmistakably to the peak-responsibility method, and even though ignorance of peak times makes it inapplicable, the principle still holds. The peak must come some time, and when it does, all loads on at this time incur demand-related cost, and the remainder do not.

But on further examination, this simple picture in black and white is seen to be incorrect. If followed strictly, and all loads outside this single annual peak period have no demand-related cost allocated to them, there is a possibility that in the future these other loads may produce a peak at quite another time. These other loads, in fact, may have an appreciable peak liability, and this accounts for the peak tendencies characteristic of so many modern load curves. Demand-related cost must, therefore be allocated not only to the loads which actually cause the peak in any particular year, but to all those loads which appear capable (under discernible trends) of producing a peak in the future and so of causing demand-related expenses.

### The E.R.A. Method

The basic assumption of what may be called the "potential-peak-responsibility method"—or, as in the report, the "E.R.A. method"—is that there are certain fairly extensive periods of the year during which a peak is liable to occur, and other periods when it is extremely unlikely. The former are called potential peak periods, and the latter off-potential-peak periods, and they share the year between them. For convenience, in the E.R.A. method, a uniform liability is assumed throughout the former periods and zero liability throughout the latter.

That is to say, a flat rate per kW or kVA of highest demand is allocated to demands occurring during the potential peak periods, and no account is taken of demand outside these periods. The choice of times will depend on the undertaking and the particular system or part of system concerned. For instance, the potential peak period might be assumed to comprise the hours from 8 a.m. to 11 p.m. of all the days of December, January and February.

The second major principle on which the E.R.A. method is based may be termed "consumption responsibility." It acts as a weighting device by which the allocation is to some extent made a function of the load factor in respect of the potential peak periods. The demand method is characterised by an average diversity allowance—i.e., since the aggregate of the component m.d.'s exceeds the simultaneous m.d. on the system, the magnitude of the allocation per kW or kVA is reduced in the ratio of the two values. But in fact, diversity cannot be a uniform average for all. A 100 per cent.-load-factor component can have no diversity whatever, whilst a 1 per cent.-load-factor component is likely to have a very high diversity, since its peak is so short-lived and occurs so seldom that it has a high probability of missing the time of system peak. The higher the component's load factor, i.e., the more frequent and longer-lived its peaks, the greater is its likelihood of adding to the system peak, and the lower its potential diversity.

### Individual Load Factor and Diversity

This inverse relationship between individual load factor and individual diversity is a matter of both common experience and common sense, and the practice usual in two-part tariffs of shifting some of the burden from the standing to the running charge, although apparently empirical and commercial in its origin, has in fact a sound cost-basis.

These two principles are carried out in the E.R.A. method as follows. Part of the demand-related cost is allocated at a uniform rate per kW or kVA of highest demand occurring within the potential peak periods, whilst outside this time-belt no allocation is made. The remainder of the demand-related cost is allocated as a kWh rate and spread over the consumption occurring within the potential peak periods. It might be thought that the division of the cost into these two parts would necessarily be arbitrary, but that is not the case. There are some component loads whose costs are definitely known, for instance a uniform (100 per cent.-load-factor) load necessarily monopolises a certain amount of plant and thus incurs a known amount of demand-related cost. By making the equation give the right answer in this extreme case, the correct constants are obtained for the general application.

The report admits frankly that the method proposed is far from perfect, and that a more scientific allocation could be made by zoning the potential peak periods to correspond to different degrees of potentiality. The method, in fact, contains within itself the seeds of its own improvement, but in the meantime it is put forward as an easily applied system which is an improvement on those usually employed. It adheres as closely as a simple method can to the basic cost consideration, and can

at least be described as " a device with the minimum of shortcomings."

In addition to describing the theory and practice of the E.R.A. method, the report shows exactly what data are required, and how reasonable assumptions can be made from the figures normally available. It also gives a detailed example of the practical application of the method.

In a further communication it is proposed to give details of the actual cost formula and its mathematical implications.

# Distribution Must Do or Die

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

CONTRARY to the time honoured testament, which bids the populace not to harken to false prophets, the purveyors of promiscuous propaganda are again subjecting public credence to prefabricated promises of a Britain abundant with cheap electrical energy. One cannot but wonder as to what will be the outcome of these promises and the hopes to which they give rise. In the years prior to the war, similar promises did more to jeopardise the popularity of electricity than did any omission in energy supplies, and the ill-conceived predictions placed various electricity authorities in an onerous predicament. Indeed, the stigma of scantily promoted electrification schemes still remains, and the time is fast approaching when the responsible parties will have to fulfil their promises or suffer a censure unprecedented in the history of public utility service. But, so various interested parties declare, electrical development has been phenomenal within the past quarter century, as is evidenced by the enormous increases in consumption and consumers. Yet, surely, it is nought but an evasion of the facts, to use the admittedly paramount progress to conceal or justify those no less vital projects which have so far been allowed to remain mere promises. For the moment, consider the outstanding commitments of the past, thereby to be better able to assess the extent of progress and the lack of it.

With the conception of the grid network in 1927, the whole country was led to believe by a popular Press in an abundance of electric power, by which to develop industries and modernise domestic life. Two years later the same Press offered hopes of an extensive electrification of the railways, thereby to gain more speedy travel and greater facility to remote places. In 1935 the public were promised a sufficiency of all-electric houses, and the community envisaged a future blessed with devices for the minimising of domestic drudgery. By these projects, it was reasonable to anticipate widespread economic advancement and a greater freedom from the " pea-soup " fogs so long the smoke-borne product of belching chimneys. True, before the war plunged the country into a turmoil of urgent national service, some small materialisation of these hopes had come about, but the extent of this materialisation was only a tithe of what was promised. In fact, the absence of adequate electric power resources has been greatly manifest of late, and even the grid authorities have expressed alarm, lest the future does not provide their network with the essential energy. Thus, it is not surprising, that the rural cock still crows upon the heath of antiquity and the urban dweller is denied the " golden egg " of full utility service. For the urban dweller there is every likelihood of early improvement, if the future matures along the lines of the past, rural life will long be barren of betterment. But, partly as a result of the prospect of vast power from Scotland's waters, the clarion call from prophetic trumpets is again—" Electricity for all." Indeed, there is even the proclamation, that Scotland will benefit by becoming the power-house for south of the Tweed.

How a wholesale transmission of power to south of the border can benefit Scotland has not been explained, if there is any logical explanation, and the local feeling is, that Scotia is again likely to chitter in the breeze of industrial activity outside her domain. It is not untrue to state, that the local public are sceptical of the counter assertion, that the Scottish hydro-electric power will be used solely for the development of the Highlands, and to attract new industries to Scotia's numerous commercial estates. But, whatever the future may bring, the hydro-electric project is (as in the case of the grid) being regarded in terms of transmission, and not from the all important viewpoint of distribution. The problem of distribution is seemingly to be the duty of local (and not so local) supply authorities, and their concern will be—as formerly—delivery costs. Thus, with various long distance distribution systems now not paying their way and with little likelihood of early improvement in revenue, the supply authorities will either have to continue their philanthropic function or refuse to give supplies to divers areas.

According to statistics, the disposition of urban and rural areas is as follows :—

*Entire country* :—92 per cent. of the total area and 22 per cent. of the population, with an average density of 115 persons per square mile. Of the 10.7 million houses in urban areas in 1939, nearly 8 million or 74 per cent. were electrically supplied, and of the 2.25 million houses and 400 000 farms, approximately 1.25 million and 35 000 respectively were supplied.

*England and Wales* :—89 per cent. rural, of which 25 per cent. is woodlands, moors, and mountainous; density 150 persons per square mile.

*Scotland* :—94 per cent. rural, of which 75 per cent. is woodlands, moors, and mountainous; density 55 persons per square mile.

These figures give rise to grave doubts, as to the chances of various rural areas becoming electrified, and certain Government officials have already declared that it cannot be an economic commercial proposition to supply electric power to more than 50 per cent. of the rural territories. By this, it would appear, that the hamlet and croft dweller must perforce exist in oil lamp and stage coach environment, simply because it is not regarded by the powers that be as economical to bring the modernity of utility services to those areas.

The wick lamp with its grime and gloom was in use in the country of 1780 A.D., as also was the hand-pump with its lack of hygiene and the open fire grate with its reeking smoke. These conditions, and others no less out-dated, still exist among many of those long-suffering rural communities without whose labours the peoples of city and urban areas could not survive. The need for full public utility services in rural areas is not merely a matter of providing amenities for their own sake, but is more a case of giving to our rural kinsfolk the same conveniences and welfare as accorded to city communities.

### Distribution Costs

It is realised that the costs of energy distribution are high (approximately 2.5 times those of generation), and they have heretofore made it uneconomic for certain local supply undertakings to extend their networks beyond certain limits. But it cannot continue to be the answer to the public need simply to assert that denial of full rural electrification is the inevitable consequence of uneconomic distribution costs. The consumer (and prospective consumer) is not concerned with a maze of statistics relating to generation and distribution costs, but is vitally conscious of his and her right to participate in the collective national welfare to which the rural community contributes no small part. It is, therefore, appropriate to provide for the fullest practicable distribution of electrical energy, so that the ultimate public demand for improvement may not result in measures detrimental to those supply undertakings whose past activities have been so commendable. The provision indicated may necessitate a measure of State subsidy, in order that the initial development may be rapid and of reasonable financial proportions, but, such co-operation between the Government and the local supply undertakings must be based upon the long term public need and not upon immediate mercenary profit to any party.

The provision of public utility services in equal measure for all persons need not imply uneconomic working, since a proper survey would enable the public need to become a closely collective demand and not the far-flung diversity of to-day. It is thus timely for the Government, the local authorities and utility undertakings to formulate tangible means of catering for the national need. For surely, if the service to the community fails in its worthiness and effect, then a change in the organisation responsible for it is called for.

## Rural Electrification

IN an address on the electrical aspects of farm mechanisation, before a large audience of farmers at Chester, on March 20, Mr. C. A. Cameron Brown, declared there had been extensive mechanisation in farm processes, but in none of that major farm mechanisation had electricity taken any prominent part. The war had produced a greatly increased appreciation of the need for, and the value of, good ancillary equipment in and around farm buildings. He gave many examples of how electricity had helped in many farming operations.

Mr. S. E. Britton, Chester city electrical engineer, said that of the 89 parishes in the Chester Corporation area of supply, 33 were 100 per cent. electrified. The Corporation had 5 247 rural consumers, whereas in 1936 there were only 3 525. There were 124 miles of h.t. lines and 300 miles of l.t. lines; income on capital outlay was 37.4 per cent. On a 320 acre farm there were 26 electric motors of 106 H.P. using 50 000 units per annum. That farm had 61 different electrical appliances including an electric killer and an electric mattress. Another farm had 32 electric appliances, including an electric adding machine. An adequate supply on farms at an economical rate had been one of the greatest benefits offered to farming for two generations. He feared politics were playing too effective a part in the general development of electricity supply to the detriment of the consumer.

# Coal Mining Report

## Technical Advisory Committee Advocate Electrification

THE report, just issued, of the Technical Advisory Committee appointed by the Minister of Fuel and Power to examine the present technique of coal production and to advise what technical changes are necessary to bring the industry to full technical efficiency, is of particular interest to the electrical industry.

### All-Electric Mines Recommended

Of outstanding significance is the recommendation that new mines should be laid out on an all-electric basis, and wherever practicable, the complete electrification of existing mines should be seriously considered. The committee also recommend that a careful examination should be made of generating stations serving individual mines to determine whether their continued operation is warranted, or whether they should be replaced by a central generation station, or by public supply.

Among the conclusions arrived at from a comparison of conditions in the coal industries of certain other countries with those in Britain are that Continental industries have been able to command adequate financial resources with which to carry out major technical improvements, and have also been helped by more favourable taxation arrangements than in Britain. The British industry, as a whole, has been in a perpetual state of financial embarrassment, and the long-standing uncertainty surrounding the future ownership of the industry has not been conducive to expenditure on long term improvements necessary to raise the general efficiency of the industry.

In Britain, in contrast to the Continent, sizes of coal are not standardised nor qualities adequately classified. An excess multiplication of qualities and sizes, especially in relation to house coals, has had unfortunate effects upon the efficiency of mining and surface operations.

The British mining engineers have often been handicapped by the short-term view of the employers and have not usually enjoyed the technical independence evidently allowed to mining engineers on the Continent. Far too few of them, however, appreciated the extent of the reorganisation required, either because of an unduly conservative outlook, or because of lack of awareness of what needed to be done.

Dealing with the cutting and drilling of coal, the committee state that important improvements in electric drilling have been made in recent years, and there is no doubt that the modern British high-speed electric drill is a most efficient machine. There is need, however, for improvements in the design of plug connectors used with these drills in the interests of safety. The need for compressed-air drilling will be rare, and electricity should be employed wherever possible.

The difficulty of efficient distribution of compressed-air power in Room and Pillar mining, and the great inconvenience which is caused by the use of hoses, instead of the trailing cable used for electric power, if the machine has to be flitted, make the use of electricity essential.

There is no doubt, state the committee, that the trolley locomotive provides the most efficient form of underground traction available, and this fact, taken alone, creates a *prima facie* case for its use. Its high efficiency, compared with other types, is due to the fact that, as its motive power is derived from an external source, its size increases less rapidly with an increase in power compared with other types. Moreover it has a high overload capacity. The load it can draw, and the gradient it can negotiate, will, therefore, always be appreciably greater than with other types. This characteristic may not always be of decisive importance, but very large tonnages will, in future, have to be drawn over increasing distances, and it will thus become a matter of great importance that the most efficient form of traction should be available. In such circumstances, it seems to us that a clear case exists for the removal of the present embargo upon trolley locomotives imposed by Regulation 136 (a) of the Electricity Regulations, made under the Coal Mines Act, 1911, and we consider that, subject to special regulations in each individual case, they should be permitted. Unless they are permitted we think that preparations for undersea and other extensive developments will be seriously prejudiced, since the type of haulage to be installed must be settled before the layout of the mine can be planned, and the gradient of the roads decided upon.

### Battery: Electric Locomotion

The committee express the opinion that a properly designed storage battery locomotive should be as safe in operation as the Diesel locomotive, and add that the use of the storage battery locomotive should be permitted in both intake and return airways, under General Regulations, subject to the same conditions in regard to firedamp content of the air as for diesel locomotives.

Signalling systems in this country, states the report, have been developed almost exclusively to meet the needs of rope haulage, and whilst many are satisfactory, the

efficiency of some leaves much to be desired. This is particularly true of the commonly used bare-wire system which demands a high standard of maintenance. The enclosed, or insulated system, requires less maintenance and reduces delays, but it necessitates the provision of contact makers at each signalling point and does not furnish the same measure of control throughout as the bare-wire system, although this may be overcome by providing pull-wire control between successive contact makers. This system has been developed especially for use with man-riding haulages. The introduction of locomotive haulage requires a different system of signalling, essentially based on visual signals in conjunction with a suitable telephone system affording communication between haulage junctions.

### Underground Lighting

With reference to lighting, the Committee state that there is no doubt that the standard of underground lighting is still too low, and reacts adversely on production, safety and health. As regards production, experience on the Continent shows that increased output follows increased illumination, and similar results have been obtained in surface factories. Inadequate illumination is a thief of time and money; makes vision slow and uncertain; increases effort and slows up the rate of working; results in the loading of dirtier coal; and renders more difficult the satisfactory operation of the increasing amount of mechanical equipment in use underground. A minimum standard of lighting of the order of 0.4 f.c. in the general working area should be aimed at.

### Cold Cathode Discharge Lamp

Recently it has been shown by the Safety in Mines Research Board that the "cold" cathode discharge lamp is incapable of igniting firedamp when the bulb is broken. This form of lighting is safer and may be designed to give a pleasanter light, free from glare, than the conventional filament bulb, and consumes much less power. The results from the preliminary trials have been promising. Experiments are also proceeding with the possibility of employing the more efficient "hot" cathode discharge tube, and manufacturers are now engaged in improving the design of the fitting for discharge lighting On the Continent mains' lighting on the coal face is extensively employed, although this is facilitated by the comparatively small use made of shotfiring. In Britain the advantages of mains' lighting have not been adequately recognised, and its dangers have been over-emphasised. It should be employed on a larger scale. Mains' lighting on the face should receive serious attention and should not be abandoned simply because of initial difficulties. We are convinced, add the Committee, that perseverance in this matter is necessary and that if there is real interest on the part of the industry suitable equipment will be developed.

We consider that if electricity is permitted on the face for any purpose there is a *prima facie* case for permitting mains' lighting also, provided suitable precautions are adopted in the choice, installation and maintenance of the equipment. We accordingly consider that permission to instal electricity on the face should include its use for lighting from the mains, subject to proper safeguards; and should not have to be the subject of special regulations for each installation, as is now the case.

We have no doubt that a higher standard of lighting outbye from the face is required and that the benefit of such lighting would repay the expense and trouble involved. The technical difficulties in the way of providing power-fed lighting outbye are much less than those existing at the face, and there is correspondingly less excuse for inadequate provision. At every point where power is being used, there is a convenient opportunity for power-fed lighting.

### Superiority of Electricity

In the summary of conclusions the Committee state that from the standpoint of efficiency in distribution and use, electricity is undoubtedly superior to compressed air, and for the intensive Room and Pillar system of mining, and for serving the high-powered machines in Longwell mining, it will be essential. Permission to use electricity should depend primarily upon the general standard of ventilation. The aim must be to make the mines safe for electricity rather than to install machinery which can be safely worked in badly ventilated mines. The provision of lightweight switchgear of simplified design, for use at the coalface, is a matter of urgent necessity. The draft Electricity Regulations are unreasonably restrictive in relation to recent developments and should be carefully reviewed and amended before they are established.

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### E.A.W. CONFERENCE

The twentieth annual conference of the Electrical Association for Women is to be held on April 19 at the Institution of Electrical Engineers, Savoy Place, London, W.C.2. At 2 p.m. the annual meeting will take place, followed by an address by the Rt. Hon. Lord Brabazon of Tara at 3.30 p.m. The Dowager Lady Swaythling will be in the chair. The proceedings will conclude with tea at 4.30 p.m.

# Earth Fault Protection—I

By TESTAX

THE function of the direct earthing protective system used in most motor installations is, of course, to ensure that the metallic framework of the plant, cable sheating, etc., is not allowed to remain at a dangerous voltage in the event of leakage due to faulty insulation. This is necessary in order to avoid possible risk of electric shock, and fire which might result if the framework voltage under fault conditions caused current to leak through some accidental high resistance path to earth.

In order to satisfy these conditions with direct earthing the framework must be connected to earth by means of a conductor of low resistance which is large enough to carry with safety, and low voltage drop, sufficient current to operate the excess current protective trips or fuses protecting the circuit. The possible earth fault current on an a.c. motor circuit depends on the voltage to earth of the supply and is limited by the impedance or resistance of the generating plant or transformer, supply line from supply plant to fault, section of motor windings in circuit between motor terminal and fault, consumer's earthing conductor and earth electrode, the earth between consumer's and supply plant earth electrode, supply plant electrode and its connecting conductor. Neglecting the portion of the conductors and earthing circuit which is outside the control of the consumer and which is generally of fairly low impedance, it will be seen that the maximum possible earth fault current which can flow is equal to

$$\frac{\text{Supply Voltage to Earth.}}{\text{Resistance of Consumer's Earthing Conductors and Earth Electrode.}}$$

This must be more than the melting current of the protective fuses or overload trip setting. Direct earthing protection involves much more stringent requirements for large motors than for smaller machines. In the case of a 200 H.P. 400 V three phase motor (230 V to earth) the overload trips may be set at about 350 A so the resistance of the earthing circuit should not exceed $\frac{230}{350} =$ 0.655 ohm, whilst in the case of a 2 H.P. motor protected by fuses melting at 10 A the protective fuses should operate with an earth circuit resistance of up to 23 ohms.

**Typical Earthing Faults.**—Typical faults on earthing circuits which may render the earthing circuit inoperative or unreliable are earth wires disconnected from apparatus or water pipes; broken, corroded, or loose earth wires; inadequate size of earth wires; inefficient bonding of cable sheathing or conduit to apparatus. Too often one finds that the enamel has not been properly cleaned from metal such as conduit nuts and apparatus when the plant is installed. Contact resistances are apt to be rather high between iron and iron and, on lead sheathed and armoured cables, one sometimes finds two or three iron to iron contact surfaces in series between the cable sheathing and the apparatus. The resistance of the connection may then be appreciably higher than that of the cable sheathing itself, especially if the parts are even slightly loose. Such series of iron to iron joints should preferably be bonded across by copper wire or strip, especially on high current plant. Where a number of items of switchgear are screwed together it is advisable that a copper conductor be bonded right from the main incoming cable to the furthest outgoing cable, including the apparatus in between, instead of using several individual bonds between the various items so there are several connections in series. The $C^2R$ heating at a high resistance connection may introduce a risk of fire on a heavy current circuit.

### Industrial Installations

In many industrial installations the actual resistance to earth of the consumer's earthing circuit is unknown so there is no assurance that the protective gear will operate on earth faults. It should be appreciated that a high resistance earth connection may allow the whole of the framework of the connected plant to become alive at a dangerous voltage in the event of an earth fault on one item. The resistance of the earth electrode may vary from time to time depending on the amount of moisture in the surrounding soil and may also increase due to chemicals in the soil.

In practically all industrial installations the framework of the plant will make some sort of accidental contact with earth, possibly due to conduit being supported by the steel framework of the building or even due to the motors standing on damp concrete floors. From a consideration of the earthing arrangements on many premises the writer is driven to the conclusion that these fortuitous earthing paths are sometimes more effective than the intentional connections, which perhaps explains why there are, in fact, so few serious accidents due to faulty earthing. If the earthing circuit has too high a resistance to pass sufficient fault current to operate the overload trips or fuses, the leakage current may continue to flow until the defect is noticed, perhaps by a shock being received, and the current is then switched off by

hand; or until the insulation becomes so damaged that a short circuit occurs between phases and causes the trips to operate on short circuit current. If there is no connection of the framework to earth the faulty insulation will, in most cases, only be discovered due to some unfortunate person receiving a shock.

**Potential Gradient of Earth Electrode.**—When d.c. flows between an earth electrode and the earth, electrolysis may cause the creation of a thin film of gas round the elec-

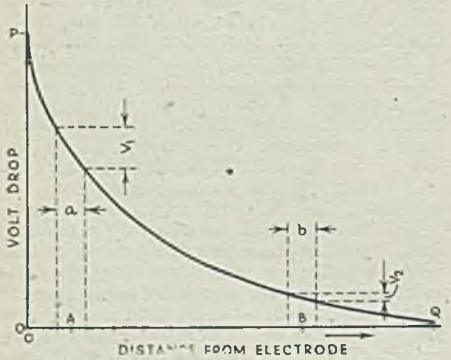



**Fig. 1.—Volt drop in vicinity of earth electrode with current flowing to earth**

trode, which causes the effective resistance of the electrode to be higher with d.c. than with a.c. The contact resistance at the buried surface of the electrode is, however, normally quite low, and the principal resistance between an electrode and the earth in general is due to the actual resistance of the soil in the vicinity of the electrode.

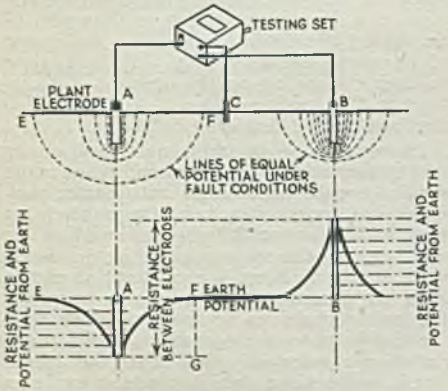



**Fig. 2.—Earth electrode resistance tests**

Earth fault current raises the voltage of the electrode above that of earth and it is very desirable that this voltage shall be low. It is also of importance that the difference of voltage, or potential gradient, existing between points of unit distance apart on the surface of the ground near the electrode shall be low under fault conditions, otherwise there may be a risk of shock to persons or animals standing near. Actually the dimensions of the earth electrode determine the potential gradient, so that a large electrode is desirable; whilst the resistance between the electrode and earth depends partly on the size of the earth electrode and partly on the specific resistance of the soil. When deciding upon a site for an earth electrode it is useful to make preliminary tests of the specific resistance of the soil in various positions.

The potential gradient in the vicinity of the electrode can be measured with a voltmeter when current is passing between the electrode and earth, and if curves of the voltage between the electrode and earth are plotted the results may be somewhat as indicated in Fig. 1. Generally the potential gradient $\frac{V_1}{a}$ at a point such as A near the electrode will be much greater than the

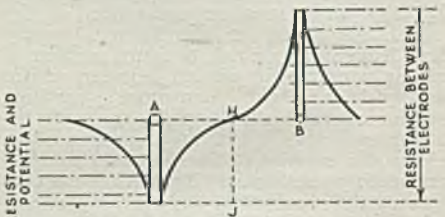



**Fig. 3.—Effect of inadequate spacing between electrodes during tests**

gradient $\frac{V_2}{b}$ at the point $B$ some distance away. This follows from the fact that the surface area of each shell of earth round the electrode increases with the distance from the electrode. The results may, however, be modified by variation of specific resistance of the soil and by the presence of water or other conducting materials in the vicinity. The I.E.E. Regulations define the resistance area of an earth electrode as that area of ground round the electrode within which a voltage gradient measurable with ordinary commercial instruments exists when the electrode is being tested; so the resistance area would be bounded by a point such as Q in Fig. 1.

**Tests of Earth Electrodes.**—In order to test the resistance between an electrode and earth a steady alternating current should be passed between the plant electrode A (see Fig. 2) and an auxiliary electrode B placed at a distance from A. A second auxiliary electrode C, which need not be of very low resistance, is used midway

between A and B, by means of which the voltage drop between A and the earth can be measured. The resistance of A is then equal to

$$\frac{\text{Voltage from A to C}}{\text{Current passed from B to A.}}$$

The testing current may be obtained at power frequency by means of a double wound step down transformer, using a voltmeter having a resistance of about 200 ohms per V; or with a.c. from an earth testing instrument comprising a hand-driven generator and a direct reading ohmeter, as in Fig. 2. During the tests the electrode A should be disconnected from all other sources of supply than that used for testing. Two or more permanent electrodes, which are bonded together under normal conditions, are useful to enable tests to be carried out without interrupting the connection between the plant and earth.

The results of the tests could be plotted in the manner indicated in Fig. 2, the total resistance to earth of A being equal to

$$\frac{\text{total voltage from C to A}}{\text{current from B to A}}$$

the boundary of the resistance area of A being at E and F where the potential curve flattens out. If the spacing between the electrodes is too small during these tests the curve will fail to flatten out between A and B, as indicated in Fig. 3. This indicates that the resistance area of B lies within that of A and the calculated resistance HJ will be less than the actual resistance FG in Fig. 2. It is, of course, only necessary to take a single reading of voltage and current, or of the testing ohmeter, in order to measure the resistance of A, if it is certain that the electrodes are wide enough apart. In practice in order to ensure this is the case the I.E.E. Regulations suggest that two more readings be taken, one with B 20 ft. nearer to A and one with B 20 ft. further from A. If the three readings are substantially in agreement the mean of the readings may be taken as the resistance of A. If not, the electrode B should be moved further from A and the tests repeated.

It is suggested that when testing an earth electrode consisting of a driven pipe or rod, that the auxiliary current electrode B should be about 80 ft. from A, 200 to 300 ft. away for testing an electrode comprising several plates or rods in parallel, and 500 to 600 ft. away for a large distributed electrode having several pipes, rods, steel structures, and water mains, etc., bonded together. It is not necessary for the three electrodes to be in line provided the resistance area of B does not overlap that of A and that C does not lie in either. It should be noted that the resistance of the electrode may vary from time to time so that periodical tests are advisable. It should also not be overlooked that, during fault conditions the soil near the electrode may become somewhat dried, so that due allowance should be made for such a factor.

**Earthing Regulations.**—The I.E.E. Regulations require the resistance of each earth continuity conductor to be not more than 1 ohm from the connection to the earth electrode to any other part of the installation. In general, compliance with this requirement is not difficult, provided the earthing conductor is large enough and the cable sheathing or conduit has tight clean joints. The earthing conductor should have a cross-sectional area of not less than half that of the largest conductor protected, subject to a minimum size of 0.0045 sq. in., and a maximum of 0.1 sq. in. The I.E.E. Regulations also require that every effort be made to make the consumers earthing resistance (sum of continuity resistance and electrode resistance) low enough to allow sufficient fault current to operate the overload trips or fuses in the event of an earth fault. This requirement may prove rather difficult in the case of large motors. It is, of course, of assistance in this connection to use the smallest possible size of fuse and lowest overload trip setting, and to ensure that the overload trips are not rendered inoperative due to stiffness of switchgear, rough contacts, weak springs, sticking no-volt trips, faulty hold-on catches, and the like. For the purpose of calculation, the maximum possible earth leakage current may be taken as equal to

$$\frac{\text{Supply voltage above earth}}{\text{Consumer's total earthing resistance neglecting other portions of the fault current circuit.}}$$

The I.E.E. Regulations accept direct earthing protection when this maximum possible leakage current is less than the operating current of the excess current protective devices, and also for circuits rated up to 100 A where the metalwork is earthed to an urban system of underground metallic water pipes having metal to metal joints. If it is not practicable to make the earth connection to the main water pipe at the point of entry to the building the pipe must have low resistance joints and the product of the pipe resistance, from the point of entry to the earth connection, and the overload trip setting (or melting current of the fuses) must not exceed 40. This ensures the potential difference along the pipe under fault conditions cannot exceed 40 V. Where these conditions cannot be complied with the I.E.E. Regulations require the fitting of an earth leakage protective device which will disconnect the live conductors if the voltage above earth of the framework of the plant exceeds 40 V.

This device may be used in addition to, or instead of, direct earthing, and may be used on the main or on individual circuits. The I.E.E. Regulations suggest that the earthing circuits be tested at intervals of not exceeding 5 years.

It is of interest to note that the Quarry Regulations call for the cables to be sheathed with metallic covering having a conductance of not less than half that of the same length of the largest of the live conductors contained therein, with bonding conductors of not less than 0.022 sq. in cross-sectional area across the flexible conduit which may be used at motors. It is also required that all the metallic structures requiring earthing shall be connected to one or more earth plates by a conductor having a cross sectional area of not less than 0.022 sq. in. Another requirement is that, where the system is not connected to the same earth plate or plates as are the metallic structures, that the several earth plates shall be linked by a conductor (of not less than 0.022 sq. in. sectional area) unless the resistance between the several earth plates is not more than 2 ohms. If the system earth plate is not accessible to the consumer the electrical resistance of the consumer's earth plate must not exceed 2 ohms. It is further required that tests shall be made at intervals of not more than six months. The Quarries Regulations also call for the current in any a.c. circuit, over 125 V for portable apparatus or 650 V for other apparatus, to be controlled so that an earth leakage current of 5 A or 15 per cent. of the rated current (whichever is the greater) shall cause automatic isolation of the circuit.

# Substitute Materials

## Examples of American Assistance to Meet Service Needs

ON Tuesday, March 27, the technical Press were granted the opportunity of inspecting what had hitherto been a secret exhibition where, for the past three years, Service experts and industrialists had studied a selection of substitute materials lent by the United States in order to help the British production of Service equipment. The exhibition, which was organised by the United Kingdom Commercial Corporation, was held at Berkeley Court, London, N.W.1, and terminated on March 31. The exhibits numbered approximately 1 500, and included packing materials, fibrous products, a wide range of plastics products and processes, glass, textiles, metals and leather; the cost of the research and development work is estimated at over £10 000 000.

Among the many exhibits on view were samples of Foamglass, which it is believed has vast possibilities for use in the insulation of refrigerators on board merchant vessels, owing to its lightness and buoyancy (Pittsburgh Corning Corpn.). Another item was a fluorescent envelope for reading charts on 'planes and ships; this is an envelope of cellulose acetate, dyed with a fluorescent material which gives a glow when placed under ultra-violet light (J. M. Gordon, N.Y. City). Other exhibits included samples of extruded plastics (Carter Production Corpn., Ohio); plastic duct for wiring systems (Pierceway Laboratory, N.Y.); navy cable containing fibre glass (Owens-Corning Fibre Glass Corpn., Chic.); electric sealing-iron for hermetically closing germ-proof paper bags (Reynolds Metals Co.); all-synthetic conveyor belt (Hewitt Rubber Corpn., Buffalo); copper-wire covered with an insulating coating of thermo-plastic material by a process called tensulation (Tensolite Corpn., N.Y. City).

Other exhibits were screwless moulded "Victory" plugs (Eagle Electric Mfg. Co., N.Y. City); celanese insulated tape (Celanese Celluloid Corpn., N.Y. City); insulating solution—Insl-X-33—for coating parts in replacement of rubber, also used for coating electrical component parts (Insl-X Co., Brooklyn); cast plastic tools for forming aluminium sheets in the aircraft industry, made of "Thermocast," a new plastic based on a hot melted ethyl cellulose composition compounded with plasticisers, resins, pigment fillers and other ingredients (Ernest Bischoff and Co.); "Plexon" fabric for, among other uses, conveyor belts for dehydrating machinery (Rayon Export Corpn. and Freyburg Bros. Strauss); a preparation of aluminium alloy surfaces for spot welding (Kelite Products Inc., Los Angeles); "Tygons"—plastic materials used for non-insulating tape, compression mouldings, flexible valves, metal clips for cable suspension, etc. (Stoneware Co., Ohio); plastic moulded parts including moulded fuse holders, "Tenite" cap and plug for oil lines, and moulded handwheel welding equipment (American Moulding Co.); metal sprayers (Metallizing Engineering Co., Inc., N.Y.); G.B. plastic moulding powder for moulding plastic insulating material (B.G. Corporation, N.Y.); "Versiflex" plastic tubing and electrical connectors called "Hylugs" (Burndy Engineering Co., Inc., N.Y. City); plastic electrode holder for welding (Golden Rod Equipment Co., Calif.).

# News in Brief

**Ilford Kitchen Unit.**—The Electricity Committee reports that over 1 000 persons visited the post-war kitchen unit at the central showrooms.

**Gainsborough Scholarships.**—It is announced that Marshall, Sons and Co., Ltd., who formed a technical school in Gainsborough 70 years ago and maintained it until four years ago, have made a gift of £100 towards a scheme for providing scholarships for technical students in the county.

**Fleetwood Bungalow Equipment.**—The Corporation has decided that the town's 100 prefabricated bungalows shall be equipped with electrical appliances throughout.

**New Sub-station Sites.**—At the request of the West Hartlepool Electricity Committee, the Borough Electrical Engineer is to report on sites for the erection of further sub-stations.

**Hospital Installation.**—The Chester Health Committee has arranged for the Electrical Engineer to improve the electrical installation at the city hospital at a cost of £450.

**Change of Address.**—King's Refrigeration Supplies Co. inform us that as from March 23, they have moved their offices to 24, Holborn, London, E.C.1. Tel. Holborn 4011. Stores and trade counter have been accommodated at 22, Middle Street, E.C.1.

**Lighting Protest.**—St. Clears P.C. is protesting against the action of the West Cambrian Power Co. in refusing to supply modified street lighting without a special payment per lamp, and against the high tariffs for private lighting.

**Rateable Value Reduction.**—The Rotherham Electricity Committee is to seek a reduction in the rateable value of the undertaking on account of reduced profits.

*TWENTY-FIVE YEARS AGO*

*FROM* THE ELECTRICIAN *of April 2, 1920: Dundee Electricity Committee has adopted the proposal of the City Electrical Engineer to charge for electric current according to the living-room space occupied. The term "living-room" includes all rooms with the exception of bathrooms, sculleries and outhouses. The "guarantee system," though satisfactory so far as most consumers were concerned, had given rise to disputes which could not occur under the new system. The proposed tariff is 2s. per 100 sq. ft. per quarter.*

# In Parliament

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

*Electricity Installation Charges.*—Mr. De la Bere asked the Ministry of Fuel and Power whether, in connection with the installation of electricity in farms and buildings in the rural areas, he will consider convening a meeting of the electricity undertakings throughout the United Kingdom with a view to abolishing the high charges for installation and long term guarantees which are at present demanded by many undertakings. Mr. Tom Smith, who replied, said electricity undertakers were under no statutory obligation to afford supplies to individual premises situated more than 50 yards from a distributing line. This point was one of the matters which was being taken into account in the general reorganisation of the industry now under consideration by H.M. Government.

*Road Traffic Signals.*—In reply to Sir W. Bass who asked the Secretary of State for the Home Department whether, in view of the altered lighting regulations in London, he would now give instructions for all the masks to be totally removed from the traffic-control lights in the Metropolitan area, Mr. H. Morrison said the possibility of removing masks from traffic-control lights was one of the lighting relaxations which received regular consideration but he could state nothing further for the time being.

*Electricity Supply (Hotham, Yorkshire).*—Col. Carver asked the Minister of Fuel and Power if he was aware of the demand of the village of Hotham, in the East Riding, for an electricity supply, and, as the place adjoins the mains of the North Lincolnshire and Howdenshire Electricity Co., if he would consider the removal of restrictions there in order to benefit this agricultural and rural community. Mr. T. Smith, in reply, said that during the war it had been necessary, owing to shortage of labour and materials, to restrict the development of electricity supplies to cases of hardship and the requirements of the war effort which had, of course, included those of agriculture. He regretted that it would not be possible to remove these restrictions in this particular case, without removing them for the country as a whole, and he was not yet in a position to say when this could be done.

# Electrical Personalities

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

**Mr. A. A. Yardley,** who has been appointed by Ferranti, Ltd., as their London area meter sales manager, was with the Hove electricity department for three years. He joined the staff of Ferranti, Ltd., in July, 1924, and has represented the meter sales department in Scotland, Ireland and North East England. During the war he has been engaged upon liaison work with Government departments.

Mr. A. A. Yardley

**Air Chief Marshal Sir Wilfrid Rhodes Freeman** has been appointed a director of Babcock and Wilcox, Ltd.

**Viscount Margesson** has joined the board of International Combustion. He is a director of the General Electric Co., Ltd.

St. Pancras Electricity Committee has appointed **Mr. W. H. Matthews** as chief commercial assistant at a salary of £650 a year. He has been in the service of the council for 30 years.

The Minister of Supply has agreed to release **Mr. G. S. Samways** from his appointment as Director of Electricity Supplies. He will still be available in an advisory capacity.

The Council of the I.M.E.A. has nominated **Alderman Sir William Walker** as president of the association for the year 1945-46, and **Mr. J. S. Pickles**, county electrical engineer, Dumfries, as vice-president.

The directors of the North British Rubber Co., Ltd., have appointed **Mr. G. A. Findlay** and **Mr. J. L. Cornfoot** to the board. Mr. Findlay is at present general sales manager and Mr. Cornfoot secretary of the company.

**Mr. J. P. Hallam**, engineer and manager of the Manchester waterworks department, retired on superannuation on March 28. He had been responsible for the electrification of the hydraulic power pumping station and the installation of generating plant at Haweswater works.

The Council of the British Institute of Radiology incorporated with the Röntgen Society, have nominated for the ensuing session, 1945-46, Dr. L. H. Clark as President; Prof. W. V. Mayneord, Lt.-Col. R. Boulton Myles and Dr. E. Rohan Williams, past presidents; Prof. G. Stead, Dr. D. W. Smithers and Lt.-Col. Hugh Davies as vice-presidents.

**Sir Lawrence Bragg,** Cavendish Professor of Experimental Physics at Cambridge University, gave a lecture at the Fondation Universitaire, in Brussels, on science and technical work in relation to civilisation. Professor Gérard presented him with the foundation's medal.

**Mr. C. H. Grindrod,** who has served the Manchester municipal transport undertaking for 40 years and has been chief electrical engineer to the department for 10 years, retired on superannuation at the end of last month. He designed several power and lighting installations for the department, including the overhead trolley line anti-flashing device during the war.

**Engineer Rear-Admiral J. Kingcome** has been promoted to Engineer Vice-Admiral and appointed Engineer-in-Chief of the Fleet in succession to **Engineer Vice-Admiral Sir Frederick R. G. Turner,** who has had to relinquish the appointment because of ill-health. Engineer Vice-Admiral Kingcome has been both Assistant Engineer-in-Chief and Deputy Engineer-in-Chief before succeeding to the highest post. He is 55 years of age and entered the Navy in 1905.

Lord Vansittart was the principal speaker at the meeting of the Radio Industries Club, held at the Connaught Rooms, on March 27, Sir Noel Ashbridge (the president) was in the chair. Among others present were: Sir Robert Renwick; Sir Harry Railing; Sir Louis Sterling; Mr. F B. Duncan (chairman, Radio Industry Council); Mr. H. de A. Donisthorpe (chairman of the club); Major V. Z. de Ferranti and Captain S. R. Mullard.

## Obituary

**Mr. H. W. E. Hall,** manager of the Sheffield office of the British Thomson-Houston Co., Ltd., on March 23, aged 63 years. He joined the B.T—H. Co., in Sheffield, in October, 1899. For many years he held a responsible position at the B.T-H. Sheffield office, being chief assistant to both Mr. A. Lucas and Mr. O. S. Nichols. On the death of the latter, he was appointed manager.

Mr. H. W. E. Hall

# Electricity Supply

**Manchester.**—The Electricity Committee is to provide a new rectifier in connection with the trolley-bus service.

**London.**—The Metropolitan Water Board is to install electric pumping plant at Amwell Hill at a cost of £375.

**Barrow-in-Furness.**—Sanction to borrow £5 000 for the completion of the change-over, is being sought by the Electricity Committee.

**York.**—The Electricity Committee is to provide supply to a farm at Beningbrough, at a cost of £800, of which the prospective consumer will contribute £400.

**Wallasey.**—The Electricity Committee reports that for the year now concluding, there is likely to be a surplus of £4 604 on the undertaking, instead of an estimated deficiency of £1 750.

**Middlesbrough.**—The T.C. has approved in principle a suggestion by the Borough Electrical Engineer that future council houses should be wired to meet electricity needs for the next 10 years.

**Chester.**—The Electricity Committee is to provide a supply to farmers and others in the parish of Rushton at a cost of £1 500, and extend the supply in the Lache area at a cost of £9 900.

**Henley-on-Thames.**—Estimates amounting to £1 400 have been prepared for the T.C., in conjunction with the Wessex Electricity Co., for renewal of normal street lighting during the ensuing financial year.

**Manchester.**—The estimated income of the electricity undertaking for the year to March 31, 1946, is £2 853 000, or an increase of £304 000. Expenditure is put at £2 827 000, or £222 000 more than for the present year. The increased expenditure is mainly due to the high cost of fuel and advances in wages. The estimated surplus for the year is £25 800, compared with a deficit of £56 000 for the current year.

**Tribunal for Tummel-Garry Project.**—Mr. John Cameron, who was in charge of the recent inquiry into the objections made to the first constructional scheme of the North of Scotland Hydro-Electric Board relating to projects at Loch Sloy, Lochalsh and Morar, is one of the members of the tribunal appointed by the Secretary of State for Scotland to hold an inquiry into the objections made to Constructional Scheme No. 2 of the Board, which has been approved by the Electricity Commissioners and covers the Tummel-Garry project and a small project at Gairloch. The other members of the tribunal are Sir Robert Bryce Walker, who was County Clerk of Lanark from 1923 to 1938, and Major G. H. M. Brown Lindsay, Convener and Deputy-Lieutenant of East Lothian. It was stated in the House of Lords last week that it was for the tribunal itself to determine the date of the hearing, but it would be impossible, owing to the shortage of counsel, for the inquiry to be properly conducted on behalf of the various parties while the courts were in session.

# Contracts Open

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

**Keighley T.C.,** April 6.—Supply and delivery of four 40 kVA 6 600/400 V 3 phase transformers. Specification from Mr. G. F. Moor, Electricity Offices, Coney Lane, Keighley.

**Manchester Electricity Department,** April 7.—Supply and delivery during a period of 12 months of service cut-outs (Spec. 819), and cables (Spec. 820). Particulars from Mr. R. A. S. Thwaites, Town Hall, Manchester; deposit £1 1s.

**Birkenhead T.C.,** April 7.—Supply and delivery of 8 rectifier type stationary charging equipment for 24 and 12 V omnibus batteries. Specification from the Transport Manager, Laird Street, Birkenhead.

**Littleborough U.D.C.,** April 10.—Supply and delivery of one 500 kVA indoor type transformer. Specification from Mr. G. Hill, Council Offices, Littleborough.

**Glasgow Lighting Department,** April 14.—Supply of electrical fittings, from June 1, 1945, to Mar. 31, 1946. Specification from the Lighting Department, 20, Trongate.

**Tees-side Railless Traction Board,** April 20.—Supply of two 300 kW mercury arc rectifiers and associated equipment. Specification from the Clerk to the Board, Municipal Buildings, Middlesbrough; deposit, £5 5s.

**Cleethorpes T.C.,** April 21.—Supply, delivery (and erection of high tension, low tension switchgear) for the following: (a) H.t. switchgear; (b) l.t. switchgear; (c) 500 kVA transformer and (d) h.t. cable. Specification from Mr. B. S. Lord, Electricity Showrooms, Grimsby Road, Cleethorpes.

# Industrial Information

**Irish Industrial Training School.**—The Government of Northern Ireland has decided to establish its first industrial training school for which the training and trades to be served will be determined after consultation with employers' and workers' organisations in accordance with post-war industrial requirements.

**Smokeless Zones.**—Proposals for ending the smoke nuisance by the setting up of smokeless zones are described in a new booklet published by the National Smoke Abatement Society. In such zones the emission of any smoke would be an offence. Copies of "Smokeless Zones" may be obtained from Chandos House, Buckingham Gate, London S.W.1, at 3d. each, post free.

**House Service Units.**—The engineering supplement to the Siemens' Magazine for February and March deals with house service units, and some of the types introduced by Siemens Brothers and Co., Ltd., which have received favourable consideration, are described and illustrated. Kitchen units, controlling cookers and other domestic apparatus, and cartridge fuses are also discussed.

**Peace-time Production.**—With reference to the announcement that the Board of Trade have allocated 19 factories for peace-time production, Brookhirst Switchgear, Ltd., state that in their case this refers to a small factory adjacent to their main switchgear works. The main Brookhirst switchgear works will be fully engaged on the production of switchgear for special purposes until those demands are satisfied.

**B.I. Pocket Book for Wiremen.**—In an attractive black cover with gold lettering, this pocket book, issued by British Insulated Cables Ltd., contains useful data on copper wires and strands, flexibles, the carrying capacity of cables, fuse wires, amperage of motors, capacity of conduits and other information including extracts from the I.E.E. Regulations and a short description of some of the B.I. wiring systems.

**Water Resources of Canada.**—The Dominion Water and Power Bureau, Surveys and Engineering Branch of the Department of Mines and Resources, Canada, has published volumes 87 and 90 of the Water Resources Papers, which deal with the surface water supply of Canada. The first contains the results of investigations by the Dominion Hydrometric Survey in the provinces of New Brunswick, Nova Scotia and Prince Edward Island for the climatic years October 1, 1938, to September 30, 1940, and the second the results of investigations in British Columbia over the same period.

**Mould Growth Test.**—The Saxonia Electrical Wire Co., Ltd., have forwarded the following report from the Ministry of Supply giving the result of a mould growth test on Insu-glass conductors: "Five samples from No. 20 s.w.g.—No. 40 s.w.g. Insu-glass (unvarnished) conductors were submitted to C.I.E.M.E., and these were tested for resistance to mould growth under tropical conditions, and after 28 days no trace of mould growth was found. Insu-glass covered wires therefore comply with the conditions laid down in C.I.E.M.E. instruction T/HO/19/1."

**N.F.E.A. Publications.**—The following publications under the heading "Wages and Working Conditions of the Electrical Contracting Industry," have been issued by the National Federated Electrical Association: (1) A 44 page booklet, dated January, 1944, entitled "Industrial Agreements and National Working Rules" inclusive of amendment slips as below, price 1s. per copy; (2) amendment slips (reference "A" to "G" inclusive), bringing the contents of (1) above up to date to May, 1944, price 6d. per set; (3) amendment slips (reference "H" to "O" inclusive) which, together with (2) above, bring these booklets up to date to October, 1944, price 6d. per set. The charges are inclusive of postage.

**Notes for Electrical Contractors.**—Arising from the revocation of the Discharge Lamp Lighting (Control) (No. 1) Order, 1943, it has now been agreed that (1) the non-manufacturing members of the Electric Discharge Lamp Auxiliaries Committee will receive authorisation from the Ministry of Supply permitting them to acquire power factor correction condensers; (2) all distributing members of the Electric Discharge Lamp Auxiliaries Committee will receive a licence from the Ministry of Supply permitting them to distribute either directly or through trade channels to the user, such condensers as may be ordered for the power factor correction of electric discharge lamp circuits. Certain members of the Electric Light Fittings Association who have previously received licences will receive licences to acquire and dispose of these condensers. The effect of this arrangement will be that the user, the contractor and the electrical wholesaler will no longer need to obtain licences. The need to exercise discretion in the installation and use of power factor correction condensers still exists.

# Company News

A. C. Cossor, Ltd.—Intm. or ord. 3% tax free (same).

Coventry Machine Tool Works, Ltd.—Fin. div. 4.8% mkg. 8% (same).

South Wales Transport Co., Ltd.—Div. on ord. 5%.

Urban Electric Supply Co., Ltd.—Fin. 4% (same), mkg. 8% (same).

Joseph Lucas and Co., Ltd.—Intm. div. 2½% (same), on ord., payable May 14.

Electric Supply Corporation, Ltd.—Fin. on ord. 6½% (same), mkg. 10% (same).

Wellworthy Piston Rings, Ltd.—Intm. div. 5% (same), payable Apr. 23.

Windermere and District Electric Supply Co., Ltd.—Pft. 1944 £5 715. Brot. in £5 517, ord. div. 10%. Fwd. £6 062.

Quebec Power.—Net pft. 1944 (after tax) $508 058 ($572 164). Taxes $378 181 ($376 801). Earned per sh. $1.02 ($1.03).

South Wales Power Co.—Fin. div. on ord. 4% (3½%), mkg. 6% less tax for yr. (5½%).

Pye (Ireland).—Pft. 1944, after deprecn., £783 (£959). Taxn. £3 142 (£2 862). Fwd. £6 383 (£5 282).

Kansas Gas and Electric.—Net income (after taxes) for 1944 $1 212 390 ($1 309 219).

Enfield Cable Works, Ltd.—Fin. div. 6½%, mkg. 12½% less tax, both same. Net pft. for 1944 £115 894 (£117 206).

National Boiler and General Insurance Co., Ltd.—Rev. balce. 1944 £52 224 (£56 642). To res. £20 000 (£30 000).

Wessex Electricity Co.—Co. is payg. to Edmundson's Electricity Corporation fin. div. 3% (same), mkg. 5% less tax (same).

Illinois Power.—Rev. 1944 $28 384 606 ($26 710 863). Net inc. (after tax) $2 690 305 ($3 276 019). Earned per prefd. sh. $5.56 ($6.77).

Pacific Telephone and Telegraph (U.S.).—Gross income 1944 $127 992 571 ($118 895 003). Net $20 652 032 ($20 590 204).

Westgate and Birchington Gas and Electricity.—Rev. 1944, £3 418; int. on invstmts. £28. Tax, £1 772; int. on deposits, £7; fwd. £5 589 (£3 922).

Associated Electrical Industries, Ltd.—Dealing permission has been granted in £1 022 330 £1 8% cum. pref. stk. of Associated Electrical Industries.

Manganese Bronze and Brass Co., Ltd.—Fin. div. on ord. 17½%, mkg. with intm. 25% for yr. (same). Net pft. £151 161 (£230 405), before tax £104 000 (£172 500).

Shrops. Worcs. and Staffs. Electric Power Co.—Fin. divs. on " B " ord., 3% (same), mkg. 5½%, less tax. for 1944 (same). Fin. div. on " A " ord. 4%, mkg. 8%, less tax (same).

Wm. Beardmore and Co., Ltd.—Fin. div. on ord. 7% (same), mkg. 10% (same). Net pfts. for 1944, £177 345, £12 323 decrease. Dirs. recommend £100 000 (same), to war contings. res.

Cambridge Instrument Co., Ltd.—Pft. 1944 (after tax) £45 574 (£49 049). To pensions £1 000 (gen. res. £1 600), dirs.' fees £850. Div. 15% (same) and bonus 3d. (6d.), both tax free, fwd. £11 539 (£11 400).

Mersey Power Co., Ltd.—Net rev. 1944 £387 549 (£357 386). Brot. in £76 465 (£121 777), and from overestimated costs in prev. yrs. £104 128. To taxes £115 000 (£136 878), deprecn. and renewals £299 207 (£199 921). Ord. div. 8% fwd., £85 596.

Mid-Cheshire Electricity Supply Co., Ltd.—Net rev. £102 918 (£104 090). Brot. in £19 563. Inc.-tax £42 364 (£40 737), deprecn. and renewals £17 831 (£16 279); pensions £5 000 (same), employees' bonus £2 500 (same). Ord. div. 8% (same). Fwd. £25 253.

A. A. Jones and Shipman, Ltd.—Net pft. 1944 £23 122 (£17 637). Brot. in £28 263 (£47 419). War damage £501 (£950), dirs.' fees £500 (same); note redemptn. £2 537 (£700), note int. £1 089 (£1 120). Pref. div. £1 894, gen. res. £10 000 (£30 000). Ord. div. 10% (same). Fwd. £33 833.

Columbia Gas and Electric Corpn.—Consd. gross rev. of subsids. $137 829 875 ($140 922 757), net rev. (after taxes) $24 993 460 ($25 553 327), blce. for parent co. $19 670 946 ($20 084 522), to exes. $2 056 305 ($1 633 209); net income $13 709 726 ($14 137 012), to prefd. divs. $6 453 640 (same), earned on common $7 256 086 ($7 683 372).

Woking Electric Supply Co.—Net rev. 1944 £104 942, plus int. £3 139 and £4 565 brot. in, mkg. £112 647. To inc.-tax £27 277, deb. int. £9 433, 6% cum. pref. div. £3 000, 7% " C " cum. pref. £3 500, 10% " C " cum. pref. £5 000, intm. ord. 3%, tax free (same), £4 435, deprecn. and renewals fund £22 191, res. £20 000, war damage contributn. res. £5 000, fin. ord. 4½%, tax free, £6 653, fwd. £6 158.

American Telephone and Telegraph.—Prelim. rept. for 1944 shows operatg. rev. $230 192 000 ($209 575 761), to operatg. exes. $145 343 000 ($130 197 042). Federal taxes $60 984 000 ($51 780 000); net operatg. income $23 865 000 $27 598 719), add div. net income, etc., $162 390 000 ($165 178 937); total income $186 255 000 ($192 777 656), to int. $23 117 000

($24 246 892), net income $163 138 000 ($168 530 764), to divs. $171 924 000 ($168 478 336); deficit $8 786 000 (surplus $52 428).

PACIFIC TELEPHONE AND TELEGRAPH.—Total operatg. revs. 1944 $221 600 042 ($203 982 763), exp. maint., etc., $121 253 029 ($106 844 226), deprecn. and amortisatn. $24 685 674 ($24 096 503). Fedl. income-tax $10 331 354 ($10 122 814), excess pfts. tax $23 590 130 ($21 189 684), other taxes $17 006 004 ($16 132 672). net operatg. income $24 733 851 ($25 596 864), total income $23 943 480 ($24 800 194), interest $2 753 370 ($3 418 182), net income $21 190 110 ($21 382 012), pref. divs. $4 920 000 ($4 920 000), com. divs. $15 382 812 ($15 382 812), surplus $887 298 ($1 079 200).

### Company Meetings

COVENTRY GAUGE AND TOOL CO., LTD.—At the annual meeting held at Coventry on March 28, Mr. H. H. Harley, C.B.E., the chairman, said the company's total turnover in 1944 was more than five times that of 1938. The number of employees has grown from approximately 750 in 1938 to approximately 5 000 in 1944. During the year 1944 wages and salaries paid by the company amounted to over £1 500 000.

HOOVER LTD.—The annual meeting was held at Greenford on March 23. Mr. C. B. Colston, chairman and joint managing director, in the course of his address, said the progress of the company had been very satisfactory. Prior to 1939, the company was dependent upon arrangements with the associated companies for research and development. At the outbreak of war they started their own research department, which had done valuable work and would be continued. A large proportion of the equipment manufactured during the war was either entirely designed or adapted by them. The demand for the company's products after the war would probably exceed the supply. How long this would last depended largely upon controls.

BRITISH MECHANICAL PRODUCTIONS, LTD.—The adjourned annual meeting was held in London on March 23, Brig.-Gen. R. F. Legge, the chairman, presiding. In the statement circulated with the accounts the chairman said the expansion of the company's business would inevitably mean an increase in capital. The directors were giving consideration to this important matter in association with the Philco Company, and shareholders might expect to hear about this within the next few months as part of a general scheme of refinancing of the Philco group. Developments and research had also been provided for by the company in conjunction with P.R.T. Laboratories, Ltd., which was the central research organisation of the Philco group. He was pleased to be able to report that there had once again been an increase in the company's turnover.

INDIA RUBBER, GUTTA PERCHA AND TELEGRAPH WORKS CO., LTD.—In the course of his address at the annual meeting held in London on March 28, Sir Walrond Sinclair, K.B.E., the chairman, said notwithstanding the difficulties which faced the rubber manufacturing industry as a whole and the company's own special problems, he looked forward with the greatest confidence to their company successfully taking its proper place in post-war reconstruction and development and contributing its full quota, as it already had to the national effort during the period of the war.

ERICSSON TELEPHONES, LTD.—The annual meeting was held in London on March 29. Sir Harold A. Wernher, the chairman presided. In the statement circulated with the report and accounts the chairman said the company's output last year was again well maintained, every part of the plant contributing its quota to this. While they would continue to concentrate upon war work, the management was not unmindful of the need to have plans ready to put into operation immediately the war ended. Their plant and organisation would be ready for a rapid change back to normal peace-time activities.

## Metal Prices

| | | Monday, April 2. Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected (nom.) | per ton | £60 10 0 | — | — |
| Electro Wirebars ... | „ | £62 0 0 | — | — |
| H.C. Wires, basis ... | per lb. | 9¾d. | — | — |
| Sheet ... ... | „ | 10⅜d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire(Telephone)basis | „ | 1s. 0⅛d. | — | — |
| *Brass* (60/40)— | | | | |
| Rod, basis ... ... | „ | — | — | — |
| Sheet „ ... ... | „ | — | — | — |
| Wire „ ... ... | „ | 10⅜d. | — | — |
| *Iron and Steel*— | | | | |
| Pig Iron (E. Coast Hematite No. 1)... | per ton | £7 13 6 | 15s. | — |
| Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ... | „ | £28 5 0 | 15s. | — |
| 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 ... ... | „ | £26 10 0 | — | — |
| Foreign or Colonial | „ | £25 0 0 | — | — |
| *Tin*— | | | | |
| Ingot (minimum of 99.9% purity) ... | „ | £303 10 0 | — | — |
| Wire, basis... | per lb. | 3s. 10d. | — | — |
| *Aluminium Ingots* ... | per ton | £85 0 0 | — | — |
| *Spelter*... ... ... | „ | £25 15 0 | — | — |
| *Mercury* (spot) Warehouse ... ... | per bott. | £69 15 0 | — | — |

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

COMPANY MEETING

# SCOTTISH POWER COMPANY

## Hydro-Electric Board's Schemes—Mr. William Shearer's Review

THE thirty-fifth ordinary general meeting of the Scottish Power Co., Ltd., was held in Edinburgh on March 29.

The Chairman, Mr. William Shearer, presided, and in the course of his remarks said: All our plants, hydro-electric and steam, functioned satisfactorily during the year, enabling us not only to meet all demands within our areas of supply from Service Departments, factories and works directly engaged in the prosecution of the war, but also to satisfy the requirements of our general consumers.

### Hydro Board's Schemes

Since our last meeting the Hydro Board have published two constructional schemes, and the brief references which I shall make to them are intended only to indicate the extent to which our interests are or may be affected.

Constructional scheme No. 1 lies entirely outside our areas of supply, and our interest is therefore indirect and remote.

Constructional scheme No. 2 similarly comprises a major project based on the use of the waters of the rivers Tummel and Garry and a minor project at Gairloch.

Distribution schemes have also been published affecting the same areas in the vicinity of the minor developments. The minor projects and developments are stated to be completely uneconomical.

The Tummel-Garry project lies within the 1922 area of supply of the Grampian Company, and is designed to take advantage of the water control we have established at great cost in our extensive catchment areas. By all the laws of equity the very substantial benefit which will accrue to the Hydro Board through our works and operations should be recognised if the development is proceeded with. This aspect of the scheme is receiving our consideration in addition to various other matters which would affect us.

Excluding special supplies to authorised undertakers and the Central Electricity Board, the average price obtained during the year 1944 from our general business, which includes power, domestic, shops and agricultural supplies, was as low as 1.3d. per unit. Including special supplies, the average price was slightly under 1d. per unit.

These figures completely refute the accusations frequently levelled against us that we are exploiting the Highlands and using their natural water resources in order to supply electricity in the southern areas. Our uninformed critics, however, may have changed their view in the knowledge that the development of the water-power resources of the Highlands and the supply of electricity in these sparsely populated districts by the new Hydro Board will depend almost entirely on profits—if one may dare to whisper such a word in referring to a "non-profit earning" organisation—profits anticipated from export to the south, unless, of course, in the meantime the tax-payer is called upon to foot the bill. In other words those critics may, somewhat reluctantly perhaps, have come to the conclusion that the devil they knew is probably not much more objectionable than the devil they are only beginning to know.

Further reductions in the rates of supply to power users in industrial areas served by our selected stations were carried into effect during 1944 and our tariff for public lighting supplies was also reduced.

All our agreements with industrial users, except within the areas of the Grampian Company, contain a coal clause which provides for an increase in the unit charge in ratio to the rise in the cost of fuel above a basic figure. The reduction in the rates of supply to these consumers includes a concession of between 8 per cent. and 9 per cent. on the special fuel charges which, I believe, is much appreciated by those engaged in industry.

### Nationalisation

I will not detain you by elaborating my views on the question of nationalisation and public ownership of this and other industries as I have given expression to those views at length on numerous occasions both here and elsewhere.

I will content myself to-day by suggesting that if any of you are inclined to be influenced by the opinions of those political theorists and bureaucratic monopolists who are so eager to create to their own specification a new world for other people to live in and who are always so vociferous in times of national emergency, you should think well before giving any support to their policies.

If these gentlemen should ever achieve their ambition, the shackles that would be placed upon us would have such a deadening effect that in the course of a generation or two, this great country of ours would descend into the category of a second or third rate power.

# 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.*

NEEDHAM ENGINEERING CO., LTD., Sheffield.—Feb. 17, £6 500 mort., to Hillsbro' Estates, Ltd.; charged on land and bldgs. situate junction of Townhead St. and Pinfold St., Sheffield. *£6 500. Sept. 27, 1943.

A. C. FORD LTD., Wolverhampton, electrical and motor engineers. March 3, series of £1 000 (not ex.) debentures, present issue £400; general charge.

A. TAYLOR AND SON (EASTERN) LTD., Beccles, motor and radio experts. March 1, £650 mortgage, to Eastern Counties Building Society, charged on property. *£1 200. October 25, 1944.

### Satisfactions

ELECTRIC SUPPLIES (BLOXWICH), LTD.—elec. engrs.—Sat'n Mar. 3, £2 331 15s. 3d., reg. Aug. 24, 1938.

MECHANICAL AND ELECTRICAL ENGINEERING CO. (SHEFFIELD) LTD.—Sat'n. Mar. 3, of mort. reg. Aug. 30, 1941.

### 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.*

FREEMAN, Hugh, 62, Woodward Road, The Dell, Rock Ferry, electrician. £26 18s. Nov. 22.

MARCH, Cecil E., 4, Fellows Road, Farnborough, electrician. £18 0s. 1d. Dec. 15.

ALLEN BARTON (ENGINEERS), LTD., R/O., Providence Foundry and Engine Works, St. Helens Junction, St. Helens, engineers. £19 2s. Feb. 1.

EYRE, Albt. R., 95, Barton Road, Stretford, electrical engineer. £10 2s. Jan. 16.

WHITEHEAD, Edgar Granville, 18, Clarendon Road, Morecambe, electrical engineer. £14 13s. 9d. Jan. 31.

### Company Winding Up

KYE ELECTRICAL LTD.—(Voluntary Winding-up). A general meeting of the members of the above named company will be held at Electra House, Victoria Embankment, London, W.C.2, on April 17, 1945, at 11 a.m., to receive the account of the Liquidator.

# Coming Events

### Friday, April 6 (To-day).

I.E.E., MEASUREMENTS SECTION.—London, W.C.2. Discussion, "Are Engineers Losing their Sense of Proportion on the Accuracy of Industrial Measurements?" H. D. Hawkes. *5.30 p.m.*——N.W. STUDENTS' SECTION.—Manchester. "Electrical Computing," R. B. Quarmby. *6.30 p.m.*

INSTITUTE OF THE PLASTICS INDUSTRY, N.W. SECTION.—Manchester. "Commercial Testing of Plastics in the U.S.A.," Capt. Hertel. *6.30 p.m.*

### Saturday, April 7.

I.E.E., LONDON STUDENTS' SECTION.—Visit to St. Bartholomew's Hospital, E.C.1. *2.30 p.m.*

JUNIOR INSTITUTION OF ENGINEERS, N.W. SECTION.—Manchester. "Roll Grinding Machines," J. Gradwell. *2.30 p.m.*

### Monday, April 9.

I.E.E., WESTERN CENTRE.—Bristol. "A Survey of the Problems of Post-War Television," E. J. Edwards. *5 p.m.*——N.E. CENTRE.—Royal Station Hotel, Newcastle-on-Tyne. Annual general meeting, followed by an informal conversazione.

### Tuesday, April 10.

I.E.E., SCOTTISH CENTRE.—Glasgow. Informal paper, "Plastics for the Engineer," P. D. Ritchie and W. A. Kirkwood. *6.15 p.m.*

### Wednesday, April 11.

I.E.E., TRANSMISSION SECTION.—London, W.C.2. "Distribution of Tensile Load in Relation to Temperature and Sag of Steel-cored Aluminium Conductors," E. W. W. Double. *5.30 p.m.*——INSTALLATIONS SECTION.—Waldorf Hotel, London, W. Luncheon. *12.30* for *1 p.m.*

ELECTRODEPOSITORS' TECHNICAL SOCIETY.—Birmingham. "The Plating Shop, Plant and Layout," S. Wernick. *6.45 p.m.*

### Thursday, April 12.

I.E.E., INSTALLATIONS SECTION.—London, W.C.2. "Factors Influencing the Design of Electric Lighting Installations for Building Interiors," R. O. Ackerley. *5.30 p.m.*——CARDIFF STUDENTS' SECTION.—Students' lecture. "Electrical Engineering Research," H. W. M. Warren.——S. MID. STUDENTS' SECTION.—Stafford. "Fibrous Glass Insulation for Electrical Machines," S. Steinbock. *6.30 p.m.*

DIESEL ENGINE USERS' ASSOCIATION.—Caxton Hall, Westminster. "Cold Metal Spraying and Its Application to Internal Combustion Engines," V. G. Young. *2.30 p.m.*

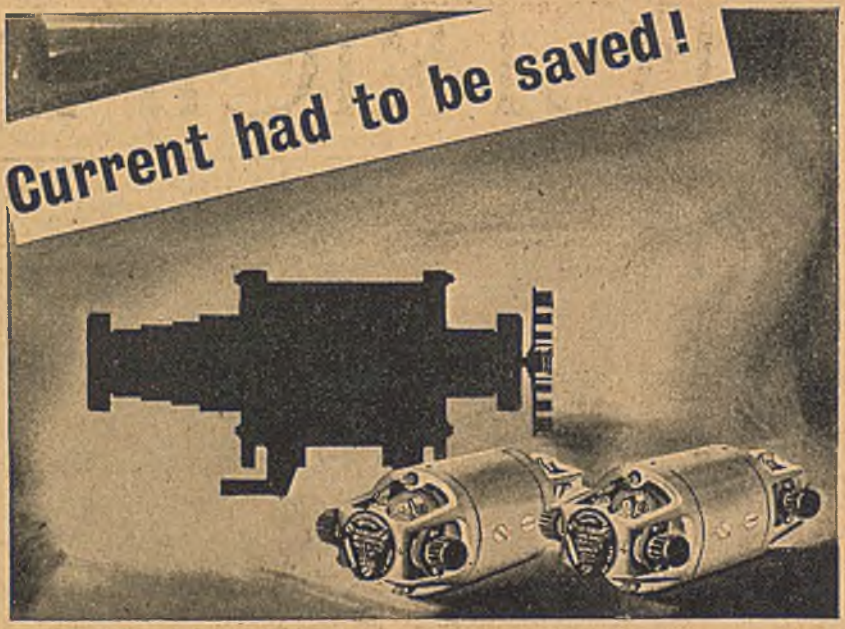
SOUTH WALES INSTITUTE OF ENGINEERS.—Stepney Hotel, Llanelly. "Plastics, or Use of Coal Bye-Products," Dr. W. Idris Jones. *3 p.m.*

### Friday, April 13.

I.E.E., N.E. STUDENTS' SECTION.—Newcastle-on-Tyne. "$CO_2$ Measurement," R. Lord. *6.30 p.m.*

### Saturday, April 14.

I.E.E., LONDON STUDENTS' SECTION.—Visit to the Nine Elms Works, Battersea, of the Gas Light and Coke Co. Ltd. *2.30 p.m.*

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