

THE

# ELECTRICIAN

Vol. GXXXIV. No. 3486.

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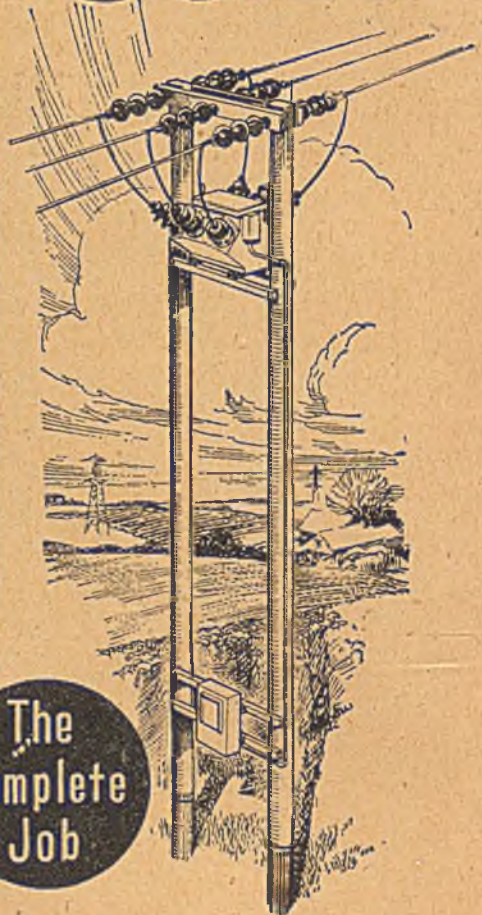
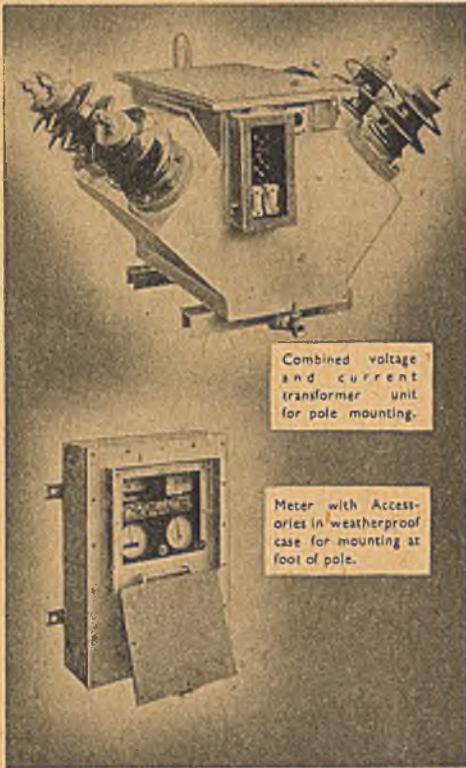
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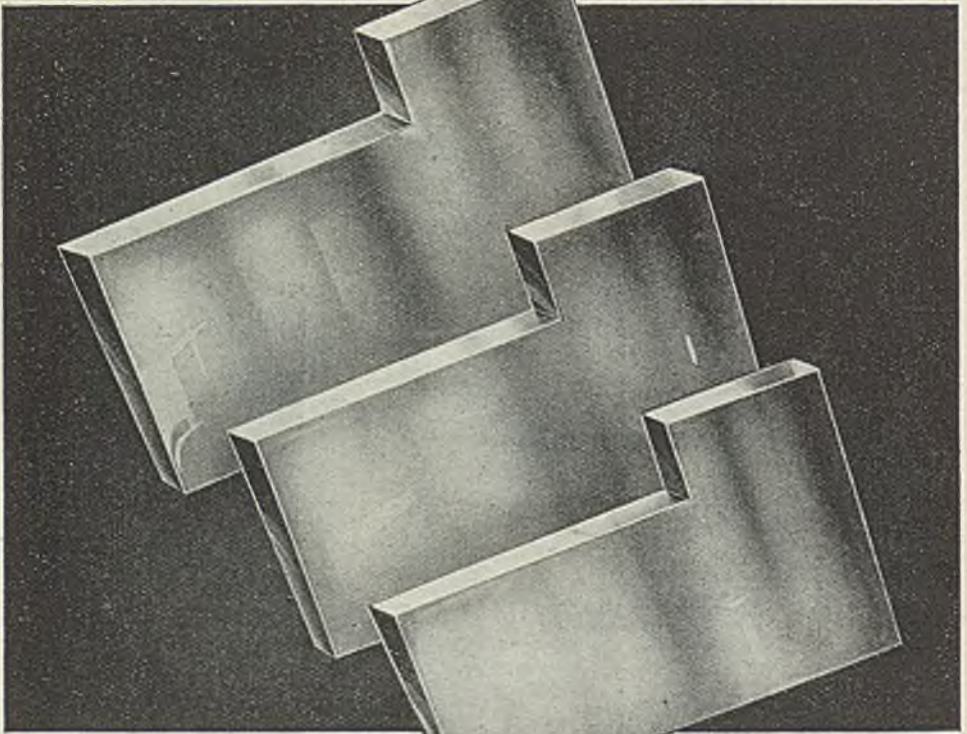
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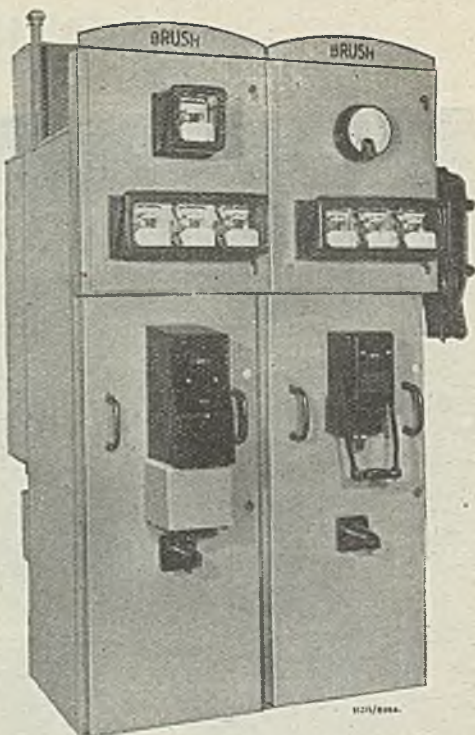
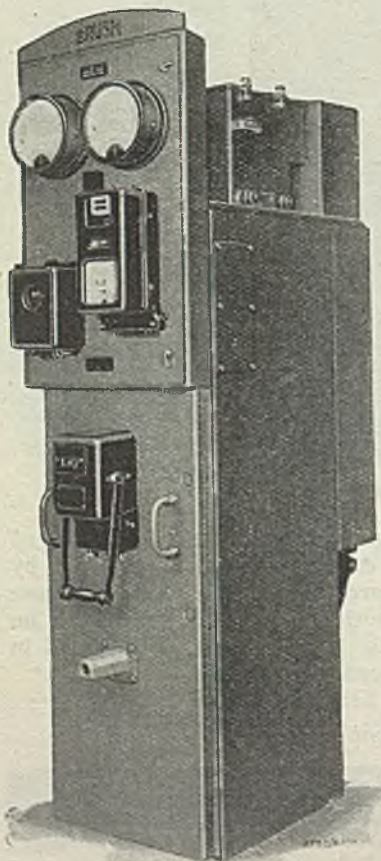
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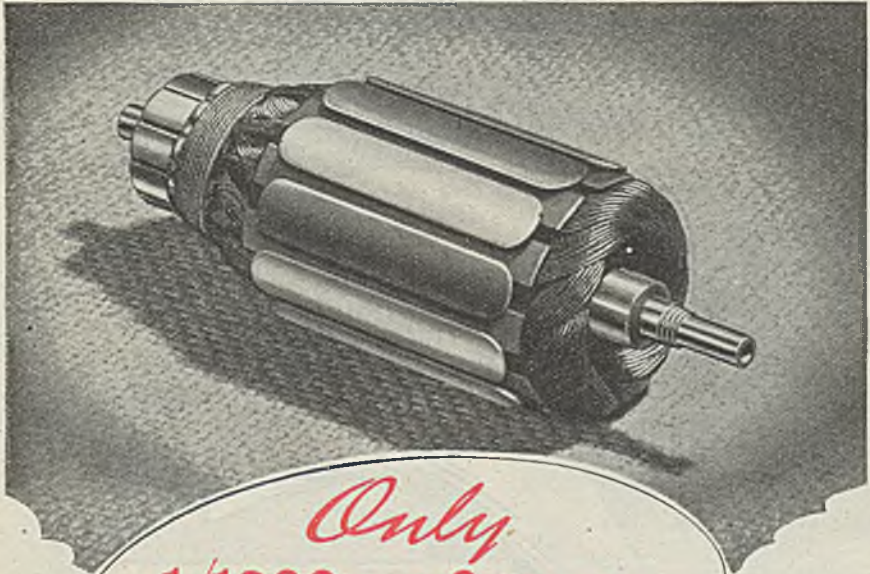
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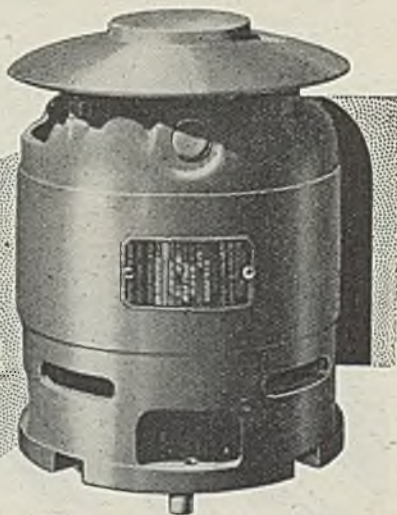
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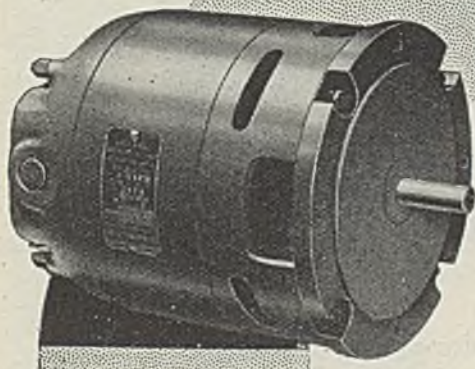


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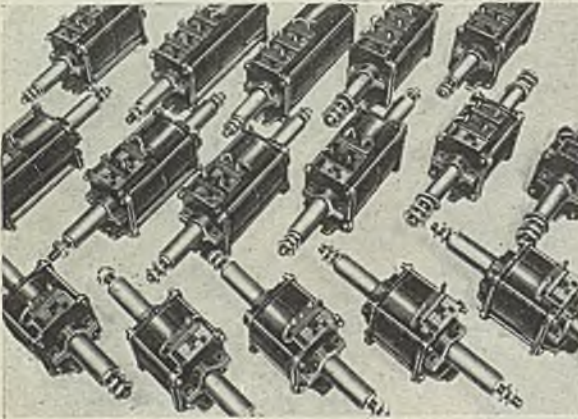


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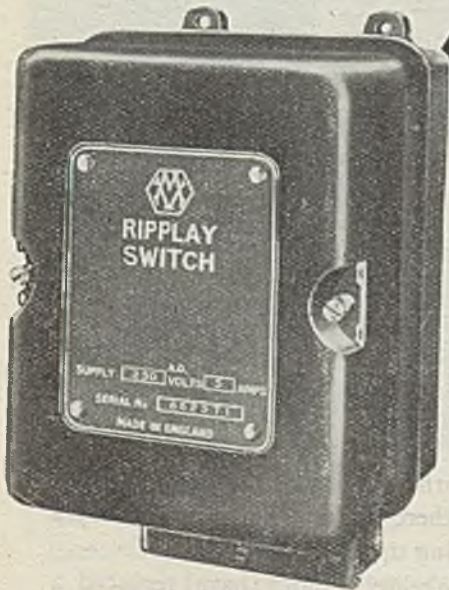
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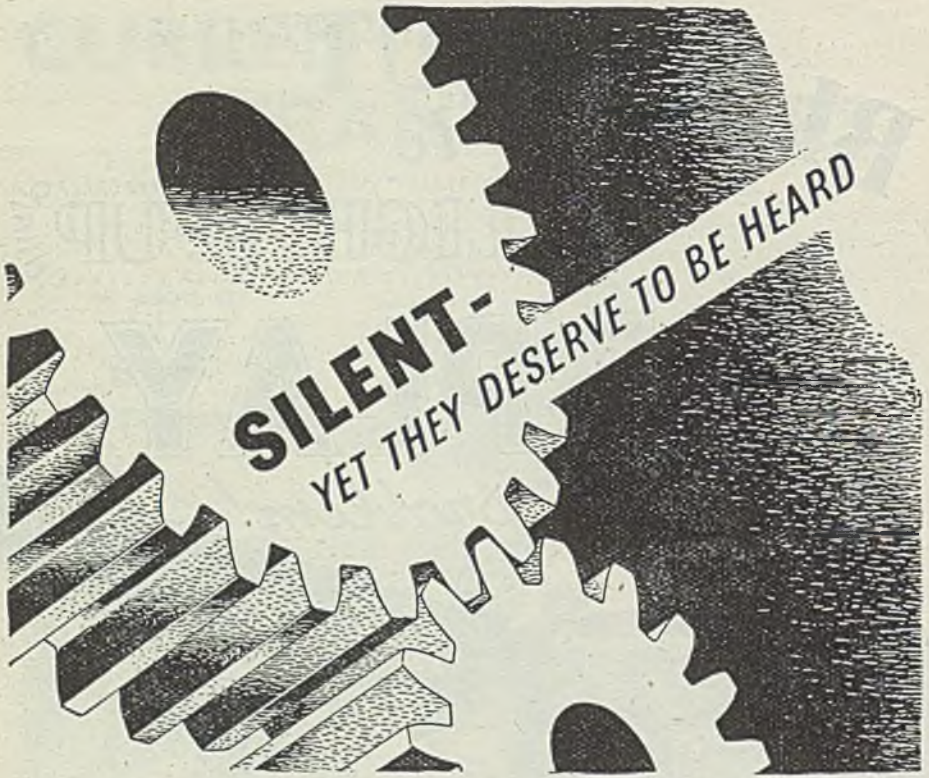
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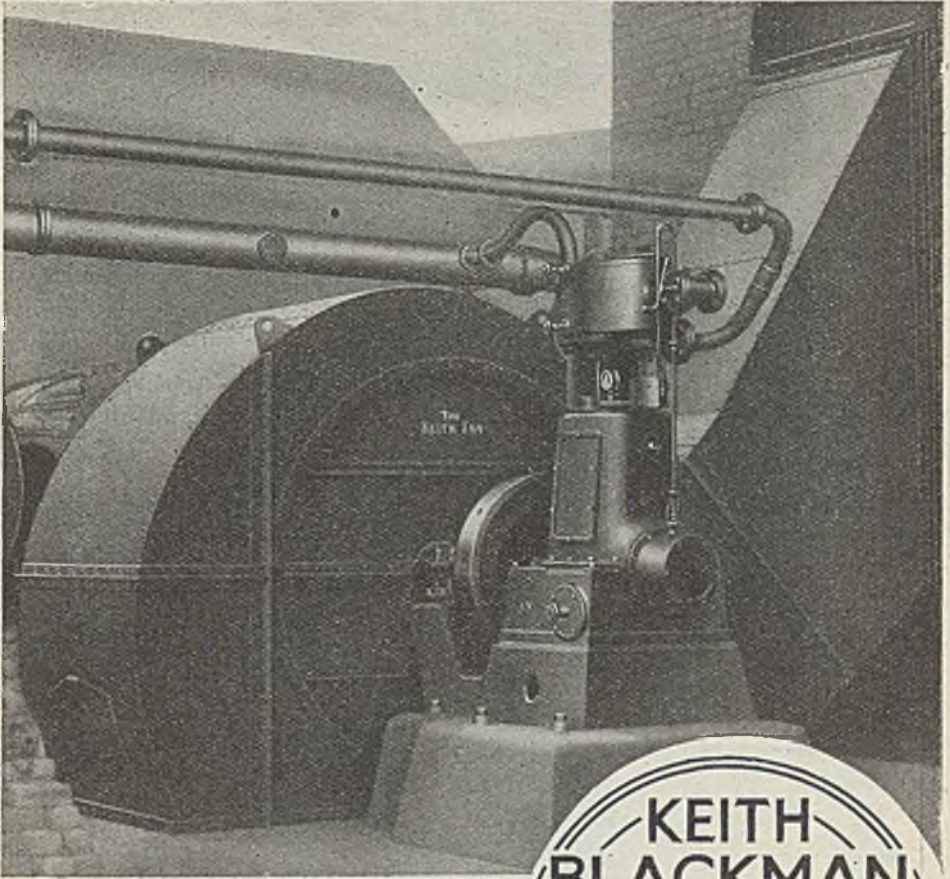
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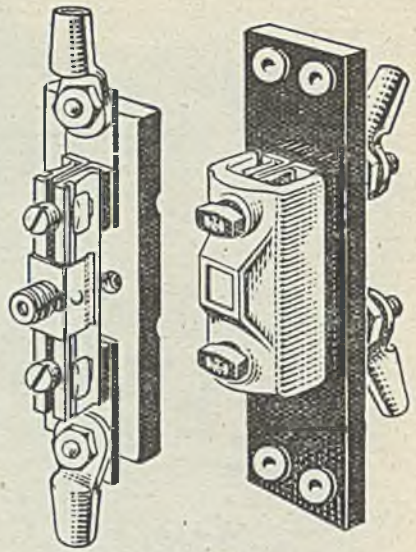
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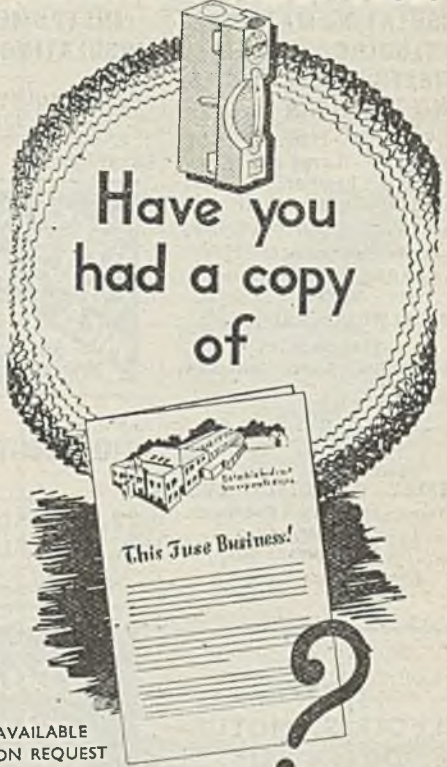
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March 23, 1945

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rent assets were £11 748 000 and their ordinary current liabilities £4 966 000; but the addition of £4 501 000 owing to the Inland Revenue, left them on the average only just on the right side of solvency.

These same firms before the war employed 14 150 work-people, whereas today they employ 29 013, involving expenditure on new premises, on plant and tools, and the financing of increased work in progress and stocks. As a result, the companies covered by this survey have in many cases had to spend more than their profits on essential developments for war production, and according to Lord DAVIDSON, more than half of them estimate that their current resources will be insufficient to meet transitional costs.

It is perhaps not sufficiently appreciated by many that before the transition from war to peace, the engineering industries must undergo a longer course of preparation than will be needed in most other industries—due to alteration in machine tools, replacement of worn-out equipment, changes in the raw materials to be worked, and so on—and because of this there is the danger that the small profits retained may make development expenditure during the period in question extremely difficult to finance.

The Income Tax Bill which was given its second reading in the Commons on the same day that Lord DAVIDSON painted his depressing picture, goes some way to meet the needs of industry, but since it does little more than spread the burden of taxation in a different way, something, much more fundamental is needed if the engineering industries are to be allowed to plough back sufficient profit to enable them to keep up to date and produce efficiently. No tax stimulus

## Effects of Taxation

THE effects of the present taxation being carried by the engineering industries were made abundantly clear last week, when, as president of the E.I.A., Lord DAVIDSON spoke of them before the Wales Region of the association. The picture he painted is by no means new but is depressing nevertheless, for what it revealed with respect to one industry is equally true of most others.

Confining our remarks to engineering, however, most firms have dug deeply into their financial resources in expanding war production, and have as their reward been penalised by a system of taxation which has restricted profits by reference to a standard measured by pre-war years, when the engineering industries were passing through a difficult time.

That this is so is shown by the facts collected by the E.I.A. from one hundred representative engineering firms, which in their last financial year retained £775 000 of their profits and handed over £9 125 000 to the Government. At their balance sheet dates their ordinary cur-



to re-equipment will work if the means to pay for it in the first place are lacking, nor, we submit, will mortgaging the future make the financial difficulty any less real.

### The E.D.A. Report

THE account which the E.D.A. Council have given of their stewardship during the last twelve months is one with which no one in the industry will find serious fault. The report of their work was accepted at the annual meeting of the association last week, without more than lively criticism, while the discussion, which is always so enlightening at the meeting, was commendably constructive. The year covered by the report has been one of transition from concentration on the war effort to consideration of peace-time problems and the aim of the association during this time has been to guide public opinion and to emphasise the importance of electricity's contribution towards progress in the years after the war. The report indicates the scope of these activities, but leaves to the imagination the number of man-hours which the Council have expended in covering the work of the association.

### Electrical Testing House

THERE is in the E.D.A. report a paragraph which deals with the establishment of a testing house, and though the subject is dismissed in six lines the work involved in presenting the substance of that paragraph has covered many months of voluntary time. There can be few in the industry who are not already aware of the controversy which envelops the subject of an appliance testing house, and after obtaining the latest information on similar schemes in the United States and elsewhere, the appropriate committee has got so far as preparing a final report describing the lines upon which such a testing house might be established and operated by the association. Such a report, which is now being considered by the Council, represents many hours of research, many hours of deliberation, and is indicative of the public spirit which permeates so many of the committees in the industry.

### Coal Suitability

BECAUSE the supply industry has made repeated and strong protests against the low efficiency of coal supplies over the last few years, the Insti-

tute of Fuel has been encouraged to issue a statement summarising the views of a number of supply engineers in the north-west area. This is intended to indicate what is considered to be the range of fuels most suitable for chain-grate and p.f. fired boilers, and advocates a coal price structure. It was pointed out by Mr. HAROLD HOBSON, chairman of the Central Board, last January, that the loss of capacity in the country due to unsuitable fuels was one of the causes which necessitated forced interruptions of supply this winter, and if we are to profit from our experiences, the substance of the statement under review is sufficiently suggestive to start a course of constructive argument. Interruption of supply due to low-grade fuels, means in addition to loss of efficiency, the lost use of expended capital and it is time that the coal industry realised that in the efficient running of the supply industry is not only a chance of greater prosperity in the coal trade, but also in the trade of the country as a whole.

### Midland Counties Expansion

THE review which Mr. W. SHEARER gave at the meeting of the Midland Counties E.S. Co., Ltd., last week showed that the group of companies controlled by this organisation are well prepared for a continuance of expansion under peacetime development when the demands for war purposes begin to fall off. What those demands have been is indicated by the fact that whereas the units sold in 1939 amounted to 490 million, the figure now reached is 808 million; sales in 1934, that is ten years ago, were 263 million. The companies' consumers have perhaps gained more by such expansion than have the companies, for in spite of rising costs, considerable reduction in current charges have been made without undermining the financial stability of the companies. The other side of the picture shows that during the last few years some £3 500 000 have been paid away in rates and taxes, the ordinary stockholders having received by way of dividend in the same period, only £618 000.

### Metesco Plea for Freedom

PARTLY because of, and partly in spite of, the difficulties of the war the output of the supply industry has reached record dimensions, and it is a generally accepted fact that the industry

is to be congratulated on its foresight in meeting war conditions. These achievements were the subject of a review by Major H. RICHARDSON when speaking at Tuesday's meeting of the Metropolitan E.S. Co., Ltd., which made it clear that all experience supports the view that the undertakings which have served the public so successfully should be allowed to continue their work, and should not be stifled by "masses of restrictive regulations," more especially at a time when transition will present difficulties of its own. The prospects of the supply industry must depend upon the country's trading prosperity, and this in turn will depend upon the amount of freedom industry may be allowed in order to exert initiative and invention in the development of that trade. In order to make the most of such freedom an unfettered electricity supply industry is a first essential.

#### Glenco Building Programme

**S**PEAKING at Tuesday's meeting of the County of London E.S. Co., Ltd., Sir ROBERT RENWICK emphasised the importance of the industry's development programmes to industrial activity in general, and disclosed that generation expenditure under consideration for the County of London group during the next ten years, already amounted to something like £21 000 000, with an estimated expenditure of a further £12 000 000 during the next five years, on distribution and transmission. The cost of plant and materials in the estimates of these development programmes may, said Sir ROBERT, have some influence upon future rates of supply, for though the company is anxious to get back to the former low rates, building costs must be a major factor in determining future rates to consumers.

#### Overseas Trade Reports

**I**T is a long time since the Department of Overseas Trade last published its reports on commercial conditions in foreign countries, but the urgency of re-establishing our export trade has apparently caused to be issued this week five volumes covering the United States, Brazil, Bolivia, Chile, and Peru; slim affairs compared with the pre-war publications, but reports, nevertheless, from which a certain amount of useful information may be obtained. The most interesting of the reports—the whole series of which

will apparently cover twenty-six countries—is that concerned with the United States and deals with commercial conditions in that country up to 1939. The report also reviews the United States as a post-war market for United Kingdom goods, and though no specific mention is made of electrical goods, one factor which would contribute to the expansion of United Kingdom exports is said to be a better appreciation of industrial research. There appears to be a good deal of truth in this, for while it is perhaps a fact that as many fundamental scientific discoveries are made here as in the United States, it is indisputable that the elaboration and commercial application of basic inventions and developments are carried on far more intensively in the United States.

#### Criticism in British Trading Methods

**S**OME critics of the methods by which United Kingdom goods are sold in the United States see a weakness in the diffusion of sales effort among scores of importers each handling, in small volume, a comparable grade of a given product. These critics appear to be convinced that it is imperative to achieve some concentration of effort through, for example, an Export Group, and that only in this way will it be possible to create efficient and adequately financed selling organisations able to rival, in scope and drive, the powerful distribution and advertising methods employed by United States manufacturers in selling their own similar products.

#### Rich But Difficult Market

**T**HE U.S. offers a rich but not an easy market, in that maximum sales can be obtained only if articles are well presented and pushed by sales methods customary in that country. The success of those United Kingdom manufacturers who entered into the "battle of the dollar" before the war, shows that when we are prepared to compete on equal terms with the United States manufacturers, much useful business comes our way, but as we have said on other occasions, a take-it-or-leave-it method will not do. Of particular interest is the suggestion that in view of the improvement in American quality goods it will be necessary for British exporters to establish goodwill by brand names rather than by relying on the general prestige of the "imported from Britain" tag.

# French Electrical Industry

## Expected Changes in Supply Field—Nationalisation Questions

**B**IG changes are to be expected in the French electrical industry, particularly on the supply side in that a demand for nationalisation is growing.

General de Gaulle, in his recent speech before the Consultative Assembly, said that provisional nationalisation of the supply industry would be carried out at the proper time, though no indication as to when that might be was given; if and when such nationalisation does take place, however, it will only be temporary in that finality on the point at issue will be decided by an elected Government.

The supply industry itself has made no reply, but it is known that authorities and undertakers are preparing a plan for submission to the Government which, they hope, will avoid nationalisation; this plan, itself calls for the regrouping and rationalising of distributing authorities. In this connection the supply authorities say that there are far too many distributors, and that as organised at present they are uneconomic. It is suggested that there should be some sort of centralisation which would make for more efficient and more economic working.

It is at the same time pointed out that France has been placed among the most efficient producers of electric power, thanks to private enterprise, while the price per unit is one of the lowest in Europe.

The trade unions, which are agitating for the nationalisation of the industry, on the other hand, insist that the power producers worked willingly for the Germans and de-

mand that many well known personalities in the industry should be arrested and tried.

The unions and the Resistance Movement have set up Liberation Committees in every industry, the purpose of which is to examine the conduct of the various company officials during the occupation. So far as the supply industry is concerned, the generating authorities point out that they did all that they could to hinder the Germans and when asked to tie the French network to the German system in order to supply Germany with power, by excuses and delays they avoided this being carried out. They also say that when the Germans asked the French to dismantle their copper lines in order that the metal might be sent to Germany, they worked so slowly that only a very small part of the total was actually sent. Finally, they insist that work on the construction of barrages and generating plant was continued during the occupation and so France's favourable position as a producer of energy was retained.

Coal quality in France is so bad that thermal power stations are operating under the greatest difficulty. Before the war the mining trade graded and prepared the coal for the stations but this is no longer possible. Some authorities have tried various means to keep up their efficiency, including the use of air jets, to keep the coal burning. This, at first, caused the coal to burn too quickly, but the difficulty has now been overcome by the application of a system which enables regulation of the air flow.

## Current Consumption in Scotland

**T**HE Regional Controller of the Ministry of Production for Scotland has issued a direction to all factories in Scotland requiring a reduction of 25 per cent. in their gas and electricity consumption.

The direction in so far as electricity is concerned, is to the effect that until further notice the weekly consumption of current at premises to which the direction relates, is to be reduced to a level not exceeding 75 per cent. of the average weekly consumption based upon the last meter reading before the date of the direction.

Factories have been informed that a variation of the direction may be granted in exceptional circumstances to safeguard the most urgent categories of production and certain continuing processes, but the direction remains operative in relation to such factories unless and until they have

received official notification that a variation or cancellation of the direction has been allowed.

The Ministry of Fuel, with the concurrence of the Board of Trade, has also made an Order directing that a 25 per cent. cut in electricity consumption should be carried out by businesses engaged in the wholesale and retail distribution of goods employing ten or more insured workers.

The necessity for this action arises from the serious situation in relation to coal production in Scotland as a result of the strike of colliery deputies, following so soon after the losses due to the recent period of exceptional weather. In consequence, coal stocks at power stations in Scotland are now so low that compulsory measures for an immediate economy in the consumption of electricity must be introduced.



# The E.D.A. Luncheon

## Sir Stafford Cripps on Need for Cheapness of Supply

THE need for reducing the cost of the generation and distribution of electricity and also the prices of electrical appliances was stressed by Sir Stafford Cripps, Minister of Aircraft Production, who



Mr. Herbert Morrison and Mr. F. Newey, new chairman of the E.D.A. Council

was the guest of honour at the twenty-fifth annual luncheon of the British Electrical Development Association at the Connaught Rooms on March 16. The president, Lord Brabazon of Tara, occupied the chair, and members and guests present numbered about 570.

In proposing the toast of the association, Sir Stafford Cripps congratulated it upon having "developed." This, he said, was their silver jubilee—a span of years marking the period between the end, as we hoped, of two great world wars, and one during which there had been very great development both in the use and the uses of electricity. He thought few people realised the immense and vital contribution that the electricity supply industry had made to our production of war materials. He was speaking from his own experience when he said that without the flexibility of locating factories which was given by the grid we would have been very hard put to indeed. He doubted whether we would have been able to supply the Fighting Forces with all the equipment and machinery that had contributed to their victorious battles over the last period; and it certainly had not been an easy task to keep all the stations and the supply lines running at maximum pressure over that long period of time, and with practically no breaks in the supply.

Part of the price that had had to be paid for that eternal vigilance in the power houses had been, unfortunately, the death

by enemy action of numbers of the technical staff and works personnel in different parts of the country, and to those who had thus given their lives that our war production might not fail in this great emergency he was sure they all would desire to pay their homage of gratitude.

The association and its members, he added, had done a grand job both on the production side and the domestic side of our war economy. Not only had they served this country, but also our great allies, the Soviet Union, which looked with great respect upon the electrical industry of this country, had been helped by them. He had seen in our factories great transformers and other heavy equipment being made for shipment to Russia by that once perilous northern route which had carried so much help from the people of this country to our allies in the Soviet Union. He had also seen in our own aircraft factories the vast use made of electricity not only for power purposes, but for the very important domestic needs of factory canteens, hostels and similar purposes which had helped to maintain the comfort of our workers through the war period. Indeed, so struck had he been with the various uses of electricity for domestic purposes that he personally had used no other source of heating.

### Scope for Women in the Industry

There had been a great and almost embarrassing advance in the use of electricity during the five years of war in industry and in the ordinary daily life. People had become more electrically-minded, so that the field would be open after the war to the most extensive development of the use of electrical appliances of every kind; and there was one aspect of the matter that they had to bear in mind. Hundreds of thousands of women had for the first time during the war become familiar with the use of electricity, both in industries and in the Services. Electrical appliances of all kinds had become accepted features of the work of those women, and for that reason the industry would have to appreciate that women had become knowledgeable in those matters. Development in the domestic field in particular should offer some scope in the electrical industry for skilled women electricians.

Perhaps some of them did not realise how much electricity was used in the air. One of our big bombers contained five miles of electric cable; the horse power available

for electrical purposes was 8 H.P.; there were 24 separate electric motors, and 55 lamps, as well as 27 power plugs, so that electricity had permeated the stratosphere as well as the ground level.

There was a great prospect of development ahead and what materialised from that prospect would, he thought, depend upon our ability to get cheaper generation



Before lunch, Mr. Clarence Parker (left) and Sir Stafford Cripps in serious mood—

and distribution costs, and also the lowness of the price at which we could make the appliances available to the ordinary person. To have real success in the electrification of our country we must bring down the price of generating our power, whether it was by coal, by oil, or by water power resources.

We must also regard the market for electrical appliances not as a luxury, or semi-luxury market, as he thought we did before the war, but as one of the necessities of modern civilisation. That meant the introduction of mass production on the very latest and most efficient lines with massive tooling up and ample capitalisation. And if we really developed properly our domestic market on mass user lines, then he thought we could have a smack at competing in the export market and so help greatly in the future economy of our country. We had a great reputation throughout the world for electrical machinery and goods, but hitherto, perhaps, they had been more on the heavy than on the light side of the industry, and he hoped we would strive to develop the extensive use of products on the lighter side so that our electrical "gadgets" would become as well known and as universally acclaimed in the world as those of some other countries with whom we might be in serious competition.

Lord Brabazon, replying for the association, said Sir Stafford had spoken about the essential part electricity must play in our national life, and for that reason he was going to introduce a dull subject;

and that was coal. In this country, we did not get our power from water, in spite of the enormous amount of rain we had to put up with, but from coal. They in the E.D.A., were not concerned with the politics of coal; all they were concerned about was the quality and the price of the article; and they had been hit very hard. The policy of charging a flat rate increase in the price for all grades of coal bore much harder on the generating stations which used the very poor grades than on those who used the better qualities. Thus the flat rate increases awarded since the commencement of the war represented probably an increase of over 100 per cent. in the cost of power station coal, but only an increase of 50 per cent. in the price of house coal. While the price of the coal had gone up the calorific value had gone down, and the recent shortage of electricity which people had had to put up with in some parts was largely due to filthy coal which was entirely unburnable. In some cases no less than 40 000 kW of plant was out of action entirely due to that. The electrical industry was at the mercy of forces over which it had no control, but those concerned with generation had done their share in development from the efficiency point of view. In 1917 it required 3 lb. of coal to generate one unit of electricity; to-day they were generating a unit of electricity from one lb. weight of coal. That was an enormous improvement. Instead of consuming 45 000 000 tons of



—And after, Sir Stafford Cripps and Lord Brabazon share a joke

coal a year, they were now using only 22 000 000 tons, so that by their efficiency they were saving the country 23 000 000 tons a year. That was remarkable evidence of fuel efficiency. We were now using in this country 700 units of electricity per person a year. They hoped soon to raise that to 1 000 units per head. He understood that in America the annual sales averaged 1 100 units per head of the population. We must aim to beat that.

# Electrical Development

## Annual Meeting of the E.D.A.—New Officers Appointed

THE annual report of the Council for 1944, presented at the annual meeting of the Electrical Development Association, which followed the luncheon at the Connaught Rooms on March 16, stated that the year had been marked by a greater demand than ever before on the resources of the industry, while at the same time there had been a widespread quickening of interest in post-war questions, largely as a result of the prospect of an early end to the war in Europe. The aim of the association had been to guide the trend of public opinion and to emphasise the importance of electricity's contribution towards progress in the years after the war.

New members of the association included the Corporations of Pudsey, Adwick-le-Street, Portland, Dover, Felixstowe, Bolsover, Keighley and the Bognor Gas and Light Co.

The Executive and Publicity Committee had in preparation a series of films for cinema distribution which would cover broad propaganda as distinct from the direct advertising type of film for selected audiences.

The association's exhibition service met increasing demands in connection with local exhibitions. The directors of the Building Centre had taken over 9, Conduit Street—a building famous for a generation as the old headquarters of the R.I.B.A.—which would be joined up with the main building in Maddox Street.

### Standard Dimensions of Cookers

In addition to detailed discussion in regard to the interchangeability of cooker parts, the E.D.A. Electric Cooking Committee dealt with problems in connection with the maintenance of electric cookers and kettles in service; consideration was also given to possible developments in the design of boiling plates, particularly of the radiant type. Proposals were received from the B.E.A.M.A. Domestic Cooker Section for a specification of standard dimensions designed to ensure complete interchangeability of the principal wearing parts of domestic electric cookers. The specification closely followed the E.D.A. proposals made in the previous year, except in two important matters, namely the type of plug-in connection to be used for boiling plates, etc., and the question of oven elements.

In addition to negotiations with the Board of Trade in regard to the maximum production of electric kettles and suitable utensils for electric cookers, attention was paid to the increased quantities which

would be required as a result of the Government scheme for building temporary houses.

The Joint E.D.A./B.E.A.M.A. Heavy Duty Cooking Committee reviewed many problems of common interest. Efforts made to secure permits from area bread officers for electric ovens met with some success.

Others matters dealt with included school kitchens, industrial heating, public lighting, rural electrification, the establishment of a testing house and bringing up to date the electrical equipment of training colleges for teachers of domestic science.

More than 300 inquiries had been dealt with by the Electric Vehicles Association. The association had collected and circulated details of existing tariffs. A report on battery standardisation had been circulated and the Committee was now investigating the standardising of battery containers.

### Discussion

**Mr. Clarence Parker** (chairman of Council) presented and moved the adoption of the accounts. He pointed out that there had been an increase in expenditure from £56 000 in 1943 to £95 000 in 1944, a difference of £39 000. Most of the increase had been taken up by advertising which had gone up by £23 000. The cost of films had increased by £8 000. This included £7 500 for a film on post-war housing. Press expenses had gone up by £1 100, owing mainly to additional public relations work. The expenditure on display had gone up by £900, due to a large number of photographs having been taken for exhibition purposes. The revenue for the year was £95 000, compared with £57 000 the year before. The normal expenditure on the present basis would be £140 000. In other words, they had collected 70 per cent. for 1944, as compared with 44 per cent. in 1943.

Presenting the report of the Council, Mr. Clarence Parker said the Council had of necessity to turn its attention to matters which would affect industry after the war and to develop a policy, and that was, firstly, to secure the greatest amount of co-operation and co-ordination within the industry; secondly, to present the industry as a unit to everybody with whom they came into contact and to bring about the greatest amount of liaison with everybody; and thirdly, to do their best to maintain an informed public opinion.

**Mr. F. S. Naylor** referred to the paragraph in the report headed "Welding Load," and said this gave a description of the activities of the South-East England

Centres Sub-Committee as if they were purely technical in relation to the welding load. That was not so. The terms of reference were "To report and make recommendations with regard to forms of tariff." There was a desire on the part of many members to deal with tariffs through the E.D.A. He would like to know exactly whether it was the policy of the Council that the Centres should not handle this matter of uniformity of tariffs.

**Mr. Clarence Parker** said it was possible to consider the desirability of a uniform basis of tariffs, but to consider actual tariffs he thought was a little beyond the capacity of the association.

**Mr. Naylor**, in answer to the President, said he was not satisfied with that reply. It was well understood that uniformity of tariffs would not mean standardisation of tariffs, and he believed that in the E.D.A. there was a well-knit organisation to handle this question on an area basis. Therefore, he would like the Council to recognise that fact and encourage the Areas to take steps towards bringing about a uniform basis of tariffs in their areas.

**Mr. E. E. Jolly** (electrical engineer and manager, Bethnal Green) suggested that Mr. Naylor had misunderstood what the Chairman of Council had said, viz., that discussion of a uniform basis of tariffs was a matter for discussion in the association, but not the actual value of the tariffs.

**The President** said he also thought there was very little difference between Mr. Naylor and the Chairman of the Council on this matter. He was sure the Council would take note of what had been said and deal with the situation.

**Mr. J. W. J. Townley** (borough electrical engineer, West Ham) called attention to the paragraph headed "Industrial Heating," and asked the Council to give particular attention to this very valuable field.

**The Chairman** agreed that the matter was very important and said it was not being forgotten.

Replying to Mr. Jolly, the Chairman said, in future the E.D.A. would have a little closer contact with the E.A.W. in regard to the issue of diplomas. They were going to have a little more say in the matter and their interest would be more lively in the future.

**Mr. Jolly** said he would like put down in black and white the standard of qualification the Council would accept.

**The President** said he understood that that matter was going to be considered.

**Mr. A. W. Barham** (borough electrical engineer, Watford) asked what steps were being taken to ensure a fair field and no favour for electricity in post-war houses. There was, he said a good deal of insidious propaganda that the load of the house,

as such, should be shared by coal, electricity and gas, and that needed to be very carefully considered.

A member said that the Ministry of Works was erecting 52 temporary dwellings in Portsmouth and as a result of a conference between the representatives of the various services interested, owing to a lack of supplies of electric irons, heavy gauge bottom pans and kettles, it was agreed that the lighting should be provided by the electricity undertaking and that gas should be used for cooking. Could some steps be taken to ensure that in future the services should be shared 50/50? This depended on the supply of appliances, and could some further information be given as to what progress had been made in regard to the negotiations with the Board of Trade and whether there was any possibility of further supplies being put on the market?

**The Chairman** of the Council replied that the position with regard to electrical apparatus was still very difficult. As regards aluminium, he understood that more metal was being released and the prospects of the manufacture of more heavy gauge aluminium utensils was promising. As regards small electrical apparatus, the position was still rather obscure, and he thought it was likely to be another six months before there would be any real improvement. The use of gas or electricity in temporary houses varied considerably in different areas, but he believed the electricity supply industry had now made it clear that the use of gas was likely to cause trouble.

**Mr. Clarence Parker** reported the re-election of Lord Brabazon as President of the association for another year, and the election, as vice-presidents of Sir William Beveridge and Captain J. M. Donaldson.

**Mr. F. Newey**, vice-chairman, was elected chairman of the Council and Mr. H. J. Randall, vice-chairman.

The Council of the E.D.A. for the year 1945-46 will be:—

Appointed by the C.F.B.: Messrs. H. F. Carpenter, A. J. Fippard, F. Nicholls, H. J. Randall, C. D. Taite and G. A. Vowles. I.M.E.A.: Messrs. R. Birt, J. Eccles, E. E. Hoadley, Councillor J. Selwyn Jones and F. Newey. Power company members: Captain J. M. Donaldson and General R. F. Legge. L.E.S.A.: Mr. Clarence Parker. P.E.S.A.: Sir John Dalton. Conf. of J.E.A.'s: Alderman H. Leese. Nominated by area committees: Central Eng., Mr. F. H. Pooles (Mr. R. H. Rawll, deputy); Mid-East Eng., Mr. A. G. Connell (Mr. A. Kelson); N. Counties, Mr. S. I. Ellis (Mr. T. E. Daniel); N. Ireland, Mr. R. A. Boyton (Mr. W. J. Girvan); N.W. Eng. and N. Wales, Mr. W. H. Metcalfe (Mr. G. A. Robertson); Scottish, Mr. A. E. Roots (Mr. H. I. Hulme); S.E. and E. Eng. (Gr. London), Mr. J. R. Jones (Mr. F. W. Purse); (Eastern) Mr. A. Wade (Mr. G. P. Dixon); (Southern) Mr. H. Dixon (Mr. S. J. C. Ellis); S.W. Eng. and S. Wales (Northern), Mr. C. L. Townsend (Mr. Edward Jones); (Southern) Mr. A. E. Baker (Mr. R. W. Steel).

# A Maintenance Problem

By HAROLD GREAVES, A.M.I.A.

THOSE in charge of works plant, or who are in any way connected with its installation or maintenance, are already aware of the modern methods of production whereby the maximum use is made of mechanical devices to reduce the amount of fitting time required. By means of the employment of such mechanisation, it is possible for men, and women, who, though unskilled, to turn out, after a short period of training, a product of any required standard.

## Large-Scale Production

As large as production has been during the war period, it is likely to be on an equally large scale in the years to come, if we are to regain our export trade, and it is interesting to note in this connection, a report to the effect that before the war America was producing cars at an estimated cost of 9d. per lb., and paying wages higher than Britain, whereas the cost of production in this country was 1s. 4d. per lb.

In a modern system of scientific production, extensive use is made of time-study, in respect of which both machine operators and those on assembly work, can benefit by an arrangement of "payment by results," or the payment of a wage for individual performance.

In such an arrangement, however, the maintenance man is unable to take part, in that his work is considered non-productive, and below are considered means whereby to assess the value of such work in an attempt to apply a bonus system. One method is to award points for time-keeping, conduct, manipulative skill, etc., each man starting the week with a full complement of points, subject to deductions for shortcomings. The final total is then used as a basis for the payment of a bonus for either the individual, or for the department as a whole.

Though sound in theory, however, the system is rarely efficient on account of the difficulty in arriving at the correct number of points to be deducted, and a possible sense of injustice in the assessment of the penalties. Another method which has been tried is that of offering an average bonus for the works, but here again there are disadvantages in that though a man may not make the slightest effort to assist production, he is nevertheless guaranteed his regular bonus; this system lacks the first essential of efficiency, incentive, and it is not a generally popular system.

It is suggested that providing proper attention is given to the question of time-study and the engagement of labour, the amount of bonus need not be of prime im-

portance, in that the average peace-time bonus for workers on production is rarely more than 33½ per cent.

First, consider the importance of time-study in relation to the failure of a machine. The time spent on the repair may be divided into three parts: (a) Time lost between stoppage of machine and receipt of complaint by the maintenance department; (b) time lost between the receipt of complaint and arrival on site of the repair squad; (c) the actual time spent on the repair.

The first item is outside the control of the maintenance department, beyond the responsibility of seeing that when the complaint is received it is transferred to the right quarter without delay; item (b) is more a matter of organisation and close co-operation between the various departments concerned. It is item (c) which requires most attention for cutting down the time spent on the repair presents all sorts of possibilities.

## Factory Installations

A considerable amount of electricity distribution in modern factories is carried out by means of an overhead bus-bar system, and from a maintenance point of view each time a fuse renewal is called for, means the use of a ladder, and in a modern factory the time spent on moving such ladders can be considerable; again, unless the ladders are padlocked to the steelwork, the time spent in finding them may be greater than that expended on the actual repair.

Although the fuses by their location in the plug-in connection box cater for short-circuit faults both on the machines and in the down leads, time could be saved, it is suggested, by incorporating fuses on the machine, either in place of the isolator or in the form of a switchfuse; these could be of a size determined by the average load of the machine, and would normally fail before the fuses in the bus-bar box.

With these conditions obtaining, the time spent on the repair depends on the skill of the individual concerned, and it is here that the importance of selection of staff enters the picture. Fortunately, in peacetime, at any rate, there is available a supply of men who understand the theory of the machinery on which they work, and by their employment to the exclusion of half-trained "handy men," a standard for which the bonus system could be introduced would be arrived at.

In order that full use could be made of individual skill a plan of inspection of plant would be called for, the amount of time

spent on any one machine in a specified period being determined by the amount of apparatus, type of duty, hours of work per working week, this again being classed as a branch of time-study, its value being assessed in freedom from break-down.

Maintenance is an essential part of any system of production, and in order that its quality may be equal to the demands called for, it is necessary that a high standard of

skill is shown by those who carry it out. Finally, unless existing rates for such work are revised there is little chance of attracting the right type of man, and in this connection the following are suggested: (a) The rate payable should be at least equal to the rate paid to any hourly-paid worker on the plant; (b) the bonus should be dependent upon the number of break-downs occurring during any week.

## 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.*

Having served for 18 years with the Metropolitan-Vickers Electrical Co., Ltd., **Mr. A. J. Staines** is taking up an executive position with Newey and Eyre, Ltd.

Following the death of Mr. George Keith, **Mr. M. Burningham** has been appointed chairman and managing director of Keith Blackman, Ltd., and **Mr. A. L. Ayton** secretary.

**Mr. James Milne**, vice-president of the Commercial Cable Company, entertained members of the American Communications Delegation now visiting London at luncheon at the Ritz Hotel on March 14. Among others present was Sir Frank Gill.

The Committee of the I.E.E. North Midland Centre have nominated **Mr. A. Kelso** (Harrogate electricity department) as chairman, and **Messrs. A. G. Connell** (Halifax electricity department) and **R. H. Coates** (Sheffield electricity department) for election on September 30.

At the annual general meeting of the Telecommunication Engineering and Manufacturing Association, **Mr. T. A. Eades** and **Mr. F. T. Jackson** were elected chairman and vice-chairman, respectively.

**Mr. Samuel I. Ellis**, of the lighting and heating department of the North-Eastern Electric Supply Co. Ltd., has been appointed chairman of the B.E.D.A. (Northern Counties area) for the sixth successive year. **Mr. T. E. Daniel**, borough electrical engineer of Darlington, is vice-chairman.

The engagement is announced between Guy Heaton, only son of Mr. and Mrs. Noel Heywood, of Alderley Edge, and Yolanda Mary, eldest daughter of Mr. and Mrs. Vincent Z. de Ferranti, of Alderley Edge, Cheshire.

**Mr. F. Newey**, engineer and manager of the Lincoln electricity undertaking, and a former president of the I.M.E.A., has been elected chairman of the E.D.A. Council for the ensuing year, and **Mr. H. J. Randall**, managing director of the City of London Electric Lighting Co., Ltd., is the new vice-chairman.

To assist in their rural electrification development schemes, estimated to cost £15 000 000 in the first five post-war years, Edmundsons Electricity Corporation have secured the services of **Mr. C. A. Cameron Brown**, who has been working for the E.R.A. for the last seven years. Mr. Cameron Brown will superintend the corporation's development schemes and his services will be at the disposal of their associated companies.

**Mr. G. W. Robb**, of Rotherham Corporation, has been appointed transport manager to St. Helens Corporation.

**Mr. A. G. Guthrie** and **Mr. R. P. Willcox** have been appointed directors of J. and E. Hall, Ltd. Both have been connected with the company for many years.

**Mr. A. J. Newman**, chief engineer and general manager of the Bristol electricity department, has retired after 41 years' service. He was appointed assistant engineer in 1904, deputy electrical engineer in 1915, and chief engineer and general manager in 1932. **Mr. I. A. D. Pedler**, who has been deputy chief engineer since 1932, has been appointed acting general manager and chief engineer. He proposes to retire in June on reaching the age of 60 years.

### Obituary

**Mr. H. P. Froy**, chairman and joint managing director of W. N. Froy and Sons, Ltd., aged 76 years.

**Mr. E. A. Hounsell**, turbine sales engineer and joint London manager for the Brush Electrical Engineering Co., Ltd., on March 20, aged 51 years.

**Mr. G. V. Boys**, secretary of the Institution of Naval Architects since 1935, on March 15, aged 51 years. He was senior engineer with Messrs. Kennedy and Donkin.

**Mr. P. W. Paget**, the last of that famous group of wireless pioneers—Marconi, Kemp and Paget—who heard the first Trans-Atlantic wireless signal, aged 72 years. He joined the Marconi Company in 1898. He retired in July, 1938.

# Potential Export Markets

## Commercial Conditions in the U.S.A. and S. American Countries

THE first five of twenty-six reports reviewing commercial conditions in foreign countries have been issued by the Stationery Office on behalf of the Department of Overseas Trade. They deal with the U.S.A., Bolivia, Brazil, Chili and Peru, and should afford guidance of considerable value to manufacturers and exporters in the electrical and other industries.

According to a series of articles on export markets, published in THE ELECTRICIAN in 1940, and the early part of 1941, the South American republics bought a large proportion of their electrical goods from Germany, and in the post-war period much of that trade should be diverted to the United Kingdom.

As to the United States as a post-war market for British goods, the review just issued, states that since United Kingdom exports to that country in pre-war years consisted of manufactures and semi-manufactures to the extent of well over 75 per cent., and since United States imports of such manufactures from all sources represented 40 per cent. of the total imports, it is within this portion of imports (having a hypothetical aggregate value of \$4 500 millions) that United Kingdom exporters must seek their major opportunity in the expanded post-war market. It is reasonable to think that there will be an increase in the value of United Kingdom exports to the United States roughly proportionate to the expected rise in the levels of consumption in that country, but that any increase beyond this will have to depend upon other factors.

### Need for Intensive Research

As one factor contributing to the expansion of United Kingdom exports not only to the U.S.A., but to all markets, the importance of more intensive industrial research in the United Kingdom cannot be sufficiently emphasised, says the booklet. It is, however, of particular importance in relation to the United States markets, precisely because the possibilities of expansion of the United Kingdom's traditional exports are limited, even if such possibilities be fully exploited, it therefore seems essential to develop a new range of exports, based probably upon recent inventions, in order to effectively tap new areas of potential sales.

It may well be that one of the most important factors in achieving an expansion of their exports to the United States after the war, will be found to lie in the revision

and improvement of methods used by exporters in the merchandising of United Kingdom goods.

It is well known, states the review on Bolivia, that United Kingdom goods have always been popular in that country, while British business methods have established a basis of goodwill which should react advantageously to U.K. exporters, provided that they are prepared to display much more initiative and enterprise than hitherto in catering for Bolivian requirements. In order to recapture the trade which the United Kingdom lost to Germans and Japanese, a radical change will have to be effected in United Kingdom methods of salesmanship.

It has been suggested that in the interests of trade, United Kingdom firms should be encouraged to set up in the Bolivian distributing trade, by opening wholesale and retail stores in the principal towns, and by establishing branches of retail houses.

### Group Selling Recommended

Brazil is, on the whole, definitely a price market, declares the review on conditions in that country, and the sale of a very wide range of products, including even capital goods, is affected by this fact. Germany, in addition to selling articles lower-priced than the United Kingdom article achieved an appreciable part of her success in the sale of machinery by carrying the article in stock and by having a technical expert to explain its operation. Where an exporter sells a limited amount of machinery it may not be possible for him individually to arrange that his salesmanship should be strengthened in this way, but it should often be possible for him, by participation, in some form of group selling, to do so. In a price market, where cheapness is itself a selling point, it is more desirable that a machine should be carried as stock in order that the potential customer can see for himself the advantage of the machine and have explained to him the relative advantages of the durability compared with lower prime costs.

On the assumption that Brazil will suffer no serious economic crisis upon the close of hostilities, it seems likely that in the transitional period following the end of the war she will afford a valuable market for imported goods. There will be a large demand for re-stocking and ample funds will be immediately available. The well-to-do classes—purchasers of both capital goods and high quality consumer goods—will

have at their disposal larger resources for the purchase of such goods post-war and, in Brazil, there will be a considerable pent-up demand for goods of practically every kind except where local industry already produces a surplus for export. Immediate post-war requirements of imported consumer goods of high quality and of kinds not produced locally, including, wireless sets and domestic refrigerators, should exceed pre-war demand.

#### Demand for Electrical Plant

Plans are being made to increase the country's output of hydro-electric energy and to improve transport facilities. In the matter of the capital goods requirements of public utility concerns such as heavy electrical plant, locomotives, telephone and wireless installations, Brazil has still to rely upon imported supplies.

The fact cannot be overlooked that the very extent of Brazil's war-time prosperity may prove a danger in the post-war period. A wave of industrial inflation has been created by the virtual suspension of imports from many pre-war supplying countries, an accumulation of fortunes in Brazilian currency through unprecedented sales to the Allied nations and a general shortage of objects on which to spend these fortunes.

There will be in Chili, states the review of that country's possibilities, an exceptional demand for all classes of manufactured goods immediately after the war to meet the needs of a population which has been denied, at any rate, in the later stages of the war, a large volume of goods it was accustomed to receive. Apart from this demand for consumer goods, and industrial machinery, there might well be a demand for machinery and plant in connection with public works projects which have been under consideration chiefly as a result of the establishment of the Reconstruction and Assistance Corporation. A large number of these schemes involved hydro-electric developments but, with the outbreak of war and the consequent difficulty in obtaining supplies, most of the proposals were placed in abeyance.

#### Conditions in Peru

The view is expressed that if the size of Peru's favourable trade balances during the war years is to be the criterion it seems to be unlikely that Peru will find herself possessed, at the end of the war, of any large reserve of foreign exchange. She may possibly encounter difficulties during the transition period in maintaining so high a level of income from her exports of minerals, other than petroleum, as she has enjoyed during the war and in again building up her pre-war volume of cotton exports. Shortage of labour, especially of technicians, may limit the expan-

sion of industry or retard the projected development of agriculture. On the other hand, the provision of cheaper hydro-electric power, improved transport facilities and the ability to satisfy by local production more of her domestic needs will prove of value when war-time conditions come to an end.

Peru has, however, the advantage, comparatively rare in Latin America, of a considerable diversity of export products and it may be that her exchange receipts from current exports will permit her to offer a fair market for capital goods. As in most countries, there will be a large demand in Peru immediately after the war for those goods which she herself does not manufacture and has been unable to obtain from abroad in the quantities or qualities normally imported; these include machinery and tools of all kinds not only for public utility concerns and for manufacturing industries but for agriculture, as well as in connection with public works contracts, electrical and telephone equipment.

## Correspondence

*The Editor welcomes the free expression in these columns of genuine opinions on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

#### Reactive Metering

[TO THE EDITOR]

Sir,—We would like to bring to your notice a misleading statement in the article headed "Reactive Metering" by G. W. Stubbings published in your issue of March 16.

The second and third sentences read as follows:—

"The first is a meter, each element of which is completely compensated internally so that the torque it produces is proportional to kVAr. Meters of this kind, which would be connected similarly to energy meters, have never been commercially developed."

Whilst it is true one may say that it all depends on what is meant by "commercially developed," we would like to point out that we have supplied meters of this type to integrate kVAr for many years and there are thousands of such meters installed throughout this country.

In addition, the reactive kVAh meter incorporated in our well-known Trivector utilises this fully compensated integrating meter and the number of these installed runs into thousands.

Yours faithfully,  
for Landis and Gyr, Ltd.,  
A. E. CLARKE, Home Sales Manager.



# Control of Supply Systems

## The Reliability of Telephone Type Apparatus

A PAPER by Mr. W. Kidd and Mr. E. M. S. McWhirter on "Operational Control of Electricity Supply Systems" was read before the I.E.E. Transmission Section on March 14.

Supervisory equipment for the remote control of plant has proved to be thoroughly reliable and to facilitate efficient operation of electricity supply systems. This paper gave the reasons for, and the steps taken to develop, the common-diagram control system, which enables an almost unlimited number of sub-stations, etc., to be completely controlled from one diagram and control panel, and is sufficiently flexible to cater for the growth of the undertaking. It described a wall-type system diagram which automatically indicates which sub-stations have changed conditions, and therefore the area involved in any disturbance. The system diagram is equally extensible to accommodate new feeders and sub-stations, with a minimum of operating disturbances.

Particulars of the circuits and apparatus, and comparisons of floor area, pilot and cost economies were given; also information of an installation dealing initially with 78 sub-stations, to which others are being added.

**Mr. E. B. S. Powell** (London Power Co.) congratulated the authors on having the courage to break away from normal supervisory methods and reducing the amount of equipment necessary and, incidentally, the cost and maintenance. This was an instance of co-operation between the telephone engineer and the power engineer which was of great assistance. The Manchester control system provided the greater part of the needs of the control engineer and avoided the changing of a large number of lamps all over the diagram, but it fell short in regard to one minor detail in that the control engineer had to study four or five different diagrams at the same time. Obviously the authors had not found that a disadvantage, but the system of control would be strengthened if the wall diagram was hand dressed, giving facilities for quick reference. On the London Power Company's system, it was all done by telephone, but it was not found that that introduced a great deal of delay. He felt that where a common diagram might serve a useful purpose, even in a manually operated sub-station, was in giving correct information to the control engineer as to what had happened, which was one of the most difficult things to find out.

**Mr. D. P. Sayers** (Birmingham electricity

department) said his principal criticism was the absence of any figures of cost in the paper, because much as supply engineers appreciated the convenience of obtaining automatic information and indication of their system they must first be satisfied that such extra facilities as those obtained from the application of telephone technique could be economically justified. No doubt there had been considerable improvement in telephone type relays, but even with modern automatic telephone systems, wrong numbers and signals occurred, and under conditions of switching high voltage equipment and large areas of distribution, nothing short of 100 per cent. reliability could be tolerated. Therefore, it was very necessary that development of this kind of equipment should not proceed too fast until actual service experience had proved that it was satisfactory.

**Mr. C. G. Carrothers** (Kennedy and Donkin) said the control room illustrated did the authors' system rather less than justice. Control engineers would appreciate a room with some windows in it.

**Mr. N. C. Smart** (General Electric Co., Ltd., Coventry), speaking as a telecommunications engineer, expressed his satisfaction that a progressive undertaking like that at Manchester had so much faith in the operation of telephone type gear that they were prepared to go in for such a comparatively complex system. No doubts need be entertained as to the technical operation of the system, and he asserted that the reliability of it had been proved during the past 10 or 15 years. It seemed a pity that there was not, in this type of system, a diagram always in front of the control engineer, showing the circuit breakers that were closed and those that were open. That seemed to him necessary for the satisfactory, rapid and reliable operation of the system.

**Mr. R. Farrall** (London Transport) said that whilst the system installed at Manchester must be considered eminently satisfactory if yearly cost was the only yardstick to measure it, it was necessary to consider at what sacrifice of the normal requirements of a good control scheme this saving had been made. The two main requirements of a good control scheme were reliability of control and speed of operation. As regards reliability, he maintained that supervisory gear was not infallible. In the present stage of development, no single operation should take more

than three seconds. Power engineers should make it clear to telephone engineers—who did not always appreciate the power engineers' problems—that the requirements he had indicated must be met, otherwise he feared that supervisory control would be discredited, which would be a pity, because he believed it had a great future.

**Mr. D. E. Bird** (Edmundsons Electricity Corporation) said that one of the important features of supervisory control was the control of the system under normal conditions, which meant satisfactory voltage and loading of the various feeders. That was not possible without supervisory indications of load and feeder conditions, and he did not see provision for this in the authors' system. Whilst he was not worried about the reliability of telephone apparatus, he was worried about the reliability of the pilots, especially if they were on overhead lines. He was interested in a system having 20 or 30 miles of overhead lines, and if the supervisory system was to pay for itself, the pilots would have to be overhead. Had the authors any idea as to the reliability of pilots under these conditions?

**Mr. T. R. Rayner** (Automatic Telephone Co., Ltd.) expressed the view that the last thing wanted was a common diagram system. The control engineer must be given all the information he required to enable him to decide what to do, but it was comparatively useless to tell him that a breaker had opened in one of three sub-stations if these three sub-stations happened to be situated on a common line, because a single occurrence might have caused a complete shut-down of a sub-station or the sub-station might be fed from one side. Would the authors recommend the application of their system to the major distribution, say the 33 kV, or did they suggest that the distribution of the major quantities of power should be handled on an individual basis and the lower voltages should be dealt with by a common diagram system?

**Mr. J. A. Broughall** (L.M.S.) said he could re-assure power engineers as to the reliability of Post Office type of equipment and promised to send in details of actual performance on one or two systems with which there had been 8 or 10 years' experience by his company. He added that the paper would be still more useful if it contained a classification of equipment defects, as this would enable comparisons of experience to be made and make certain that the same things were being compared. Perhaps a compromise between the old system and that of the authors' was likely to give the best results. The point was that it was no use obtaining information at a

quicker speed than the operator could assimilate it.

**Mr. B. Webb-Ware** (Central Electricity Board) asked if the authors, in preparing their curve which indicated that a minimum of 10 sub-stations justified economically, a common diagram, had allowed for any duplication of the transmission system in the control centre, because he had had experience where there had been difficulty due to lack of that. He added that his experience with telephone type apparatus for supervisory control had been that it was highly successful, over a period of some ten years.

**Mr. G. A. Burns** (Automatic Telephone Co., Ltd.) thought the authors had been ungenerous to the supervisory control in the space they had allotted to it, and also the amount of space allowed for the diagram. The authors' system did not appear to make maintenance simpler. One important point that had come out in the discussion was the general acceptance of the reliability of telephone type apparatus, which was very different from the attitude taken at a previous meeting on that subject in 1935.

**Mr. McWhirter** replying to some of the points raised, said it was not easy to give figures of cost for systems of this type. They varied considerably and a great deal depended on the particular conditions. The provision of a control room with windows was a debatable point. The number of sub-stations for which it was economical to instal supervisory control was between 8 and 12, but for larger systems more equipment would be required, and it was necessary to plan for the total number in view. The authors felt there were great disadvantages in having a complete detailed diagram of the whole site network. With a large number of sub-stations the whole thing became chaotic, and therefore the authors favoured a reduction of the amount of detail shown on the common diagram, at the same time giving the control engineer facilities for seeing the detail as and when he wanted to look at each part of the network. The pilots in Manchester were all underground, but in a rural area they would have to be overhead, and it was recognised that overhead pilots were not as reliable as underground pilots. Nevertheless, this was not a matter to be afraid of because the system could be used in these circumstances if the problem were attacked in a normal commonsense manner. In reply to Mr. Rayner's question whether the authors would recommend this control for 33 kV distribution, his answer was "Why not?" always provided there were sufficient 33 kV sub-stations to warrant the cost. If there were only, say, up to 6, and no more were anticipated, the individual system would probably be cheaper.

# Instruments and Temperature

## Methods of Design to Reduce Errors

**A**t a meeting of the I.E.E. Measurements Section, on March 16, a paper by Mr. G. F. Tagg, on "Temperature Compensation in Indicating and Recording Instruments," was read and discussed.

One cause of errors in indicating and recording instruments was, stated the author, their use at a temperature other than that at which they were calibrated. Most of the physical properties of materials on which the performance of an instrument depended varied to a greater or lesser degree with temperature. It was, therefore, necessary when designing an instrument to reduce to a minimum any errors caused by changes in temperature, and, if possible, to make them negligibly small. This was done either by adopting such a design that the temperature errors themselves were very small, or by introducing other changes with temperature which would compensate them. An account was given in the paper of the more common methods employed, each method being briefly discussed to indicate the best arrangement for each type of instrument. The instruments considered were ammeters, voltmeters, millivoltmeters, wattmeters, and rectifier-operated and thermocouple instruments.

**Mr. W. Phillips** (Elliott Bros. (London), Ltd.), said that whilst it might be true, that changes due to physical expansion and contraction were so small that they could, in general, be neglected, this was not necessarily so in the case of dynamometer instruments. The question of thermal lag was important when a compensating device was used. The results obtained by the formulæ in the paper could be regarded more as a guide than giving actual final figures, since they took no account of the resistance of the connecting leads or of the change in the elasticity of the control springs. In the case particularly of precision wattmeters, the most troublesome sources of error were the self-heating and variation of the elasticity of the spring. Errors of  $\frac{1}{2}$  per cent., were often met with, due principally to the self-heating effect. While the effect of temperature on the control springs could be compensated by means of a variable resistor in the voltage circuit and a thermometer in close proximity to the coils to measure the temperature, an automatic device would be of great benefit especially for portable instruments. With regard to rectifier instruments, an improvement in the temperature coefficient of the low range voltmeter could be effected by selecting a rectifier in which the leakage current was higher than usual. In

connection with the author's suggestion of the use of Mutemp for compensating d.c. moving coil ammeters by shunting a proportion of the flux, he had tried a similar material—Thermalloy—and found that if the temperature variation of the instrument, between certain limits, was, say, 5 per cent., it was necessary to shunt about 10 per cent. of the flux. Another method of using these temperature-affected magnetic alloys was in the core of a choke coil.

**Mr. F. R. Axworthy** (Everett, Edgcombe and Co., Ltd.) expressed surprise that no reference was made to induction instruments. Although the ordinary shaded pole induction ammeter or voltmeter suffered from having a poor temperature characteristic, several interesting movements had been devised to improve its performance. Some mention might also have been made in the paper of errors due to self-heating of instrument coils, and methods of eliminating or minimising these errors in various types of instrument. He did not think that Swinburne's method of compensating millivoltmeters had much to recommend it, and he did not agree with the author that 10 V was the lowest satisfactory range for a rectifier voltmeter. It depended, of course, on the volt drop used, but a satisfactory 5 V instrument could be achieved quite easily. This could be further extended to 1 V or less by incorporating a transformer in the instrument.

**Mr. D. C. Gall** (H. Tinsley and Co., Ltd.), as an instrument maker interested in temperature compensation, thought the author had simplified things a little too much, because in his experience the chief difficulty was to arrange compensation so that it was true during changing temperatures as well as at fixed temperatures. All the author's formulæ applied to conditions of equilibrium, but experience showed that such conditions were seldom reached, particularly in instruments on aircraft or under industrial conditions, where changes occurred very rapidly, and if there was to be accuracy over the whole range, it was essential that the compensating circuits changed their temperature at the same rate as the circuit or component which they were compensating.

**Mr. D. Connelly** (Sangamo-Weston, Ltd.) asked for information as to whether the shape and size of the magnet and the springs affected the temperature coefficient. Further information was also sought with regard to new types of alloy of the cadmium and beryllium-copper types which were now

coming into use for springs. No mention was made in the paper of a material which had been very widely used for compensation, viz., carbon, although there were disadvantages in that carbon could not be used over a very wide temperature range and there was a tendency to instability.

**Mr. C. L. Lipman** (Nalder Bros. and Thompson, Ltd.) said the methods of compensation described in the paper represented standard practice and gave excellent results when applied to instruments of the moving coil type. The advent in recent years of the group of nickel-aluminium-cobalt-steel permanent magnets had so improved the performance of the moving coil instrument that the designer need no longer worry about temperature errors in permanent magnet moving coil instruments. The position with regard to induction type instruments, however, was not so favourable and the opinion and advice of the author on the subject of temperature compensation as applied to induction instruments would be appreciated. It could be stated, nevertheless, that the temperature errors in modern induction type instruments had been reduced to amounts which were consistent with good engineering practice. To achieve this, methods of compensation somewhat different from those described in the paper were being employed. It should be borne in mind that in the case of induction instruments, the torque was proportional not only to the product of two currents, but also to the sine of the phase-angle between the respective fluxes. Therefore, any method of compensation should tend to stabilise the phase-angle as well as the magnitudes of the currents under changing temperature conditions. Furthermore, such a method of compensation should also, as far as possible, take care of the self-heating error which was present in some induction type instruments.

**Mr. H. Easton** (Ferranti, Ltd.) said the point which appeared to him to be most important in the case of moving coil instruments of modern types as regarded the effect of temperature error, was the temperature coefficient of the springs, and it was a matter which had not received adequate attention in the paper or discussion.

**Mr. L. B. S. Golds** (Edmundsons Electricity Corporation), speaking from the user's point of view, said he was sorry that self-heating errors had not been dealt with. The whole paper sounded delightfully easy, but although a number of errors could be worked out beforehand, when it came to the actual instrument they very often did not work out as the author had described.

**Mr. A. B. Townley** asked if the author could give any information as to the comparative performance of vacuum thermo-

couples with which it was impossible to make any temperature compensation externally.

**Mr. P. J. Higgs** (National Physical Laboratory) remarked that the stability of the material had not been touched upon, and he asked the author for some information as to the stability of the materials he had mentioned. He had done a fair amount of work on similar materials, but at rather higher temperatures than in instruments and there was a great difficulty in being able to determine any temperature coefficient at all, because of the continual change in stability. There was a tendency for small changes in metals to go on for months and even years. To overcome that there was a process of heating at much higher temperatures for a short time than ordinary working temperatures, and in this way these metal changes had been overcome. With regard to carbon as a compensating device, he recalled experiments some years ago in which the effects of temperature were very much smoothed out by the carbon. As to springs, it was known that a spring material depended for its properties on being in an over-worked or drawn condition and under the effects of temperature and time it lost its resilience and springiness. He had had experience of materials which were very much more stable than others, and this effect of temperature and time was of great importance when an instrument was overloaded for a time and therefore overheated, or where it had to be used in tropical countries.

The author, replying to the discussion, said that induction instruments were deliberately left out of consideration in the paper because it would have unduly increased the length of it. Compensation to take account of changes in temperature was rather difficult, but one of his methods given for the thermo-couple instrument was intended to cover changing conditions as well as static effects. Errors due to the control springs were more serious in high precision instruments, and they were not at all troublesome in the ordinary range of commercial switchboard instruments. There was not a lot of information available with regard to errors due to the magnet. Nothing very authoritative had yet been published on the later materials. There seemed to be very little information available as to whether the size and shape of magnets and springs affected the temperature coefficient.

**B.T.H. Activities.**—The current number of the British Thomson-Houston Company's publication contains a review of progress in 1944, with details and illustrations of outstanding productions, and an interesting reference to turbo-electric ship propulsion.

## News in Brief

**Street Lighting.**—Having considered reports from the gas and electricity engineers, the Blackpool Highways Committee has decided to adopt electric street lighting on the Grange Park estate.

**New Trolley - bus Services.**—The Newcastle-on-Tyne City Council intends applying for sanction to run trolley-buses on a further 16 routes and to abandon tram services on the routes concerned.

**Electricity in Rural Areas.**—The North Riding Rural Councils' Association has asked the Electricity Commissioners to give special and urgent consideration to the needs of rural areas when planning future electricity developments.

**Hull's All-electric Houses.**—The first five of Hull's 100 all-electric prefabricated houses have been completed.

**New Housing Installations.**—The Burton-on-Trent Housing Committee has decided that cookers, refrigerators and wash boilers are to be electric at 85 houses and of gas type at 15 houses. The Scarborough Housing Committee is asking the electricity department to consider the question of maintaining the electrical equipment proposed to be installed in temporary houses and to state the best terms that can be offered for this service.

**Chinese Wireless Circuit.**—A direct wireless circuit is now available between

London and Chungking for all classes of telegraphic traffic, states Cable and Wireless, Ltd. To supplement it at certain times of the day, traffic between Britain and China is automatically relayed via Colombo.

### TWENTY-FIVE YEARS AGO

FROM THE ELECTRICIAN of March 19, 1930: It is reported that as a result of experiments conducted at the Signals Experimental Establishment at Woolwich Common, it has been found to be quite practicable to handle traffic by wireless telegraphy at speeds of 100 words per minute, using the standard Post Office type of Wheatstone transmitter with punched tape for transmission, and the standard Wheatstone inker for reception. The first tests of this method were carried out between Woolwich and Bedford in July, 1919, when a speed of 62 words a minute was reached.

## Electricity in Scotland

HOPE that Scotland would help the electrical industry out of the very serious position in which it found itself as a result of war-time restrictions was expressed by Mr. C. N. Haldane, vice-president of the Institution of Electrical Engineers, in Glasgow on March 17 at a luncheon meeting of the Scottish Centre of the institution.

Replying to the toast of the "Institution," proposed by Mr. James Williamson, chairman of the local centre of the Institution of Civil Engineers, Mr. Haldane said he doubted if the public were really fully aware of the seriousness of the present situation. In the post-war years there would be a very great demand on the electrical industry, and a very greatly increased quantity of electricity would be required.

He hoped that the water power of Scotland was going to play a considerable part in helping them to extricate themselves from their very serious difficulties. But, alas, there seemed to be a certain section of opinion in Scotland which was not very favourable to the utilisation of

those water power resources. As a Scot himself he had always believed that Scotsmen were very careful with their bawbees. In Scotland they had a valuable asset which could bring in a very large number of bawbees, and yet they found reluctance in certain quarters to make use of that asset.

Col. H. Carter, chairman of the Scottish Centre, proposed the toast of "The City of Glasgow," and Lord Provost James Welsh in reply said he realised there were ways in which Glasgow could be improved, and one of them was by becoming a bigger consumer of electricity. As an industrial city Glasgow suffered more from a vitiated atmosphere than from perhaps any other single factor. One of the ways in which that could be put right—and must be put right—was by a greater consumption of electricity. He hoped that in Glasgow they would be allowed to adapt themselves to the needs of the future in that particular way. "It was difficult to look ahead until they knew the Government's plans for the allocation and reallocation of the basic industries.

## Book Review

**Electric Power Stations.**—By T. H. CARR. Second edition revised and enlarged. Vol. I (London: Chapman and Hall). Pp. xii + 507. 32s. net. Vol. II. Pp. xii + 549. 32s. net.

The appearance of a new edition of this comprehensive and up-to-date work, only three years after its initial publication, is a fitting commentary on its value and importance as a conspectus of British practice in the design and construction of electric power stations. Since reviewing the original edition, I have had an opportunity of studying Mr. Carr's treatise critically in the light of some American textbooks on the same subject, bearing in mind that the United States have over led the rest of the world in power station development. The comparison, although generally favourable where the scope and details of technical description are concerned, show Mr. Carr to disadvantage in respect of such major issues as the fundamentals of station design; system stability as influenced by alternator excitation and by the distribution of station reactance; the broad economics of power plant location, construction and operation; and last, but far from least, attention to prose style and the rules of English grammar.

It seems a pity that an authoritative publication, which might have become the legitimate successor to Sir John Snell's "Power House Design" and could have been made the English counterpart of Dr. Klingenberg's classic "Bau Grosser Elektrizitätswerke," should be marred by a style of writing that is reminiscent of a manufacturer's handbook or technical information leaflet. Engineers cannot all be expected to write like Churchill or Belloc, but at least they should not say "each" when sometimes they mean "both" and at other times "one." Neither ought they to subdivide the category of *space occupied* (Vol. I., Table 22) into "square" and "cubic" when the correct terms to use are *area* and *volume*.

What one misses most in Mr. Carr's work is the broad consideration on the one hand, of economic questions affected by power station design, e.g., modern developments in thermal cycles, fuel combustion, cooling towers, insulating media, alternator excitation; and, on the other hand, of economic questions affecting that design, although in a sense he has dealt with these latter under the heading of station costs (Chapter 22).

On the descriptive side the book is admirably informative. In fact it is a storehouse of information on British power station practice which no serious student of

the subject can afford to be without. But it is doubted whether, even in its revised and enlarged form (both volumes have increased in length by over one-quarter), Electric Power Stations will meet the needs of specialists who have to design, plan and construct the modern steam-electric generating station. H.R.

## In Parliament

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

**Electricity and Telephone Wires (Poles).**—Replying to Mr. Bossom, Major Lloyd George said there were technical considerations which seriously limited the use of the same pole by overhead lines and telephone wires, but nevertheless the practice was not unknown in this country. He had consulted the Postmaster-General who agreed that the two departments should confer and examine the possibility of extending the joint use of poles.

**Lighting in Railway Carriages.**—Mr. Soronsen asked the Parliamentary Secretary to the Ministry of War Transport if he would arrange for all shades over railway carriage lamps to be removed so as to provide effective illumination during morning and evening on L.N.E.R. suburban and other trains, particularly in view of the present inadequacy of lighting on some lines; and whether he would order lamps to be lowered or extinguished only in the event of alerts in the vicinity of trains. In reply Mr. Noel-Baker said he was advised that the use of unshaded lamps could not at present be permitted in railway carriages where blinds were not in use. The order to extinguish or reduce such lighting during an Alert had been suspended since January.

**Street Lighting.**—In reply to Major Sir Jocelyn Lucas who asked the Secretary of State for the Home Department whether his attention had been called to the differences in street lighting as between town and town, and as between various sections of the same city; and if, to avoid accidents, he would endeavour to secure a minimum national standard of lighting for all main routes, Mr. H. Morrison said that under emergency legislation it had been necessary to limit the amount of street lighting allowed in war-time, but he had no power to require any minimum standard of street lighting.

## BOOKS RECEIVED

"The Measurement of Colour." By W. D. Wright. (London: Adam Hilger, Ltd.) Pp. vii + 223. 30s. net.

# Estimating and Contracting

## New Skill and Technique Required to Meet Future Conditions

**T**HE importance of accurate estimating for contracts was stressed by Mr. W. H. Brooks in a paper on "Estimating and its Relation to the Economics of Electrical Contracting" read before a meeting of the A.S.E.E. on Tuesday.

He said the estimating department was the pivot of any contracting organisation. To-day a rough calculation was by no means good enough, since accuracy was the main factor for safe contracting.

Successful estimating was determined by the early training and subsequent experience of the estimator prior to his becoming an estimator or supervising electrical engineer.

### Eliminating "Cut Price" Contractors

With a really efficient system compiled and formulated upon experience with the actual work undertaken and with records kept up to date, the estimating department of any contracting organisation was well qualified to submit its tenders correctly and compatible with the work involved. The essentials of any estimate were: (1) The labour cost; (2) the material cost; (3) the general overheads; and to be capable of arriving at or computing those costs the estimator must be qualified in many respects. It was interesting to note that the recommendations of the Central Council of the Ministry of Works for the placing of building contracts, and the letting of sub-contracts, depreciated the issuing of invitations to tender to firms of indifferent standing, which, in his opinion, would assist in eliminating the "cut price" contractor.

However, estimates could produce no good results unless the internal function of the business was efficient and economic and the system of administration simple in character and operation.

It was anticipated that the installations of the future would differ in many respects from those they were accustomed to, and that standardisation would provide a rigidity in specification. This should assist the estimator in many respects, and if he had not already established his system of collating his costs, he should formulate it so as to enable him to calculate easily the costs of various operations or work. Such a system could be devised very efficiently by carefully watching, recording and making an inventory of every item associated with jobs on hand, whether they be contracts or day work jobs.

The success of any contract depended upon the supervision of the actual job and

upon the co-operation of the costing and estimating departments. To achieve the success so necessary to contracting, the estimator himself must be not only a qualified engineer but a liaison between the firm and the client's agents, and the pivot upon which the business revolved.

The future would, no doubt, reveal many changes in installation practice, and new methods of work were bound to develop. We had crossed the threshold of specialisation and embarked upon a new era.

With the promised mass-production methods for building construction and numerous uses to which prefabricated components would be put; the installation of the various services would require a new skill and technique; they would see a greater use of hand power tools for speeding up the installation work; the conditions of employment on the building sites improved whereby a full working day during the winter months would be aided by electric light and power.

The changes might affect traditional building and constructional and installation methods, and the electrical contractor must be prepared to meet these changes, much of which would be to the ultimate advantage of the electrical industry. Therefore, the advice to every estimator, or prospective estimator, was to prepare himself for the future and arm himself with the information in readily applicable form; it would be the finest asset for future work.

### Need for More Co-operation

It was gratifying to learn that the various committees and sub-committees working on the preparation of the many B.S.I. codes of practice, were aiming at getting greater rigidity into the specification and determining the practice to be adopted for the particular work to be undertaken; further, the need for more co-operation between the principals concerned was inferred and, perhaps, anticipated.

It was almost demanded, that the guiding influence of action in the future should be planned co-operation in place of disorderly and wasteful competition.

And whilst the future might hold good promise of work in plenty, it should not mean a harvest for some short while and then degenerate to a slump inactivity.

It would, he thought, depend upon the honesty of purpose of those responsible within the industry in maintaining a true perspective of enterprise; economic values in relation to employment; and a balanced efficiency within the business organisation.

# Electricity Supply

**Workington.**—The Electricity Committee is to erect an 11 kW sub-station in Oxford Street at a cost of £9 680.

**Cardiff.**—The Housing Committee has arranged to provide electricity supply to the Crystal Glen housing site at a cost of £2 508.

**Barrow-in-Furness.**—The Electricity Committee is to provide supply to a farm at Backbarrow at a cost of £90 for mains extension.

**Walsall.**—The Electricity Committee has authorised the installation of additional feeder mains and ancillary apparatus at an estimated cost of £20 500.

**Nuneaton.**—A scheme for the improvement of the electricity supply to Weddington, at an estimated cost of £6 370, has been approved by the T.C.

**Blackpool.**—The Electricity Committee is seeking sanction to borrow £19 935 for mains and services, and £8 275 for sub-stations and plant.

**Hammersmith (London).**—The B.C. is recommended to authorise the conversion of 52 existing gas lamps to electric lighting, at an estimated cost of £2 000.

**Kettering.**—The T.C. is applying for sanction to borrow £2 380 for the provision and laying of electricity mains in connection with the housing site at Highfield Road.

**Burnley.**—The cost of equipment necessary for immediate and post-war development, as envisaged by a circular from the

Electricity Commission, is estimated by the Electrical Engineer at £10 595.

**Camberwell (London).**—The B.C. has agreed to an application by the South Metropolitan Electric Light and Power Co., Ltd., for a fringe order to supply premises outside the company's supply area.

**Mansfield.**—The Electricity Committee is to provide sub-stations at Titchfield Park and Littleworth and extend mains at a cost of £5 150.

**Durham.**—The North-Eastern Electric Supply Co., Ltd., have stated that there is no truth in a report that the plant for a new power station at Kepier had been abandoned on the ground that the foundations were not suitable. At the inquiry last December, it was stated that the Kepier site fulfilled all requirements.

**Erne Scheme.**—The Erne scheme, which is to be taken in hand as soon as there is sufficient equipment available, is to cost about £3 500 000—pre-war values. This was disclosed when the Minister of Industry and Commerce, Mr. Lemass, was speaking in the Dail, Dublin, on the second stage of the Electricity Amendment (Supplementary) Bill. The Bill gave the E.S.B. advances of up to £7 500 000. Included in this sum was £1 500 000 for the steam generating plant at Clonlath, and £500 000 for distributing stations. The network for rural areas would embrace 7 500 miles of 10 V lines. The Bill passed its second stage.

## 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.

**Halifax Markets Department, March 30.**—Renewal of electrical installation at the abattoir, to be carried out in mineral insulated copper-sheathed cable. Specification from the Borough Electrical Engineer, 19-23, Northgate, Halifax.

**Southend-on-Sea, T.C., March 31.**—Supply and delivery over a period of 18 months of 5 000 house service meters. Specifications from Mr. A. C. Johnson, Electricity Works, Southend-on-Sea.

**Manchester Electricity Department, April 3.**—Supply, delivery and erection of (a) automatic voltage variation equipment and reactors (Spec. 821), (b) mercury and rectifier equipment (Spec. 822), and (c) 660 V d.c. traction switchgear (Spec.

No. 823). Particulars from Mr. R. A. S. Thwaites, Town Hall, Manchester; deposit £1 ls.

**West Midlands J.E.A., April 4.**—Supply, delivery, erection and testing of two 5 000 kVA, 33 000/3 300 V, three-phase, 50 cycle outdoor type transformers, and two 600 kVA, 3 300/400 V, three-phase, 50 cycle indoor type transformers, at Ocker Hill, Generating Station, Tipton. Staffs. Specification from the Authority, Phoenix Buildings, Dudley Road, Wolverhampton.

**Manchester Electricity Committee, 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 ls.

**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.



# Industrial Information

**B.E.A.M.A. Contract Price Adjustment Formula.**—For purposes of calculating variations in (a) rates of pay, the rate of pay for adult male labour at March 17, shall be deemed to be 90s. 6d.; (b) costs of material, the index figure for intermediate products last published by the Board of Trade on March 17, is 176.9, and is the figure for February.

**Production and Engineering.**—The bulletin issued by the Ministries of Labour and Production for February and March contains an illustrated article on "Electric Motor Repair work," much of which is done by women. Other features include "Method and Packaging," "Machining Improved Wood," "Control of Machine Tools," "Drawing Technique," "New Hope and a New Job" and "Aids to Resettlement."

**Industrial Administration.**—The current issue of the Journal of the Institute of Industrial Administration contains an address by Sir Stafford Cripps on "Management's Contribution to Post-War Prosperity"; an article on "Training Industrial Leaders" by O. J. Brusen; and the joint winning papers for the Junior Executive Prize—"The Application of Science to Industry," by W. L. Kent, and "The Future of Psychology in Industry," by G. K. B. Evens.

**Oil Immersed Circuit-Breakers.**—A new publication (No. 220) giving details of type "M" ironclad oil immersed non-drawout circuit-breakers of high rupturing capacity, suitable for use on systems up to 660 V and 3 300 V, has been issued by J. G. Statter and Co., Ltd., who claim that this range of switchgear is of robust construction, and is designed for industrial use under the most severe operating conditions. They can be fitted to customers' own ironclad busbar chambers and mounted in various positions.

**Metropolitan-Vickers Gazette.**—This quarter's number contains a review of the work of the research organisation of the Metropolitan-Vickers Electrical Co., Ltd., during 1944, with details and illustrations of various types of research and testing equipment produced; and articles on "One-piece Transportable Cooling Units for Large Transformers," "A.C. Variable-Speed Drive for Lathes," "A New method of Moulding Thermo-Plastics," "The Rectifying Property of Carborundum," "An Improved Air-Break Starter Design," and "Unified Boiler Control System."

**Supply of Electrical Goods.**—The Board of Trade have issued a general licence (S.R. and O. 1945 No. 245) permitting building undertakings and civil engineering

undertakings to supply at any premises such electrical goods (other than radio goods, electric torches and torch batteries) as are used in the course of building and civil engineering contracts, without the necessity of obtaining individual licences under the Location of Retail Businesses Order.

**The E.C.A. of S. Year Book.**—Revised and brought up to date, the Year Book of the Electrical Contractors' Association of Scotland, published at 3s. (3s. 6d. post free), forms an invaluable guide and book of reference for members and other electrical contractors. It contains a list of officers and members of the association, and firms represented; a directory of institutions and associations connected with the electrical industry; the holidays-with-pay scheme for Scotland; the interim scheme to regulate the working conditions and training of apprentices for the electrical contracting industry in Scotland, and the scheme for the reinstatement of apprentices returning from the Forces; details of Scottish electrical supply undertakings. Scottish supply companies and particulars of areas with voltage of supply and rates applicable; Central and South Scotland electricity schemes; and other information.

## Metal Prices

|                                                             | Monday, March 19.      | Inc. Dec. |
|-------------------------------------------------------------|------------------------|-----------|
|                                                             | Price.                 |           |
| <b>Copper—</b>                                              |                        |           |
| Best Selected (nom.) per ton                                | £60 10 0               | —         |
| Electro Wirebars ...                                        | £62 0 0                | —         |
| H.C. Wires, basis ... per lb.                               | 9 $\frac{1}{2}$ d.     | —         |
| Sheet ...                                                   | 10 $\frac{1}{2}$ d.    | —         |
| <b>Phosphor Bronze—</b>                                     |                        |           |
| Wire(Telephone)basis ..                                     | 1s. 0 $\frac{7}{8}$ d. | —         |
| <b>Brass (60/40)—</b>                                       |                        |           |
| Rod, basis ...                                              | —                      | —         |
| Sheet ...                                                   | —                      | —         |
| Wire ...                                                    | 10 $\frac{1}{2}$ d.    | —         |
| <b>Iron and Steel—</b>                                      |                        |           |
| Pig Iron (E. Coast Hematite No. 1)... per ton               | £7 13 6                | 15s.      |
| Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ... | £27 10 0               | —         |
| Mild Steel Tape (Cable Armouring) basis 0.04 in. ...        | £90 0 0                | —         |
| Galvanised Steel Wire No. 8 S.W.G. ...                      | £26 0 0                | —         |
| <b>Lead Pig—</b>                                            |                        |           |
| English ...                                                 | £26 10 0               | —         |
| Foreign or Colonial ..                                      | £25 0 0                | —         |
| <b>Tin—</b>                                                 |                        |           |
| Ingot (minimum of 99.9% purity) ...                         | £300 10 0              | —         |
| Wire, basis... .. per lb.                                   | 5s. 10d.               | —         |
| <b>Aluminium Ingots ...</b>                                 | £85 0 0                | —         |
| <b>Spelter... ..</b>                                        | £25 15 0               | —         |
| <b>Mercury (spot) Warehouse ...</b>                         | per bott. £69 15 0     | —         |

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

# Company News

ENGINEERING COMPONENTS LTD.—Fin. on ord. 15% (same), mkg. 25% (same).

A. A. JONES AND SHIPMAN.—Fst. and fin. 10% (same).

LEYLAND AND BIRMINGHAM RUBBER CO., LTD.—Intm. div. 2½% (same).

THOS. W. WARD, LTD.—Intm. div. on ord., 3¼% (same).

THOMPSON BROS. (BILSTON), LTD.—Intm. on ord. 7½% (same).

WATFORD ELECTRIC AND MANUFACTURING CO. LTD.—Sec. intm. 10% (same), mkg. 15% (same).

SWITCHGEAR AND COWANS, LTD.—First and fin. 20% (same). Net pft. 1944, £22 632 (£22 653).

CLAYTON DEWANDRE CO., LTD.—Fin. div. 6% (same), mkg. 10% (same). Net pft. 1944, £35 984 (£42 322).

LACRINOID PRODUCTS LTD.—Fin. div. 5% (same), mkg. 9% (same). Net pft. 1944, £5 522 (£5 559).

DIRECT SPANISH TELEGRAPH CO. LTD.—Income 1944 £8 802, exes. £2 835. Brot. in £850. Div. 4½%, fwd. £908.

ARNOTT AND HARRISON.—Fst. and fin. 20% (same). Net pft. to June 30, £22 251 (£19 225).

BRUNTONS (MUSSELBURGH).—Fst. and fin. on ord. 20% (same). Net tradg. pft., 1944, £37 727 (£37 298).

WOKING ELECTRIC SUPPLY CO. LTD.—Fin. on ord. 4½% (same), mkg. 7½% tax free (same).

BROWN BROTHERS.—Fin. on ord. 10% (same), mkg. 12½% (same). Net pft. to Jan. 16, £106 634 (£102 763).

P. AND W. MACLELLAN, LTD.—Net pft. 1944, £52 996 (£55 059). Fst. and fin. div. 6% (same).

LANCASHIRE DYNAMO AND CRYPTO, LTD.—Fin. div. 10% (same) and bonus 7½% (same), mkg. 22½%. Pft. for 1944, £134 000.

COVENTRY MACHINE TOOL WORKS, LTD.—Dirs. have purchased from Ministry of Supply whole of sh. cap. of John Stirk and Sons.

MIDLAND ELECTRIC MANUFACTURING CO., LTD.—Div. on ord. 10% (same) and cash bonus 15% (same). Pft. 1944 was £48 423 (£46 394).

ERICSSON TELEPHONES, LTD.—Fin. 12%, and bonus 3% (both same), mkg. 20%, tax free (same). Net pft. 1944, £116 507 (£112 837).

LANCASHIRE UNITED TRANSPORT AND POWER CO., LTD.—Fin. 6% (same), mkg. 10% (same). Pft. 1944, £154 574 (£153 419).

WASTE HEAT AND GAS ELECTRICAL GENERATING STATIONS, LTD.—Net pfts. after taxation, to Jan. 31, £8 786 (£8 412).

Fin. 5½% (same) on ord. mkg. 8% (same), payable, less tax, Apr. 5.

THORN AND HODDLE.—Net pft. to Sept. 30 (after tax), £1 181 (£1 122). Pref. arrears from Oct. 1, 1941, to Sept. 30, 1944, £1 077, fwd., £4 577 (£4 473).

BRUCE PEEBLES AND CO., LTD.—Pft. for 1944 (after taxn., etc.) £42 554 (£39 737). Ord. div. 5% and bonus 3% (same), to deprecn. £20 000 (same), fwd. £15 506 (£12 282).

ASSOCIATED ELECTRICAL INDUSTRIES, LTD.—The dirs. recd. div. for 1944 of 10%, less tax, on £4 921 838 ord. (same). Net pft., after prvdg. for depn. and taxn., is £467 543 (£459 971)—an increase of £7 572.

VOKES LTD.—For yr. to June 30, 1943, net pft. on tradg. was £147 652 (£219 688), and £48 084 for 1940-41. Dirs.' fees £1 700 (£700). Net pft. £12 587 (£15 001) (£3 608 1940-41), carry fwd., £13 663.

COVENTRY GAUGE AND TOOL CO. LTD.—Net pft. to Aug. 31 £27 753 (£24 021), brot. in £85 098 (£79 892). Div. 7½% and bonus 7½%, both tax free (same), fwd. £94 041.

LONDON PASSENGER-TRANSPORT BOARD.—Net rev. £4 673 286, £73 994 less than in 1943. Int. upon prior chg. stks. £3 901 381, lvg. for service of "C" stock, £771 905. Fin. pmnt. of int. of 1¼%, mkg. 3% for yr., agnst. 3¼% last yr.

TAMWORTH DISTRICT ELECTRIC SUPPLY CO. LTD.—Tradg. pft. 1944, £17 804. Deduct deb. int. £3 060, loan int. £408, deprecn. £6 712, contings. £500, pref. divs. £2 000, additl. 1% on 4% pref. £125, ord. div. 8% £5 000. Fwd. £518 (£519).

BRITISH THOMSON-HOUSTON CO. LTD.—Net pfts. for 1944, £596 527 (£580 362). To deprecn. £228 975 (£226 435), and to gen. res. £150 000 (same). Div. on ord., 7% less tax (same). Carry-fwd. £255 704 (£248 368).

E. K. COLE, LTD.—An alteration of the objects of E. K. Cole (of Southend) was confirmed by Mr. Justice Vaisey, in the Chancery Division, on Mar. 19. The new objects specified were thermionic rays and thermionic rectifiers.

SCOTTISH POWER CO., LTD.—Fin. div. on ord. 5% (same), mkg. 8% less tax. Tradg. pfts. 1944, after taxatn. of operatg. cos., £552 955 (£535 509) of which deprecn., etc., takes £245 368 (£202 465). Net rev. £273 358 (£274 500).

RUSHDEN AND DISTRICT ELECTRIC SUPPLY CO. LTD.—Net. rev. 1944, £11 702 (£13 085), plus £12 041 (£10 352) brot. in. To taxn. £5 794 (£5 446), intm. div. 4% (same), £1 800, fin. div. 5%, mkg. 9% (same), gen. res. £1 000 (same), fwd. £13 799.

BRITISH POWER AND LIGHT CORPN.—Income 1944 £390 865 (£344 694). To dirs.' fees £2 000 (£2 369), exes. £6 433 (£6 842), leavg. pft. £382 432 (£335 483). Tax £242 000 (£208 500), pref. divs. £43 500 (same), ord. div. 7%, £71 050 (same), fwd. £183 778 (£157 896).

SEVENOAKS AND DISTRICT ELECTRICITY.—Rev. 1944 £53 610 (£52 642). Brot. in £5 380 (£4 286). To deprecn., renewals, etc., £20 000 (£19 500), taxn. £18 000 (£17 500), contings. £1 000 (same), pref. div. £2 584, ord. div. 7% (same) £10 964, fwd. £6 442.

NEWCASTLE AND DISTRICT ELECTRIC LIGHTING CO. LTD.—Pft. 1944, £70 485. Add int. on investmtns. £1 641, mkg. £72 127, plus £17 569 brot. in. Deduct inc.-tax £11 032, int. on deb., etc., £14 756, to leasehold. redemptn. £150, to deprecn. £25 114, to superann. £2 922. Div. 7%, £21 000, fwd. £13 721.

PENNSYLVANIA WATER AND POWER.—Operatg. rev. 1944 \$2 613 215 (\$2 576 843), other income \$424 253 (\$412 549), income deductns. \$878 398 (\$874 695), net inc. \$2 159 070 (\$2 114 698), pfd. div. \$107 465, com. stk. divs. \$1 719 392, adjustmtns. \$9 183, earned surplus fwd., \$6 146 295 (\$5 823 265).

TAYLOR, TUNNICLIFF (ELECTRICAL INDUSTRIES).—Divs. from subsids. for 1944 £20 675 (£20 615), plus tax repaymt. £202 (£413), mkg. £20 877 (£21 033). Admin. chgs. £329 (£409), lvg. net inc. £20 549 (£20 625). Pref. div. £5 500 (same), ord. div. 10%, £15 000 (same), fwd. £477 (£399).

HOOVER LTD.—Pft. for yr. £574 967 (£452 659). Taxatn. takes £440 369 (£345 411), dirs.' fees £1 763 (nil) and W.D.I. £3 518 (£5 145), leavg. net pft. £129 317 (£102 103). Div. on £600 000 5½% pref. is £16 500 (same), and distribtn. on £800 000 ord., £100 000 (£80 000). Carry-fwd. £39 135 (£26 318).

FOSTER YATES AND THOM, LTD.—Tradg. pft. to Sept. 30, £57 003 (£84 025). To A.R.P. £6 186 (£7 243), war damage £965 (£1 197), dirs.' fees £2 200 (same), deprecn. £14 054 (£13 833), leavg. pft. £33 598 (£59 552). Tax £23 500 (£49 500), div. 5% £6 000 (same), gen. res. £4 000 (same), fwd. £1 925 (£1 827).

RICHMOND (SURREY) ELECTRIC LIGHT AND POWER CO. LTD.—Rev. 1944 £119 637 (£112 604), less expend. £82 720 (£77 127), lvg. £36 917 (£35 477). Brot. in £1 355 (£2 082). To sinkg. fund £1 204 (£1 104), deprecn., etc., £11 900 (£11 800) tax £14 500 (£14 000), contings. £500 (nil), ord. div. 6% £9 300 (same), fwd. £868.

WEST GLOUCESTERSHIRE POWER CO., LTD.—Pft. 1944, £171 167 (£178 006), plus £2 275 (£1 767), brot. in, prov. for contings. not required nil (£27 642). To inc. tax and E.P.T. £92 500 (£118 500), gen. res. £43 865

(£55 985), deb. stk. sinking fund £8 889 (£8 493), div. 6½% on non-cum. partic. prof. £16 852 net (same), ord. div. 4% (3½%), fwd. £5 266.

NORTHMET POWER COMPANY.—Fin. div. on ord. 4%, makg. 7% for yr. (same), payable Apr. 4. Blec from workg., includg. int. and div., was £927 300 (£860 891), £66 409 increase. Interest absorbed £75 097 (£75 877), deb. redemptn. £47 387 (£47 387), prov. for deprecn. £457 448 (£405 229), and £50 000 (nil) for W.D.C. Inc. tax on pfts. for yr. and divs. require £268 238, leavg. £72 409 to be carried fwd. (£43 279).

BRITISH ALUMINIUM CO. LTD.—Accts. for 1944 show total pft. after providg. for E.P.T. £1 049 257 (£1 068 937), brought in, £274 684, mkg. £1 323 941. To dirs.' fees, taxatn., deb. service and allocatn. of £75 000 (same) to deprecn., and £125 000 (same) to res. After providg. for div. on pref. dirs. recommend fin. of 7% (same) on ord., mkg. 10%, leavg. £280 691 to carry-fwd.

NORTH METROPOLITAN POWER STATION.—Rents recvd. 1944 £489 994 (£433 287), misc. receipts £1 938 (£792), mkg. £491 932 (£434 079). To office exes. £1 131 (£1 154), dirs.' fees £250 (same), deb. int. £166 604 (£120 517), Northmet Power loan int. £580 (nil), to deb. sinkg. funds £161 959 (£155 770), tax £161 405 (£156 385), ord. div. £3 (same).

NORTH WALES POWER CO.—Net operatg. pft. 1944, £415 474, plus interest, rents, etc., £38 077, mkg. £453 551. To dirs.' fees £1 350, deb. and loan int. £40 224, deprecn. provn. £102 500, spec. renewals £7 500, lvg. pft. £301 977. To E.P.T. £159 000, inc.-tax (includg. £43 000 towds. 1945-46) £83 000 div. 5½% £55 000 (same), fwd. £35 359 (£30 382).

SOUTH LONDON ELECTRIC SUPPLY CORPORATION, LTD.—Rev. for 1944 £147 042, brot. in £346, trans. from res. fund £16 100, refund of rates £1 303, mkg. £164 791. Deduct deb. int. £13 500, diff. between issue and redemptn. price of deb. stk. £685, contributns. to skg. funds £87 195, provn. for taxn. £24 000, pref. div. £1 800 ord. div. 7% £37 346, fwd. £265.

LONDON AND HOME COUNTIES J.E.A.—In presentg. at the mtg. of the Londqn and Home Counties Joint Electricity Authority on Mar. 1, the accts. for 1944, the vice-chairman of the Finance Committee (Ald. H. G. Coleman) quoted the following extracts from the accts.: Gross rev. surplus for 1944, £571 786. Net rev.' surplus (after chargg. int. and sinkg. fund contributns., etc.), £174 580; deduct res. for taxatn., £130 000, and res. for deferred repairs, £22 500, leavg. £22 080. Add £122 022 brot. in, mkg. £144 102 carried fwd. Total capl. expend., £6 399 550. Loans repaid or provision therefor totalled £2 731 605.

## COMPANY MEETINGS

## MIDLAND COUNTIES ELECTRIC SUPPLY

*Mr. William Shearer on Nationalisation*

The thirty-second ordinary general meeting of Midland Counties Electric Supply Co. Ltd., was held on March 15, in London. Mr. William Shearer (the chairman) presided, and in the course of his remarks said:—

"In reviewing the results of all our operating companies, I cannot refrain from calling attention to the contribution we have made to the National Exchequer, and local government in the form of rates and taxes. Out of our total trading profits for the last five years we have paid or provided for this purpose no less than 3½ million pounds, whereas during the same period the distribution by way of dividends to holders of ordinary stock amounted to £618 000.

"These figures, read in conjunction with our low scale of charges to consumers, surely indicate how utterly misleading is a statement contained in the Socialist Party's manifesto of May, 1944, setting out its post-war policy for coal and power, reading as follows: 'The solution of the power companies is the monopoly of control for the benefit of the shareholders, ours is the solution of public ownership and control for the benefit of the community.'

#### Nationalisation Proposals

"As the future of our industry has become the subject of controversy, I make no excuse for referring again to certain proposals for nationalisation and public control, on which I gave you my views at length a year ago.

"The proposals outlined in certain quarters affect many branches of British industrial life, but it would appear that a few key industries, including our own, have been chosen as special targets by those who desire to create huge State monopolies involving a large extension of the bureaucracy with a consequent increase of political patronage.

"The argument is sometimes advanced that if the revolutionary changes proposed were adopted, existing efficient managements would be retained under any scheme of nationalisation, and that, therefore, the benefits of both State ownership and private enterprise would be enjoyed. This is a specious argument, as I imagine that few men of enterprise, trained in business management, would consent to work permanently under the harassing conditions of Government control. No doubt a few would agree to carry on in these circum-

stances, but what of the next generation, brought up in the enervating atmosphere of rules, regulations, endless forms and returns?

"The industry within 20 years would be run by men with a typical civil service departmental outlook, an excellent and very proper outlook in its own sphere, but not in industry. Everyone from the small shop-keeper to the big industrialist knows that whenever the Government enters into the realm of ordinary trading there is a hampering influence; decisions are not quickly obtainable and when given are often reversed. This is by no means a criticism of our permanent civil service, the reputation of which, as we well know, is unequalled anywhere in the world."

#### Metropolitan Electric Supply Progress During War

The fifty-eighth ordinary general meeting of the Metropolitan Electric Supply Co., Limited, was held on Mar. 20, in London.

Major H. Richardson, M.C., J.P., chairman and managing director, said that at the end of the year supply was being afforded to over 206 000 consumers, the net increase for the year being only 173, the new consumers in the western area being offset by further evacuation of consumers from the company's London areas. In spite of the decline and the Government's appeal for economy in the use of fuel, they had sold approximately 84 million units in the London areas, 484 millions in the distributing undertakings and subsidiary companies in their western areas and 188 millions in bulk to other authorised undertakers, making a total of 756 millions, being 40 millions, or 5.6 per cent. in excess of the units sold during the preceding year.

With regard to the effect of the war during the war years he said that in their London areas evacuation of consumers combined with lighting restrictions and later the fuel economy campaign, had caused an immediate diminution of business. That setback was more than compensated for by the large increase in business in the other undertakings operated by the company in the western area.

Gross revenue during the period 1938 to 1944, had increased from £1 707 000 to £3 032 000, an increase of £1 325 000, or 78 per cent.

# COUNTY OF LONDON ELECTRIC SUPPLY CO..

## Improved Results: Sir Robert Renwick on Nationalisation

The fifty-first ordinary general meeting of the County of London Electric Supply Co., Ltd., was held on March 20 in London. Sir Robert Renwick, Bt., the chairman, in the course of his speech, said:

The output for the year 1944 was 2 481 million units as compared with the 1939 figure of 2 243 millions. The output for 1944 was the second highest output in the history of the company. The record output was that for 1943 at 2 566 million units.

The gross revenue for the past year, at some £7 898 000, shows an increase of 6.3 per cent. over 1943 and 38.6 per cent. over for the year 1939.

The number of consumers at present totals 357 983, an increase of nearly 11 000 over the 1939 figure.

The excellent position has been achieved with only a very moderate increase in our prices to consumers.

### Revenue

As I have said the gross receipts on revenue account are £7 897 985. The increase in expenditure over the previous year is some £346 700, and of the increase no less than £288 000 is accounted for in the cost of coal. Again, there is an increase of some £65 800 in the purchase of current, which also reflects the increased price of coal. The increase in the price of coal per ton since 1939, is no less than 88 per cent.

A final dividend for the year has been declared on the ordinary stock of 5 per cent., making, with the interim dividend 8 per cent. for the year and there remains to be carried forward £796 941 as compared with £787 759.

It is not possible to give you a full story of the difficulties under which Barking has operated during the war period. Quite apart from other troubles, our main difficulties have arisen from labour and coal.

### Increased Fuel Cost

I have mentioned previously the alarming increase in the cost of fuel, even though the fuel is far inferior to our pre-war grades. The votaries of nationalisation of the coal mining industry claim that it will be necessary for the taxpayer to subsidise this industry for a long time to come. Ordinary business people like ourselves might wonder why the running of this most vital of all our national industries could not be got on to the ordinary business principle of paying its own way and having some regard to its consumers' interests.

Perhaps I may now turn to the future. There is one thing abundantly clear to me—that to those two persistent and very virtuous slogans of "Full Employment" and "Social Security" there needs to be

added even more persistently and even more virtuously a third, namely, "Greater Productivity." Without greater productivity there can be no full employment and the social security we all want. So much does your company believe in it, that already our programmes of development have been submitted to the authorities and, so far as material is available, work has already been put in hand. You have doubtless heard of the £90 000 000 programme of expenditure on generating stations throughout the country.

With regard to transmission and distribution, the estimated expenditure even for the next five years is something of the order of £12 000 000, and we believe that if this country is to revive and become once again a leader in industrial matters, such a programme is absolutely essential.

### Future of the Industry

These vast sums of money are not going to be found by subsidies from the Government or even by the Central Electricity Board. They are to be found by people like ourselves who have to put such experience and such wisdom as we have accumulated into the wise expenditure and operation of these vast resources. I was asked recently by a politician as to why we should involve ourselves with all this planning and expenditure in the light of what he thinks is a possibility of this industry being nationalised or regionalised in some way. The only immediate answer I could think of for him was that we were not politicians.

It appears to be, however, that there are ideas in the minds of such as my friend and others that a prosperous industry such as ours should be nationalised and that the Government, that is the taxpayer, would find these vast sums of money for development. What is always forgotten is that with the industry as it is at present there is a background of vast technical and other professional experience among both directorates and staffs. Some people think, apparently, that all this experience will pass over to the Government at salaries and fees consistent with Treasury regulations. We have only to look at the record of this industry during the war years which proves that it is highly organised and efficient and it will be a very unwise government which decides on any interference of a major character for no other reason than that of political expedience. I have said to you before that your board is strongly of the opinion that no major operation is necessary, although improvements can be made of what I called a first-aid nature within the industry itself.

# 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.

**BRITISH ALUMINIUM CO., LTD.,** London, E.C.—Feb. 24, disposition by Jno. A. Douglas with consent of the co., granted in implement of a Trust Deed dated Sept. 12, 1934; charged on land with 108 South Alloa Road, Falkirk, and other buildings thereon with fittings and fixtures. \*£3 270 64d. Apr. 14, 1944.

## Notice of Dividend

**BRIMFIELD,** Robert T. H., lately of Wellington Cottage, Wellington Square, London, S.W.1, lately carrying on business under the style of Richfield Electrical Components, at 73-78, High Holborn, London, W.C.1, electrical contractor. First dividend 11½d. per £, payable March 30, 1945, Bankruptcy Buildings, Carey Street, London; W.C.2.

## 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.

**PRIEST, J. H.,** 768, College Rd., Kingstanding, wireless dealer. £11 11s. Jan. 11.

**TELEVIEW, 4, York Road, Southend-on-Sea,** radio dealers. £23 2s. Jan. 29.

**WESTBURY, Jno. T., The Firs, Cossington,** electrical engineers. £47 0s. 10d. Jan. 9.

**JOHNSON, Frank, 4, Iverson Road, London, N.W.6,** electrical engineer. £31 1s. 9d. Feb. 6.

**LEWENT, H. M. (male), 167, Anson Road, Crickwood,** radio electrician. £11 11s. 10d. Jan. 25.

**COLE, Chas. H., 22, Northgate Street, Bury St. Edmunds,** electrical engineers. £34 9s. 11d. Jan. 27.

**PAYNE, Geo., 34, Alphonius Road, Clapham Park,** electrical engineer. £46 5s. 3d. Jan. 30.

# Coming Events

## Friday, March 23 (To-day).

**I.E.E.—Storey's Gate, St. James's Park, London, S.W.1.** Joint meeting with the Institution of Mechanical Engineers. "Expanded Tube Joints in Boiler Drums—with Special Reference to the Battersea High-Pressure Boilers." W. B. Shannon, C. W. Pratt, T. B. Webb and W. B. Carlson. 5.30 p.m.—**I.E.E., N.W. CENTRE, RADIO GROUP, Manchester.** Informal discussion, "Recording and Reproduction of Sound." F. E. Williams. 6 p.m.—**S. MID. STUDENTS' SECTION, Loughborough.** "Electrical Technique in Resistance Welding." 6.30 p.m.

**ILLUMINATING ENGINEERING SOCIETY—Birmingham.** "Some Visual Factors for Illuminating Engineers." W. D. Wright. 6 p.m.

**INSTITUTION OF ELECTRONICS, N.W. BRANCH.—College of Technology, Manchester.** "Pulse Generation." Dr. F. J. G. van den Bosoh. 6.30 p.m.

## Saturday, March 24.

**I.E.E., N.E. STUDENTS' SECTION.—Visit to King's College Electrical Laboratory.—I.E.E., N.W. STUDENTS' SECTION.** Visit to Aerialite, Ltd., Stalybridge.

## Monday, March 26.

**I.E.E.—London, W.C.2.** Informal meeting. Discussion. "The Future of Synthetic and Thermoplastic Insulated Cables." T. R. Scott. 5.30 p.m.—**N. E. CENTRE.—Newcastle-on-Tyne.** Lecture, "An Elementary description of the molecular theory of Permittivity and Energy Loss in Dielectrics." E. B. Moullin. 6.15 p.m.

—**S. MID. CENTRE.—Birmingham.** (a) "The Installation Section of the report on "Electricity Supply, Distribution and Installation," and (b) "The report of the Electrical Installations Committee convened by the Institution on behalf of the Ministry of Works: "Post-

War Buildings Studies No. 11. Electrical Installations," opened by W. N. C. Clinch. Responder, J. Beard. 6 p.m.

## Tuesday, March 27.

**I.E.E., N.W. CENTRE.—Manchester.** "A Survey of X-Rays in Engineering and Industry." Dr. V. E. Pullin. 6 p.m.—**CAMBRIDGE RADIO GROUP.—University Engineering Department, Trumpington Street.** "Design and Manufacture of Radio Valves." G. Liebmann. 7 p.m.

**TELEVISION SOCIETY.—I.E.E., Savoy Place, London, W.C.2.** Annual meeting. Discussion. "Some Social Aspects of Television," Capt. C. H. Cazaley. 5.30 p.m.

## Wednesday, March 28.

**I.E.E., SCOTTISH CENTRE.—Edinburgh.** "The Relation Between Steam and Hydro Power." R. W. Mountain and C. G. Carrothers. 6 p.m.—**S. MID. CENTRE, STUDENTS' SECTION.—Birmingham.** "Turbo-Alternator Ventilation." H. R. Ogle. 7 p.m.—**I.E.E., LONDON STUDENTS' SECTION.—Address by the President, Sir Harry Railing. 7 p.m.** Visit to the Sun Engraving Co., Ltd., Watford, Herts. 2.30 p.m.

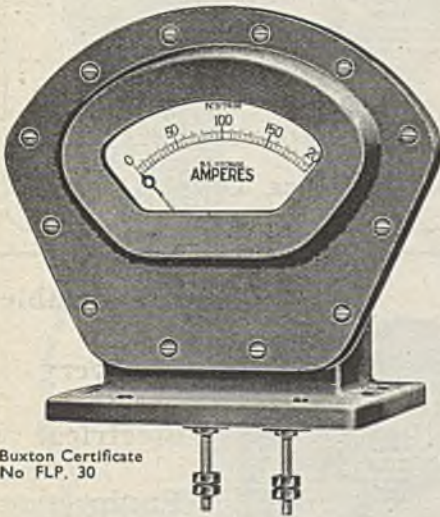
**BRITISH INSTITUTION OF RADIO ENGINEERS, MIDLANDS SECTION.—University of Birmingham.** "Dielectric Heating by the Radio Frequency Method." L. Grinstead. 6 p.m.

**JUNIOR INSTITUTION OF ENGINEERS, N.W. SECTION.—Manchester.** Presidential address by Maj.-Gen. K. C. Appleyard, followed by film of the Tennessee Valley Authority. 7 p.m.

## Friday, March 30.

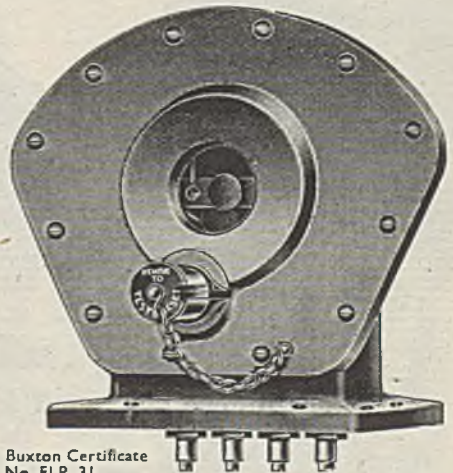
**I.E.E., CARDIFF STUDENTS' SECTION.—"A.C. Commutator Motors, Schrage Type." S. R. Phelps and L. Davies.**

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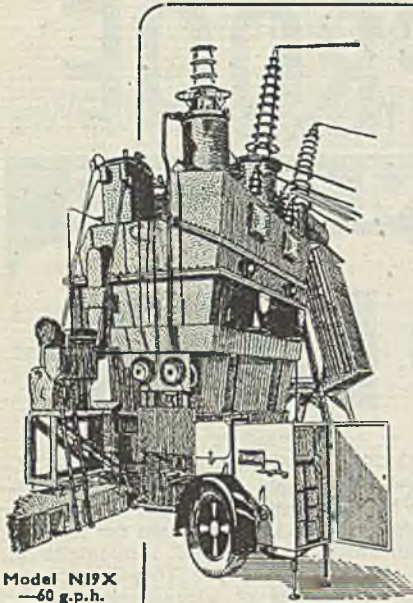
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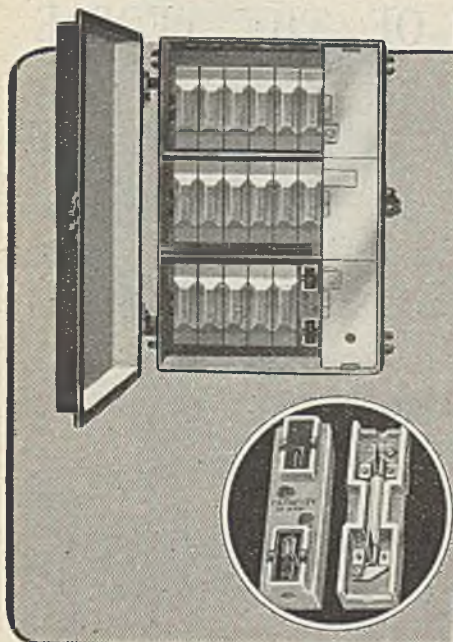
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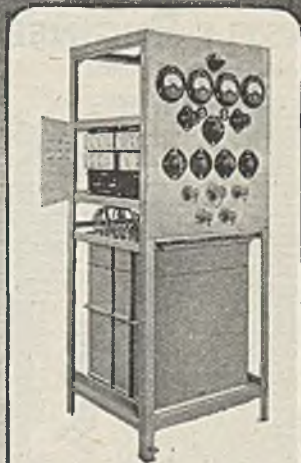
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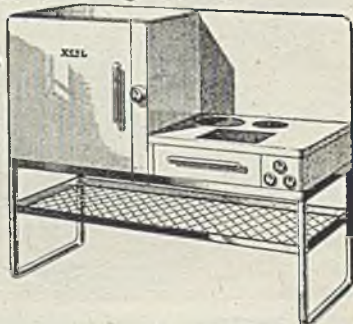


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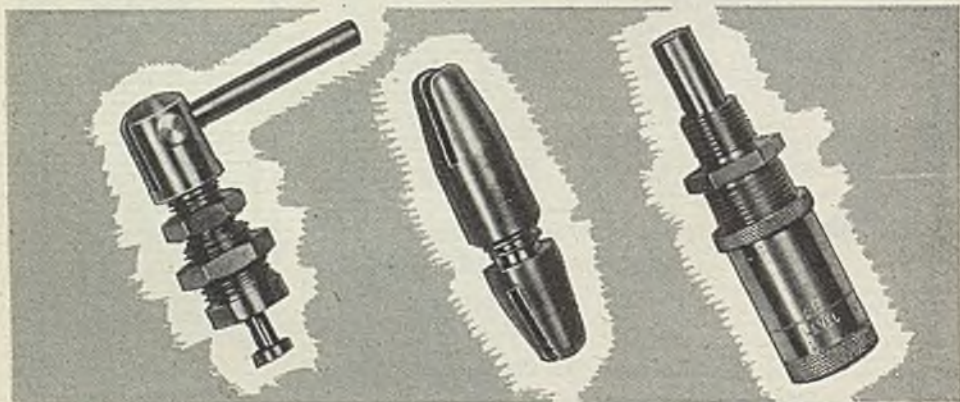
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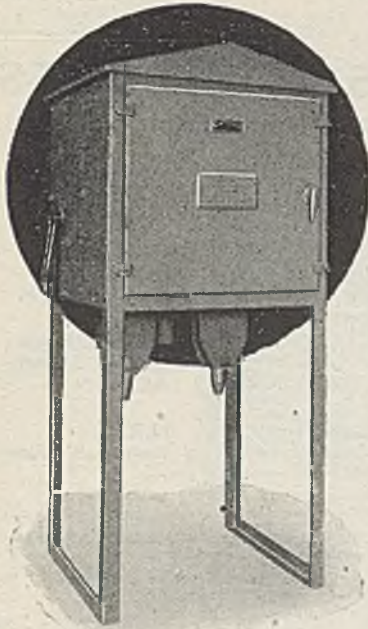
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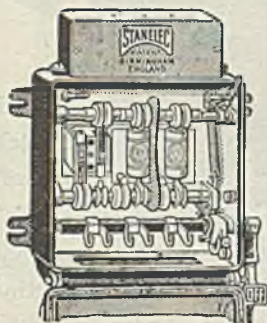
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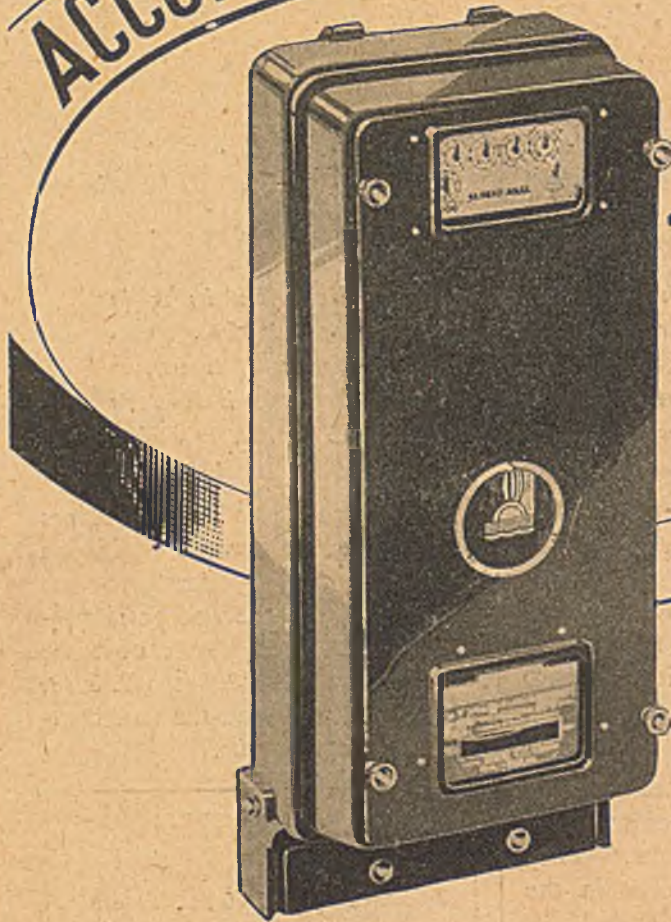
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