THE
ELECTRICIAN

Vol. CXXXIV. No. 3484. Friday, March 9, 1945. Sixpence

[Registered at the General Post Office. Entered as Second Class at the New York U.S.A. Post Office.]

It is well worth your while to spend a few minutes with our representative working out how much extra profit you make by selling Atlas Lamps. Atlas dealers get extra good discounts, generous rebates, attractive sales aids and perfect freedom to stock whatever make of other good lamps they like. Our advertising—appearing in every main thoroughfare and regularly in the National and Provincial daily and evening papers and magazines—is creating bigger sales for you. Write for terms to-day.

THORN ELECTRICAL INDUSTRIES LTD.

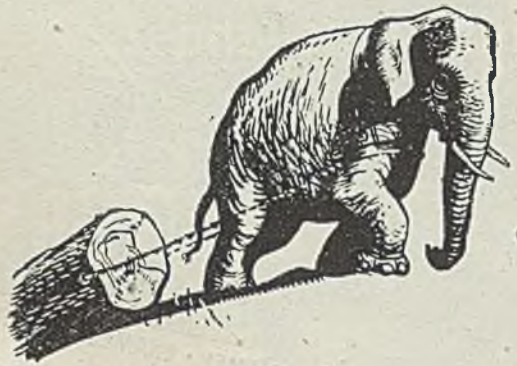
ATLAS LAMPS

Nothing better has come to light

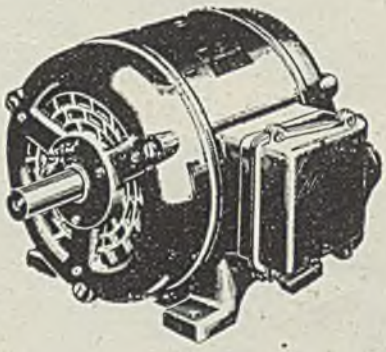
THORN ELECTRICAL INDUSTRIES LTD., 105-109, JUDD ST., LONDON, W.C.1. 'Phone: Euston 1183
Northern Branch: 55, Blossom Street, Manchester. 'Phone: Central 7461
N.E. Depot: 46, Sandhill, Newcastle-on-Tyne, 1. 'Phone: Newcastle 24068

T117

Extra starting torque?



. . . Here is your motor.



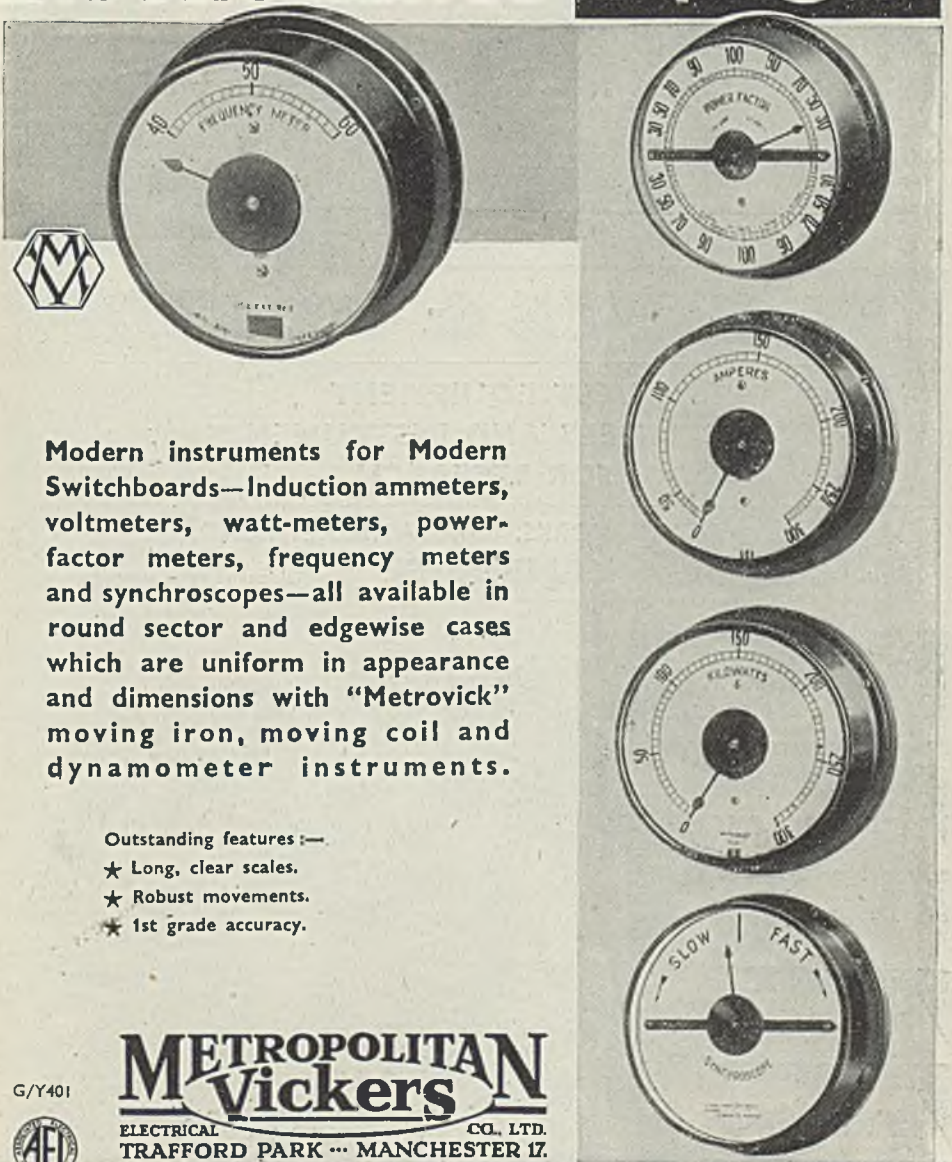
Where you have a drive demanding extra starting effort, you may think it difficult to obtain a suitable motor. That is until you look into the Parkinson standard range of A.C. motors. There you will find the Parkinson "Tork"—a motor with just that extra starting torque required. It would be the same if you required other special characteristics. Parkinson Flow Production has made it possible to offer a standard range of over 2,000 types which includes many that you usually expect to have specially made. The Parkinson A.C. Motor Service can save you a great deal of time and money.

CROMPTON PARKINSON
LIMITED

ELECTRA HOUSE, VICTORIA EMBANKMENT LONDON, W.C.2 *and Branches*

INDUCTION INSTRUMENTS

TYPE FC



Modern instruments for Modern Switchboards—Induction ammeters, voltmeters, watt-meters, power-factor meters, frequency meters and synchroscopes—all available in round sector and edgewise cases which are uniform in appearance and dimensions with "Metrovick" moving iron, moving coil and dynamometer instruments.

Outstanding features :—

★ Long, clear scales.
★ Robust movements.
★ 1st grade accuracy.

G/Y401

METROPOLITAN Vickers ELECTRICAL CO., LTD.
TRAFFORD PARK ··· MANCHESTER 17.

Descriptive leaflets will be sent on request

Light aids production

IMPROVE YOUR LIGHTING *in consultation with* METROVICK'S ILLUMINATING ENGINEERS

MANUFACTURERS'. SUPPLIES SECTION

MISCELLANEOUS ADVERTISEMENTS

FOR SALE

LAMP Lowering and Suspension Gear, T.E.S., lead and other Cables, Winches (hand), hundreds of thousands in use, Searchlights (sale or hire), Carbon rods, Ebonite, Fibre, Hightensite, Porcelain House-wiring and other Cleats, Reels and Knobs, Mirrors, Lenses, etc. —London Electric Firm, Croydon.

PATENT AGENTS

MEWBURN, ELLIS & CO.,
PATENTS, DESIGNS AND TRADE MARKS,
70 & 72, Chancery Lane, London, W.C.2.
Grams: "Patent, London." *'Phone: Holborn 0437 (2 lines)*
And at—NEWCASTLE: 3, St. Nicholas Buildings.

Relays for all purposes
•
TEMPERATURE CONTROLLERS
•
PRECISION RESISTORS
•
EARTH PROTECTION
Butcher—Black & Decker system
•
ELECTRO METHODS LTD
112 BRENT STREET · LONDON · N·W·4

C. Clifford & Son Ltd.
BIRMINGHAM

PHOSPHOR BRONZE
"SEA-CLIFF" Trade Mark. **TUBES, SHEETS, RODS & WIRE**
To the latest Air Ministry, Admiralty, War Office and B.S. Specifications.

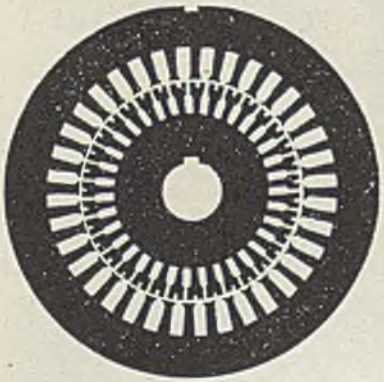
VULCANIZED FIBRE.
EBONITE, BAKELITE
Sheets, Rods, Tubes and Machined Shapes
LEATHEROID Sheets, Rolls, etc.
"CLIFTEX" Insulating Tapes.
Insulating Staples, Jointing, Presspahn.
MOSSES & MITCHELL LTD.
60-68, Ironmonger Row, London, E.C.1.

TESTOSCOPE

Indispensable to Radio Service Engineers. Makes 20 tests. Interesting Booklet on request. From all Wholesalers or direct. Send for leaflet R4.
RUNBAKEN·MANCHESTER·1

BATTERY CHARGERS & TRICKLE CHARGERS

Trouble-free Chargers fitted with selenium all-metal rectification. Thirty years experience behind every Runbaken product. A few Agencies available. Booklet K5 describing 12 Models, on request.
RUNBAKEN·MANCHESTER·1



SHEETS
AND
STAMPINGS
FOR THE ELECTRICAL TRADE
JOSEPH SANKEY & SONS, LTD.
BILSTON
LONDON: 168, REGENT ST., W.1

THE ELECTRICIAN

Established 1861. The Oldest Weekly Illustrated Journal of

Electrical Engineering, Industry, Science and Finance

Bouverie House, 154, Fleet Street, London, E.C.4. Telegrams: "Benbrotric, Fleet, London. Telephone: Central 3212 (Ten Lines).

Midlands Office: Daimler House, Paradise Street, Birmingham. Telephone: Midland 0784.
Glasgow Office: 116, Hope Street, Glasgow, C.2. Telephone: Central 3970.

The Offices of THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations. Until further notice the offices will be open between the hours of 9 a.m. and 5.30 p.m. from Monday to Friday.*

No. 3484. [No. 10. Vol. CXXXIV.] March 9, 1945 Annual Subscription 25s Overseas 30s.

CHIEF CONTENTS OF THIS ISSUE

Electric Kitchens

LAST week, the electric kitchen received special publicity for two reasons; the first was concerned with the visit by the Queen to the E.D.A. exhibits at the Building Centre, and the second is found in a broadsheet published by the organisation known as PEP, dealing with household appliances.

The Royal visit to the Building Centre is something of which the industry is justly proud, for it had about it an informality which permitted full expression to be given to the interest, enthusiasm and knowledge of domestic affairs which the Queen has shown on other occasions, while her criticisms and appreciation of the various technical differences in the appliances, demonstrated that the visit was inspired by a personal desire to see for herself what the industry has to offer, and what it intends doing in the future.

It is with the latter that the PEP broadsheet is concerned, and after discussing, among other things, the progress made in cooker design, it is stated that whereas gas and solid fuel cookers are more limited in their potentialities than electric cookers, manufacturers of the former have exploited the possibilities of their fuels to a greater advantage than have the makers of electric cookers exploited those of electricity. As an example of this omission, it is stated that among the things which appear to have received little or no publicity is that fine temperature control is even more important for boiling rings, than it is for the oven. We have no knowledge upon what this statement is based, but many cooker manufacturers, before the war, had not only carried out a considerable amount of research on the subject of simmering, but there were on the market a number of devices designed to give the desired results. The industry would be the last to suggest that these devices were perfect in their operation, but they were, broadly speaking, efficient, and but for the war, would, no doubt, to-day have become general in all cooker designs, in some improved form.

The electric cooker of the future has yet to be produced and though large-scale research work on the subject is not yet possible, it is a fact that manufacturers have developed many new theories which they are anxious to put into practice. For several years after the war, however, essential needs are bound to take priority, for in addition to the deferred replacements of six war years, will be the normal replacements of the post-war period, and the demand for cookers for equipping between four and five million houses, scheduled for speedy construction. The first job will thus be to provide every home with equipment of a reasonable minimum standard of comfort and convenience, the reliability and efficiency

of which are already well-known. The development of the more desirable appliances which will add luxury to comfort is a matter for research, and must take second place for some years to come.

An Electrical Lead

WHAT has been done so far, places the electric kitchen in the forefront of the post-war picture—as the exhibits at the Building Centre show—for the progress made is based upon opinions collected in the course of widespread inquiry among housing authorities, housewives, women's institutions, to say nothing of the experience gained by the supply industry and electrical contractors. What has been done, so far, is only the first step towards that standard of comfort and convenience which the industry has in mind, but it is a step which will raise the efficiency of the post-war kitchen well above the level generally accepted before 1939, permitting at the same time, the demands of the public for replacements and new installations to be satisfied.

Availability of Appliances

THERE is reason to believe that such things as combined service units, horizontal as well as vertical cookers, refrigerators, clothes dryers and the hundred and one other appliances which have already established themselves in the home, will not only become more readily available, but will, too, be within the economic reach of a greater number of people. Once the conditions in the immediate post-war years are met, once our export trade is re-established, then will the industry be able to devote adequate attention to raising the standard of kitchen equipment even higher. For the moment, however, circumstances are such that we must be content with the lead we have already established, and take comfort in the knowledge that the standard so far set is already beyond the scope of other fuel interests.

English Electric Co.'s Good Work

SOME indication of the contribution which the industry has made to the war effort, was revealed last week by Sir GEORGE NELSON when speaking of his own company's activities. The glimpses he gave of the part played by the English Electric Co. in the production of tanks, bombers, aero engines and many other products outside its normal fields of design and manufacture, showed the remarkable adaptability of a modern electrical organisation, and the fact that more than £60 000 000 worth of apparatus, over and above the normal turnover, have been manufactured, is indicative of the wholehearted spirit with which his company put its shoulder to the production wheel. For its labour, however, the company will receive no reward other than a post-war E.P.T. credit of about 1½ per cent. on the extra turnover, and that subject to income tax.

Post-War Trade and Competition

BEFORE long the war-time demands on productive capacity will give place to more normal requirements, in respect of which orders are being received in satisfactory volume, though it must not be assumed that trade will be the easy business which many Government departments would have us believe. That it will not be so was indicated by Sir GEORGE NELSON in a short review of the future, wherein he pointed out that some overseas manufacturers are apparently already offering plant "at prices obviously considerably below their home prices, and their cost of production," thus confirming the views already expressed in these pages that post-war trade will be even more competitive than it was before 1939. As Sir GEORGE NELSON points out, however, many of the prices now being put out are possibly feelers in regard to the world level of prices, and it is pleasing to hear that his company has already taken steps to ensure its own place in the export field—a place it has always held with distinction.

Domestic Installation Problems

IN this issue, the subject of plugs and sockets is once again referred to as being of importance to the industry, in that though their future design has been discussed at length, no definite conclusion has yet been reached. Schedules for post-war building are being drawn up, new designs are being discussed by architects, the public are taking a lively interest in both proceedings, but the electrical industry, so much concerned with servicing the houses of the future, is not yet sure of the part it will play. It has been stated that the combined service unit, the fused plug or socket, will increase the flexibility and adaptability of the domestic installation; both have

been acclaimed as efficient, but unless the industry soon makes up its mind to accept or reject them, apathy may set in and installation be carried on in much the same way as before the war. The views expressed in contradiction of the claims made for the new theories on installation work are relatively few, but in spite of this, little progress seems to have been made beyond the report stage.

Plastics and Raw Materials

IF any indication is needed to show how the present coal and other raw materials situation is reacting adversely upon industry, it will be found in the remarks made by Mr. K. M. CHANCE, chairman of the British Plastics Federation, on Monday. After expressing his confidence in the future, backed by an order book which will keep his organisation busy for some time, Mr. CHANCE pointed out that when he joined the company some forty years ago, he used to place contracts for boiler slack at 4s. 6d. per ton, delivered to the factory; in June 1939, the same material cost 17s. per ton. Now, slack costs on the average 40s. per ton delivered. As the raw materials used in the plastics industry are largely derived from coal or are dependent upon power for their production, it is obvious that the rising cost of coal has a considerable bearing upon the future of both plastics and the supply industry.

Possible Danger to Export Trade

UNLESS something is done to make cheap power more readily available, Mr. CHANCE sees in the position, a danger to the future of export trade. The problem facing the plastics industry is twofold: first, to be able to purchase fuel at a price approximating to that ruling before the war; second, the national problem of electric power available in suitable industrial districts at a price comparable to its cost in similar situations abroad. Of the two the latter is far more important, and though it may be difficult to believe that in this country, where industries are already centred in districts where coal and limestone abound, ways and means cannot be found for providing the industries with raw materials as cheaply as they can be supplied abroad—with coal at its present price there is little the supply industry can do to further cheapen the unit, until it is permitted to expand by natural peace-time development.

Coal Winning and Modern Machinery

THE generally unsatisfactory conditions brought about by the coal situation, have been referred to in these pages with something approaching monotony, and though everyone in the coal industry appears to be convinced that things are not as they should be, nothing but destructive criticism by miners and mine-owners has so far resulted. The electricity supply industry, so dependent upon the mines for its raw material, would like to see something more constructive than the throwing of brick-bats, something more concerned with economics, with mechanisation, with cheaper production costs; for only in that way will the coal industry settle down to the stability enjoyed by other industries. The designer of electrical machines has shown how coal-winning can be speeded up, and acceptance by the coal industry of these machines would raise its production methods from the standards of the nineteenth century to those set by modern engineering.

American Criticism

THERE has been and there will, no doubt, always be criticism by American industry of British methods, for the American hopes thereby to establish for himself easier sales and a broader market. The American has for many years recognised in British industry his biggest competitor in certain spheres of operation, and if by criticism he is able to blunt that competition he will do so. There has during the war been born in this country a feeling that trade should be a sort of "Christmas share-out," rather than the subject of competition as it was before the war, and some appear to believe such competition should not be allowed to return; even to the extent of our fuel industries sitting round the same table. Export trade is not only highly competitive, but is of the utmost importance to the welfare of this country; in recognising this, America visualises our making even greater efforts than before the war to capture markets which she might otherwise enjoy. Her reactions to the situation are critical but let us not be misled into thinking that they are more serious than attempts to reduce our competition.

Royal Praise for Electric Kitchens

The Queen Inspects E.D.A. Exhibits at Building Centre

KEEN interest in every device that will lighten the tasks of the housewife and brighten her surroundings was displayed by the Queen when she visited the all-electric kitchens, designed by the E.D.A.

The Queen is shown a batch of cakes from the electric oven. Miss Minoprio is on the right

for post-war low-cost houses and flats, at the Building Centre, Maddox Street, London, on March 1. Her Majesty was impressed by the practicability of the equipment and was gratified by the information that it would be available in such well-planned kitchens for people with small incomes after the war.

The Queen was received and conducted round the exhibition by Lord Brabazon, president of the E.D.A., Lord Lytton, a past president, Mr. Clarence Parker, chairman, Mr. V. W. Dale, general manager and secretary, and Mr. F. R. Yerbury, director of the Building Centre, while Miss Helen Minoprio, a member of the staff, and two demonstrators (Misses E. M. Eaves and R. Oliver) explained the working of the various appliances.

In the dining-kitchen of the first of the four models her Majesty signed the visitors' book.

The arrangements of the horizontal electric cooker were admired and, when told that the thermostatic control switched off the current and pilot light when the required oven temperature was reached, and the retained heat carried on the process of cooking, the Queen remarked: "It sounds almost too good to be true, especially now we have to save fuel." Referring to the hot-cupboard for keeping plates and dishes hot, she said "we could do with that at Buckingham Palace."

Expressing satisfaction with the fitting of a refrigerator into each of the kitchens, the Queen said every home ought to have one. The radiator fixed above the door to provide warmth for the meals recess in the kitchen attracted the attention of her Majesty, who observed that the idea was new to her and a very good one.

Some time was spent in the laundry-utility room, where the electric washing machine and wringer, and the drying cupboard with a heating unit in the base received approbation. It was pointed out that with such equipment the accumulation of dirty linen for a set washing day was unnecessary, because articles could be washed easily at any convenient time and placed in the cupboard to dry—a prospect which the Queen thought would be attractive for most housewives to whom the family washing was drudgery.

Her Majesty leaving the Centre. Also in the picture is Lord Lytton

Her Majesty was particularly impressed by the accessibility of the kitchen equipment and cupboards and the fact that the various sectional units were of standard size and could be moved and rearranged to suit the wishes of the housewife.

Electricity Supply in Paris

Shortage of Coal the Main Problem—Effects of Allied Bombing

BEFORE France can hope to meet the demands which will be made upon her after the war, it will be necessary to overhaul her electricity supply industry. The country is suffering from the effects of Allied bombing before D-day, the progress of war since, and German destruction. One saving feature is that those responsible for sabotage during the German occupation were careful not to harm essential installations, it being realised that their replacement would not be easy even following the Allied landing.

Work of The F.F.I.

It is understood that the F.F.I. had amongst their ranks engineers who worked to a definite plan, destroying high and medium powered transmission lines but leaving the transformers unharmed. Although these lines were often easily repaired reparation did little good, for within an hour or so the line was destroyed elsewhere. Allied bombers on the other hand attacked the transformer stations, with the result that Paris, in particular, is not yet able to take current from the Massif Central in sufficient supplies to meet every demand.

Before the war, France as a whole produced current by steam and water power in almost equal quantities. To achieve this, several million tons of coal were imported and though the resumption of such imports is promised, they have not yet materialised to any appreciable extent. Steam plants in the Paris area were not damaged very much by the war, and since just prior to September, 1939, new generators were installed at St. Denis, Ivry and Vancey, the starting up of these machines would relieve the position. So low are their coal stocks, however, that reserves are reckoned in days rather than weeks.

The only important hydraulic plant which appears to be damaged is that at Kembs, which has been put out of action for at least two years. The main damage is the destruction of two 60 000 kW transformer groups at Chevilley, the interconnections of which were vital to Paris.

Even so, electricity consumption in the Paris area during the first week of January, was 30 per cent. higher than at any time before the war; a condition of things made possible only by the ingenuity of improvisation. Since coal stocks at the time of the liberation were nil, generation was dependent upon water power, and it is a fact that current in appreciable quantities reached the city during the first week in September, just three weeks after the liberation. South of the Loire, French engineers were actually at work before the Germans left the area, but the cold snap so pushed up consumption (electricity was the only heating method as there was no coal) that a crisis was reached by the second week of January.

Unless France can increase her coal production or obtain sufficient coal from abroad, the Paris area and the north (where almost every steam plant has been destroyed) will remain short of electricity supply until the damaged transformer groups at Chevilley are replaced, and the new 465 000 kW hydro-electric plant on the Rhone at Genessiat and the 202 000 kW plant on the Dordogne at L'Aigle are completed. This will probably take two or more years.

Manchester "Incidents"

Before the outbreak of war Manchester electricity department had taken steps to deal with such crises as could be foreseen. So successful were these precautions that when bomb damage occurred factories and other priority consumers had their supplies restored, in almost every case, before the premises were fit for re-occupation.

On the night of October 7, 1940, an h.e. bomb exploded within a few feet of a group of ten 33 000 V trunk feeders running from Barton to Stuart Street, whilst in another part of the city an unexploded h.e. bomb was located between two such cables. In neither case were the feeders damaged. During the Christmas "blitz" of 1940, however, two h.e. bombs fell directly on the track of six 33 000 V trunk feeders, all of which were damaged.

Fairly extensive damage was done to the 400 and 230 V systems, involving the relaying of over 5 000 yards of distribution cables and of approximately 1 800 consumers' services.

Fortunately the power station and large main sub-stations escaped damage other than slight blast effects. The 6 500 V distribution sub-stations suffered more extensively, no fewer than 31 being damaged on the two nights of the Christmas "blitz" of 1940. A sub-station in Whalley Range, housing two 1 000 kVA transformers, was completely demolished by a direct hit.

At Denton in October, 1941, a sub-station supplying a residential area was completely demolished by an h.e. bomb.

The Road Lighting Menace

By FRANCIS G. W. TREE, A.M.I.E.E.

THE transition from total black-out to dim-out, and recently to increased vehicle lighting, has been acclaimed by some, as a means of reducing pedestrian risks and road accidents, whereas it is no more than a drift back to conditions as dangerous to public safety as was much of our pre-war street lighting. In the year preceding the war, some £5 000 000 were spent in compensation in road accidents and the infirmaries of our larger cities spent an average of £50 000 a year, in consequence of some 200 000 victims of road accidents.

It might be asked in what way was street lighting responsible for such conditions, and the answer must be that lighting authorities did not raise illumination to the required standard for either drivers or pedestrians to move in clear vision of each other.

Of the 177 000 miles of roads in this country, many were dependent upon the moon for illumination and at best, many highways were most certainly not well lit, during some 2 000 hours of darkness each year. That this was so is evidenced by the fact that the Government set up a Committee to investigate road lighting conditions, and among the conclusions reached was one that head-lamps were one of the causes of road accidents. This conclusion pointed directly to inadequate road lighting, in that had road illumination been adequate and effective there would have been little or no need for the use of other than side lamps.

In the winter periods pre-war, over a half of the total road accidents occurred during the hours of darkness, and of these, most were between 5 and 7 p.m. Since the number of accidents did not vary proportionally with traffic density, as was shown by comparison with accidents during daylight hours, it may be assumed that a high contributing factor to the accident rate was therefore bad street lighting.

Vision by Contrast

Visibility is largely a matter of contrast, and thus, where two objects of similar colour are more or less close together, it is difficult, if not impossible, to distinguish them under ordinary night light conditions. Daylight enables objects to be identified by means of their colour, whereas, artificial light tends to resolve all colours into black and/or white, according to whether the colours are dark or light in shade. Within the beam of a vehicle lamp, a white object against a light road surface may be difficult to see, and the same applies to dark objects on a dark background. Incidentally, the light from vehicle lamps tends to cause dense shadows, and in some instances—especially where a vehicle is driven at high speed—such shadows may be mistaken by a driver to be objects and in trying to avoid them, he may run into trouble.

Danger in Variability of Intensity

The human eye requires about three seconds to adjust itself to varying conditions of lighting, and where a driver is subjected to the headlamp beam of another car he is likely to be blinded during the following 100 ft. of his travel. Under this condition, he cannot drive with any high degree of safety, but is expected to do so in cases where similar changes in lighting intensities are being brought about by street lighting. As an example, on a 13-mile stretch of arterial road completed in 1938, no fewer than 17 different light intensities were encountered, ranging from high intensity, to practically no light at all.

The conditions of those days were in no way the responsibility of the lighting engineer, for equipment capable of providing good and uniform lighting was in abundance, but was solely due to the outlook of local authorities with respect to economics.

According to a pre-war estimate, motorists paid to the State road welfare exchequer over £60 000 000 per annum, yet, of this only £20 000 000 was expended on road maintenance. A mere £25 per annum was spent on road lighting—whereas, some £200 per mile was paid in accident compensation, medical treatment and other expenses. It has been estimated, that all the county boroughs and 20 per cent. of the classified roads in other areas could have been properly illuminated pre-war at a cost of £3 500 000.

As to the future, it is upon what action is taken now, that road illumination after the war will depend, and if we fail to provide artificial daylight at its best on at least all the main roads, then something must be wrong with our understanding of the position.

Prior to 1736, it is recorded somewhere or other that the penalty imposed upon all failing to adequately illuminate their local thoroughfares from dusk to dawn, between Michaelmas and Ladyday, was death at the hands of the public hangman. Over two centuries of progress has outlived this law, but a penalty consistent with modern times and for the same reason, might do something to make our local authorities more alive to their responsibilities.

The Plug and Socket Controversy

By "SUPERVISOR"

NO apology is needed in this return to the subject of plugs and sockets, as affairs seem to have reached a lamentable stage. In spite of all our rosy visions of a post-war era unencumbered with several sizes of plugs and sockets it now seems that this ideal will not be reached, but that, on the contrary, we shall have no less than three wherewith we may be plagued.

The present position is as follows. In July last Post-war Building Study No. 11 was published, in which a recommended new standard socket-outlet and plug was discussed; prior to this, detailed particulars of required and recommended features of the new socket were published in advance, owing to the extreme urgency of this particular point. The appendix of Study No. 11 states: "We have therefore invited the B.E.A.M.A. to proceed as a matter of urgency with the preparation of suitable designs, which will form the subject of joint discussions with them prior to the submission of a request to the B.S.I. for the preparation of an agreed standard. This invitation has been accepted."

The Only True Standard

This was nearly 9 months ago, and in this period of gestation the matter of urgency has apparently been overlooked. Meanwhile, the B.S.I. has gone to some trouble in the matter of publicity to draw our attention to the fact that B.S.S. 546 is the only true standard, and objecting to the use of the word "standard" in connection with other sockets and plugs without the pale. The only item of news that has filtered through the security silence has been the disturbing revelation that the new standard socket and plug may be nothing more than our old friend the 5 A socket with uprating to 10 A. This point was dealt with in THE ELECTRICIAN of January 12 last.

But other things have happened since the B.E.A.M.A. were requested "as a matter of urgency" to deal with design. First, users of the flat-pin socket and plug in the Midlands and North say that nothing on earth will induce them to depart from this pattern, which has now been installed in such numbers as to make any change difficult. In addition, a well-known manufacturer has put forward his own idea of what the post-war plug and socket should be, and this has now been installed in temporary shelters for the bombed-out, and in kitchen units sponsored by a progressive London supply authority. In addition, several other supply authorities have announced their intention of adopting this new pattern, even if the rest of the manufacturers manage to persuade the B.S.I. to the contrary.

In that event, the makers of the new "standard" socket and plug would be in the same position as the flat pin manufacturers, who manage to effect good sales notwithstanding that their product is not approved by the B.S.I.—except that one would expect an even greater measure of support for the new socket and plug. It has to be agreed that practically all the points put forward by the Committee concerned with Study No. 11 are covered by the new pattern, so that this body, at any rate, will have no criticisms of the new arrival.

Special Requirements

For information, it might be as well to recapitulate these special requirements. They were:—1. To ensure safety, particularly of young children, the live contacts of the socket-outlet should be protected. 2. The design of socket-outlets and plugs should preclude "overhang" danger—e.g., it should not be possible to insert incorrectly one pin of the plug into the live contact tube of the socket and thus expose a live pin of the plug. 3. To reduce the liability to damage, socket-outlets in all new installations should be of the flush-mounted or semi-recessed types. 4. Plugs should be easy to withdraw and should be as light and compact as possible. 5. On a.c. circuits, which have been assumed to be universal in new buildings, disconnection can be safely made by withdrawing the plug; the expense and complication of a separate switch is therefore unnecessary in the standard design. It may, however, be desirable to have an alternative design incorporating a switch for use where this additional convenience is required. 6. The socket-outlet connection terminals shall accommodate a 7/.029 in. cable looped in and out, and also a "spur" connection if required—i.e., three 7/.029 cables require to be accommodated. Particular attention should be given to the size of the terminals and cable anchorages in both the socket-outlet and the plug. 7. In view of the recommendation that socket-outlets should be placed well above floor level, the plug should be standardised with the flexible connection entry at the bottom. 8. Resilient members of the combination should be incorporated in the socket-outlet. 9. If solid pins are used they should not be slotted. 10. Provision should be made in the plug for the accommodation of

a cartridge type of fuse for 13 A, and alternatively, for 3 A. Fuses of these ratings should be interchangeable, and be readily identified. In deciding pin spacing, consideration should be given to a radical re-arrangement of the pins—e.g., the live pin might be in the centre with earth and neutral pins on the outside, or possibly the earth and neutral pins might be placed very close together. 12. It is desirable, if possible, that the new standard socket-outlet should fit into an existing standard type of connecting box. 13. The plug should accommodate satisfactorily flexible cords of circular cross section of either size 23/.0076 in. or size 70/.0076 in.

The Committee adds a footnote—" Before taking a decision on the merits of round or flat pins for the new ' all-purpose ' socket-outlet we wish to have the considered views of the manufacturers to advise us on the technical and economical considerations involved in production." From past experience it may be assumed that no technical or economic features will be found to exist in the flat-pin type, in spite of the obvious advantages that are claimed by enthusiastic users.

The only point that has been called in question in these columns is note 10, relating to fuses. It has been considered that these should not be readily interchangeable, on the grounds that flexibles require closer protection, and there is already far too much fuse up-rating. However, it is realised that it will not be possible to incorporate everybody's idea of the perfect socket-outlet and plug in the new design, and some compromise must be accepted by all concerned.

However, one might object on ethical grounds to unilateral action by any firm of manufacturers at this stage of the proceedings, we have to admit that we already have a plug and socket incorporating the main points as set out by the Committee responsible for Study No. 11. Cannot the Committee now say that the issue has been dodged for long enough, and in order to enable the industry to begin to make its plans that the new socket and plug recently placed on the market will meet all requirements and be accepted as the new design ?

The writer has no interest one way or the other in the new product, but this everlasting stalling by committees should be overcome in as realistic a way as possible, if any sort of progress is to be made. The adoption of the new pattern would at least prevent the state of affairs deplored at the beginning of this article—that we are likely to be presented with three standards, or sizes, after the war. It is realised that there are problems involved in the design of any new standard, but there are not nine months' worth; surely it is time that some action were possible.

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.

After 44 years' service with the British Thomson-Houston Co., Ltd., the last 16

Mr. A. P. Young

Mr. H. L. Satchell

as manager of Rugby works, **Mr. A. P. Young,** has retired. To mark the occasion, managers of departments, superintendents and work-people met on February 23, under the chairmanship of **Mr. H. N. Sporborg** (chairman of the B.T-H. Co.) to present Mr. Young with an illuminated address and a cheque from employees, and a brief case from the Foremen's Association. **Mr. H. L. Satchell** succeeds Mr. Young as manager of the Rugby works. He was educated at Rugby School, served in the Forces during the last war, and took up an apprenticeship with the B.T-H. in 1920. He was awarded a B.T-H. Fellowship and proceeded to the General Electric Co., U.S.A., in December, 1922, for a year. On his return to Rugby he became technical assistant to the head of the winding department. In May, 1929, he was appointed planning engineer; in June, 1940, assistant manager, and on January 1, 1945, associate manager.

Swansea Electricity Committee has appointed **Mr. W. J. Norrie,** of Liverpool, as mechanical maintenance engineer.

Mr. C. W. Hayward (chairman of Electric and General Industrial Trusts) has been appointed chairman of Lea-Francis Engineering (1937).

St. Pancras Electricity Committee has appointed **Mr. W. J. Lee,** power station

superintendent, deputy electrical engineer at a salary of £900 a year. He has been in the service of the Council for 41 years.

Lancashire E.P. Co.'s cast in "Gas Light"

Mr. C. H. Arnold becomes a director of Kayser Ellison and Co., Ltd., in place of Lieut.-Colonel Frank Kayser, resigned.

The late **Mr. F. Northwood Pratt,** a director of George M. Callender and Co., left £118 327 (net £107 965).

Mr. J. H. Wilson has been appointed secretary of Vactric, Ltd., in place of **Mr. E. L. Saville,** resigned.

Mr. William H. Higginbotham has been elected chairman of Edgar Allen and Co., Ltd., in succession to the late Mr. C. K. Everitt. He joined the company in 1930 as secretary and became a director in 1933.

Messrs. Robert Lee, F. W. Lawton, L. A. Gripper and **R. Birt** have been appointed to represent the Incorporated Municipal Electrical Association on the Council of the E.R.A. for the next 12 months.

The following members of the Council of the I.M.E.A. have been appointed to serve as the association's representatives on the Council of the Conjoint Conference of Public Utility Associations for the ensuing year:—**Alderman G. B. Brooks, Councillor J. Selwyn-Jones, Messrs. F. W. Lawton, W. P. Lilwall, F. Newey** and **J. W. J. Townley.**

Speaking at a dinner given by the directors to the staff of Dorman and Smith, Ltd., at Manchester, Mr. Thomas Atherton, managing director, said the post-war prospects of the company were promising. They had worked on new designs in all classes of gear, but their best known development was their domestic standard fused plug and socket. Among others present were Major R. Amberton, Mr. J. Noel Haworth, Mr. Bruck L. Cooper (directors) and their wives.

The success of the presentation by the Lancashire E.P. Co.'s Dramatic Society of "Gas Light," a Victorian thriller by Patrick Hamilton, to full houses at the Queen's Hall, Manchester, on February 22 and 23, completely justified the choice of a difficult and unusual play, which makes heavy demands on a small cast. Under the able direction of the producer, Mr. I. L. Thomas, the players did exceedingly well. The proceeds of £15 will go to the Comforts Fund for L.E.P. men in H.M. Forces.

Mr. Norman Hunter, borough electrical engineer of Morley, has been appointed general manager and engineer of Stockton-on-Tees electricity department in succession to **Mr. S. G. Marston,** who is retiring. The salary is £850 per annum, plus cost-of-living bonus.

Obituary

Sir Duncan R. Wilson, late chief inspector of factories, on March 1, aged 69 years. He was chairman of the National Industrial Electric Lighting Service and the Home Office Committee on Factory Lighting, 1940.

Mr. George Keith, chairman and managing director of Keith Blackman, Ltd., on March 5, aged 69 years.

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.

Equipment for Post-War Development

Sir,—I am directed by the Electricity Commissioners to refer to their circular letter of February 1, 1945, suggesting that electricity undertakers should consider how far they can proceed to place orders forthwith for essential equipment, such as meters, switchgear, transformers, etc., which they are likely to require during the first twelve or eighteen months after the termination of the war in Europe.

In view of certain questions which have been raised, the Commissioners desire it to be clearly understood that the letter was not intended to imply that the undertakers should divert orders from their ordinary suppliers if those suppliers are in a position to give delivery within a reasonable period.—Yours faithfully,

A. E. Marson,
Electricity Commission. Secretary.

Liverpool Housing Experiments

Incorporating New Ideas and Full Electric Facilities

THE Liverpool Housing Committee recently inspected two experimental houses erected on the Norris Green Estate as part of the City's war damage reinstatement scheme. Full electric facilities are afforded.

The city electrical engineer, Mr. J. Eccles, mentioned that where the electric

Fig. 1.—Electrically equipped kitchen with floor space of 80 feet.

kitchen had been fitted something less than £100 must be added to the cost of the house.

In one kitchen with a floor space of 80 sq. ft., shown in Fig. 1, the equipment includes a stainless metal draining tray, a sink and a fitted electric wash boiler, on the window side. It is intended to replace this wash boiler unit with a washing machine and wringer by the Universal Boilers and Engineering Co., Ltd. Against the opposite wall, the first unit on the left is a clothes drying cabinet with a Belling heater in the base, under a perforated plate. The moist air is extracted by a Vent Axia fan fitted in the outside wall. The clothes rails are fixed in a row on runners allowing them to be drawn forward whilst the clothes are placed in position and then pushed back into the cabinet. The next unit comprises a double shelf cupboard, over a hot cupboard fitted with a bottom heat element, whilst below is an Xcel oven at table height with the switches for the hot cupboard, oven and hob plates arranged on the right hand side of the oven, which has thermostatic control. Immediately underneath the oven has been provided a shelf which can be drawn out. Below the oven is a cupboard for pots and pans. The vent for the oven is from the back through a tube with an adjustable butterfly flap and leads into a duct. Adjacent to the oven unit is a cupboard, over which is placed an Xcel hob unit fitted with a 7 in. Backer boiling plate and Sunvic Simmerstat, an 8 in. Torribar boiling plate and a boiler grill with a grill cupboard. Separated from the oven by a working space is an Electrolux refrigerator with a cupboard on top, whilst underneath is a large vegetable cupboard fitted with perforated trays arranged to be drawn out.

In a larger kitchen, with a floor space of 132 sq. ft., intended for meals, shown in Fig. 2, a different assembly of the units was necessary. The oven unit, on the extreme left on the window side, forms a protection against draught from the door, the hob unit is adjacent, followed by the stainless metal draining tray and sink. Next is a combined washing machine, wringer and boiler unit. For this the department adapted a Hotpoint washing machine and fitted it with an external circulator of 3 kW capacity. A two-way

Fig. 2.—Layout of larger kitchen intended for meals

switch prevents the agitator of the washing machine and the heater from being used at the same time. Another working table space with a vegetable cupboard underneath finishes an attractive table level layout. The refrigerator, broom and drying cabinet units are on an end wall. The space warming is by convector heaters, with non-luminous elements.

The whole of the apparatus in each kitchen is controlled by a master switch in the larder, individual control of the cooking and washing units being by push button.

Synchronous Electrical Machinery

Stray Losses—Measurement and Reduction Discussed

A PAPER on "Stray Losses in Synchronous Electrical Machinery," by Mr. P. Richardson, was read at a meeting of the Institution of Electrical Engineers on March 1.

The earlier part of the paper discussed the problem of eddy currents from the point of view of the effect of the physical arrangement of an alternator on the stray losses. The later sections dealt with the components of stray loss, and, since these could be classified conveniently in accordance with their position in the alternator, the stray losses which occur in the stator were considered first. It was shown how the arrangement of the end-windings influences the shape of the end leakage field and thus the intensity of loss in the adjacent metallic structures, and how the loss in the core end-plate or end-shield can be estimated. The effect of magnetic and non-magnetic shielding arrangements was discussed, together with details of their arrangement. Experiments in connection with eddy-current losses in the stator end connections were described. Consideration was given to the iron loss which occurs in the stator core under steady 3-phase short-circuit conditions owing to the flux waveshape, and the indications were that this provided at least a partial explanation why the stray losses can be so appreciably greater on short-circuit than on load.

The stray losses in the rotor, generally grouped under the heading of rotor surface losses, were shown to be due to several effects, notably those due to the concentration of ampere-conductors in one slot and to the irregularities present in the stator m.m.f. wave. Consideration was also given to the surface or pole-face losses resulting from the "tufting" of flux under the stator teeth, which loss is experienced under conditions of no load and is normally measured with the stator iron loss. The factors affecting the surface losses were discussed, together with methods for reducing the losses to a minimum.

An indication was given of the relationship between the stray losses at the ends and those located within the core length of an alternator, together with a description of the effect of load conditions on each of the components of stray loss.

Mr. W. Kilner (Metropolitan-Vickers Electrical Co., Ltd.) said that in addition to the methods mentioned in the paper for measuring stray losses, there was another method, viz., to run the machine as a synchronous condenser and measure its input by an a.c. bridge or wattmeter. He had measured the losses in a large number of machines in this way and usually found that the extra losses on wattless load were much less than on short circuit, the reduction varying from 10 to 30 per cent. of the short circuit stray loss. If allowance were made for the iron loss being greater on wattless loads, then the difference in loss was between 25 to 60 per cent. of the short circuit stray loss. On a few large machines, the reverse was found to be the case, the stray loss being higher on wattless load than on short circuit. The paper was a valuable contribution to the subject of stray losses, and he agreed with the author that we should continue to seek new methods for reducing them and, if possible, to estimate what they were on full load. He had been doing this for 25 years, but his investigations had produced such variable results that he hesitated to say we were in a position to make any recommendations to the British Standards Institution with regard to a change of method of calculating them. He was convinced, however, that the relation between stray losses on load and stray losses on short circuit was not the same for different machines, even if the machines were made by the same manufacturer.

Dr. R. Pohl (Birmingham University) said we might look forward in the near future to hydrogen cooling, and the percentage of stray losses would then be very much greater, because not only would the air friction loss amount to about 1 per cent. in large turbo-alternators and might almost disappear, but the essence of hydrogen cooling was that the output went up by 25 or 30 per cent., and the stray loss would go up in the same ratio. Indeed, it might be as high as 50 per cent. of the total loss. It would not, of course, be such a terrific figure because in large hydrogen cooled machines an efficiency of nearly 99 per cent. would be obtained. As to the ratio of stray loss on short circuit to the normal loss on full load, his experience was that it was very much less on load than on short circuit, and there was a definite saturation effect to be taken into account, in addition to what the author had mentioned, which caused the loss to be smaller. Also, in the inductor type of alternator, used for high frequency generation, the short circuit loss was very much higher than the loss on full load, but the ratio was greatly in excess of the ratio now being discussed and he agreed that this matter should be recon-

sidered. In its application to the inductor type of alternator, the ratio was far too high.

Mr. J. W. Howard (General Electric Co., Ltd.) said the stray loss from the short circuit test was only of interest during the time the machine was at the manufacturer's works; after the machine reached the user it had a different set of losses and a different set of temperature rises, which created difficulties for the designer. The principal stray loss which affected temperature rise of stator windings was the eddy current loss. In regard to the rotor there was a tendency to exaggerate the stray losses. A great deal depended on the manner in which the machine was designed. In the machines with which he had been associated, the total cooling surface of the rotor was probably four times the barrel surface of the rotor. One thing that had always puzzled him was the influence of the type of winding on the short circuit losses. As to core end plate losses, the author had produced a rather interesting formula, but he would like to know what "skeleton" type core end-plate, mentioned in that formula, really meant. In connection with core end-plates, he suggested that an alternative method of approach was to regard the thing as a transformer and thought it was dangerous to draw conclusions from a model test without reference to the actual physical relations existing on the real machine.

Mr. L. D. Anscombe (B.T-H. Co., Ltd.) discussed the advantages of the salient pole machine in the matter of stray losses as compared with those on turbo type alternators, and said that in the salient pole machine the end losses were comparatively unimportant. This was partly due to the reduced intensity of the magnetic field in the larger number of poles, and partly because the overhang of the rotor winding and the core was very much less, and the pole end-plates were less compared with rotor end caps. This very low end loss possibly accounted for the fact that over a wide range of salient pole machines the stray load loss, as measured in accordance with the British standard specification, very rarely exceeded 10 per cent. of the total loss. As to operating a machine as a synchronous condenser, he thought there was a clear case for a revision of B.S.S. 268. There was one feature of a salient pole machine which differed considerably from the turbo type, viz., the fitting of laminated poles or separate squirrel cage windings. The presence of these undoubtedly reduced the loss due to stator distribution harmonics. Although the author had described the magnetic wedges fitted in the stator slot as a means of reducing the flux and the rotor loss, no indication was given as to whether they had proved satisfactory in service. His own experience had been that they were dangerous in that they were subject to strong pulsating magnetic forces and could not be made of a material which would prevent shrinkage. It would be interesting to know if these wedges had proved satisfactory after a long period of time.

Mr. G. F. Freeman spoke of the variation of these losses with load, and asked whether it was justifiable to take the losses as proportional to the square of the load current. Under short circuit conditions the iron was more or less saturated and the flux could be regarded as substantially proportional to the current. Therefore, it was said one would naturally expect the stray losses to be proportional to the square of the current, but in his view, if the machine was saturated under load conditions, that assumption was not quite justified. Some information on that point would be of value.

The author replied to some of the points raised in the discussion, but will give a detailed reply in writing.

Radio Dinner

The British Radio Industry Council entertained at dinner at the Dorchester Hotel on March 2 the delegates from overseas attending the Conference of Commonwealth Broadcasting and leading officials of the B.B.C. Mr. F. B. Duncan, chairman of the Radio Industry Council, presided, and those present included:—

Mr. G. W. Olive, chief engineer, Mr. Cahoon, engineer in charge of short-wave service, Canadian Broadcasting Corporation; Col. C. J. A. Moses, general manager, Australian Broadcasting Commission; Mr. J. R. Smith, chief engineer, New Zealand National Broadcasting Service; Mr. Horace Collett, divisional engineer, Transvaal Division, South African Broadcasting Corporation; Mr. C. W. Goyder, chief engineer, Mr. S. Gopalan, officer on special duty, development and planning, All India Radio; Sir Noel Ashbridge, Deputy Director General, B.B.C., Mr. H. Bishop, Controller (Engineering), B.B.C., Mr. R. T. B. Wynn, Assistant Controller (Engineering), B.B.C., Mr. L. W. Hayes, Head of Overseas and Engineering Intelligence Department, B.B.C.; members of the Radio Industry Council: Messrs. E. J. Power (Murphy Radio, Ltd.), and C. O. Stanley, (Pye, Ltd.), B.R.E.M.A.; Messrs. C. W. Eve (Standard Telephones and Cables, Ltd.), J. W. Ridgeway (Edison Swan Electric Co., Ltd.), and J. H. Williams (A. C. Cossor, Ltd.), B.R.V.M.A.; Mr. F. S. Mockford (Marconi's Wireless Telegraph Co., Ltd.), R.C.E.E.A.; Mr. A. F. Bulgin (A. F. Bulgin and Co., Ltd.), Mr. E. M. Lee (Belling and Lee, Ltd.), Major L. H. Peter (Westinghouse Brake and Signal Co., Ltd.), Mr. P. A. Sporing (Telegraph Condenser Co., Ltd.), R.C.M.F.

Book Reviews

Heaviside's Operational Calculus Made Easy. By T. H. TURNEY. (London: Chapman and Hall.) Pp. VII + 96. Price 10s. 6d. net.

The Simple Calculation of Electrical Transients. By G. W. CARTER. (Cambridge University Press.) Pp. viii + 120. Price 8s. 6d. net.

Oliver Heaviside's genius lay as much in the brilliance of his intuition as in the unorthodoxy of his mathematics. He got the right answers to hitherto insoluble electrical circuit problems by methods that by their very nature were unacceptable to pure mathematicians. This fact, coupled with the almost pig-headed obscurity in which he cloaked much of his analytical reasoning, made it all too easy for electrical engineering to neglect the unique achievement of the "Electrical Papers," originally published in THE ELECTRICIAN 50 years ago.

The respectability of Heaviside's "Operational Calculus" was only established many years later by orthodox mathematical reasoning. Yet it is only since his untimely death in 1925, that electrical engineers have been made aware, mainly through the standard treatises by Berg, Carson, Bush, and Coulthard, of the practical value of Heaviside methods for solving problems involving transient currents and voltages in electrical circuits. Such developments notwithstanding, there still remains a wide demand for an exposition of these methods in which the emphasis is on the electrical rather than on the mathematical approach to such circuit problems. The two volumes under review aim, each in its own way, at presenting just such an exposition of Heaviside's unique contribution to electrical progress. For it is not too much to say that, without the "Operational Calculus" electrical communication as we know it today — long-distance telephony and telegraphy, radio, television— could never have come into existence. What Clerk-Maxwell began, Heaviside fulfilled.

As its title suggests, Dr. Turney's book of 96 pages attempts to follow the memorable trail blazed by the great teacher, Sylvanus P. Thompson, whose "Calculus Made Easy" was at once a headache to the mathematics professors and an exhilarating tonic to their students. Unfortunately Dr. Turney has failed to capture the spirit of childlike simplicity which informed Prof. Thompson's brilliant little textbook, and has substituted for it a prose style that is a strange admixture of adulthood and childishness. This criticism apart, we unhesitatingly commend it as the best introduction to Heaviside's work which has so far been written for electrical engineers. It can be followed by anyone with a rudimentary knowledge of differential calculus. The chapter on Heaviside's famous "expansion theorem" alone almost justifies the relatively high price of the book. Dr. Turney's original approach lies in his use of Exponentials (with which electrical students are pretty well familiar) rather than Complex Algebra, Fourier Integrals or Laplace transforms. (which are Greek even to chartered electrical engineers), in explaining Heaviside's treatment of transients and impulses. As he aptly remarks in his preface, mathematics in engineering is like honey for tea—a little goes a long way.

Mr. Carter's book of 120 pages is in a rather different category. His treatment of the subject is intermediate between Dr. Turney's Heaviside-without-tears, and the more advanced works already referred to. It covers a good deal more ground (electrically) and digs deeper (mathematically) than the former, without demanding anything like the concentration and brain power necessary to assimilating the latter. Much of it can be judiciously skipped; e.g., Duhamel's integral and its applications in Chapter 4, Routh's stability criterion as exemplified in Chapter 6. The six practical examples which, fully worked out, constitute the final chapter are beautifully chosen and clearly illustrate the power and simplicity of Heaviside's methods in solving what at first glance appear to be difficult circuit problems. The whole book is scholarly in tone and yet written in a lucid style that makes light of difficulties. It will amply repay careful study and forms a fitting companion to Dr. Turney's more elementary volume. H. R.

Rebuilding Britain—A Twenty-Year Plan.—By SIR ERNEST SIMON. (London: Gollancz). Pp. 256 + 16 plates. 6s. net.

This book is intended to point the way whereby the population of the country may be able to live in healthy surroundings, and the author in order to stress his arguments, introduces into his text features relating to the United States and Russia, and how those countries have overcome some of their problems. The author is a strong advocate of electrical service and the aim of the book is to try to make clear what are the conditions under which an outstanding success can be achieved in the matter of town planning and building. Though the book has no direct bearing upon electrical affairs it makes most interesting reading, and the hopes expressed, if realised, will have a considerable influence upon electrical expansion.

Design and Illumination

Their Relationship in the Planning of Building Interiors

"THE Relationship Between Interior Design in Buildings and Artificial Illumination" was the subject of a paper, by Mr. John W. T. Walsh, read at the sessional meeting of the Illuminating Engineering Society at the Institution of Electrical Engineers, on February 27.

Mounting Heights

The desirability of high mounting for the lighting units demanded, said the author, the most careful consideration because it was clearly a vital matter which might well affect the design of the building. By far the most important objection to a low mounting height was the glare it caused. From the point of view of glare-avoidance, the golden rule was to mount the units as high as possible.

The difficulty of securing adequate mounting height in the modern house was very great, owing to the prevalence of low ceilings, and here he would strongly advocate mounting units as close to the ceiling as possible. In fact, he would go further, and suggest for the serious consideration of architects the provision of a recess in the ceilings, at any rate of living rooms and, possibly, bedrooms as well, for the accommodation of the upper part of a fitting for the general lighting of the room. It was important to have a good deal of luminous area below the level of the ceiling; otherwise the ceiling would be dark and, further, a small luminous area close to the plane of the ceiling would show up all the brush marks or other slight irregularities in the surface. It would also be necessary to have the major part of the flux from the fitting emitted in the lower hemisphere and ease of relamping from below should not be neglected.

In dwellings, and in other rooms, where the ceiling-height was not over, say, about 15 ft., the best form of mounting for discharge tubes was within a few inches of the ceiling, without any kind of shade or reflector whatever. The sockets at the ends should have matt-white outer covers and dark patches, or excrescences on the ceiling should be strenuously avoided.

The mention of special provision by the architect for mounting a lighting unit in the ceiling of a room led, naturally, to a consideration of schemes in which all or most of the lighting was from sources placed within compartments specially provided for them in the structure itself. In many cases, the most effective arrangement was some form of artificial window. This was particularly useful when natural daylight was absent or deficient in quantity, and where the use of ordinary artificial lighting units to reinforce the daylight would only serve to draw attention to the deficiency. Artificial windows were of very simple design and easy to accommodate, if they were thought of in time, but to add them when the building was completed was not only expensive, but usually resulted in their appearing as the after-thought they actually were; all the illusion of naturalness was destroyed.

In many cases a laylight, lighted by sources placed above it, could be very effective. This was really an artificial window in the ceiling. The extensive use of such lights had been made possible by the advent of the discharge tube, and now that this type of source was generally available it might be taken for granted that there would, in the immediate future, be a much more frequent use of artificial windows (and, probably, of other forms of built-in lighting of more doubtful aesthetic value).

In conclusion, the author expressed the hope that well-designed built-in lighting might be a common feature of building practice in the immediate future. It had a great deal to recommend it, and probably only a little further study of the matter was all that was required to convince both architects and illuminating engineers of its tremendous possibilities.

New Oil Engine Company.—A new company called British Oil Engines (Export) Ltd., has now taken over the export sales of engines manufactured by Petters, Ltd.; Mirrlees, Bickerton and Day, Ltd.; J. and H. McLaren, Ltd.; Oil Engines (Coventry), Ltd.; Fielding and Platt, Ltd. Mr. F. S. Mitman is chairman of the company and Capt. R. C. Petter has been appointed managing director. Mr. A. P. Good, Mr. A. P. Quarrell, Mr. S. A. Lane and Mr. F. A. Vaughan are also on the board. As from March 1, temporary offices have been obtained at 27, Gilbert Street, London. W.1 (Telephone: Mayfair 0352). The company will be able to offer a complete range of engines from 1½ to 1 500 B.H.P. for industrial, marine and traction purposes, and over 150 agents have already been appointed throughout the World, with resident superintendents appointed for India, Australia, South Africa and Central America. Certain territories are not yet covered and firms are invited to communicate with the company.

Post-War Fuel Economy

By F. D. PARKER, A.M.I.E.E.

THERE can be no question that fuel economy, or the efficient utilisation of fuel, will be pursued with equal vigour in post-war years. Until recently, such a policy might have been considered a somewhat irritating but necessary war-time expedient to be abandoned in the early days of peace. Recent pronouncements, however, on the fuel situation, both immediate and future, should have dispelled any illusions in this respect.

In the electrical field, especially where installations have been efficiently designed and installed, one could argue with a good measure of truth that there exists no scope for fuel economy; that utilisation of electricity in itself promotes efficiency, and by virtue of its cost, wastage is naturally avoided. Any economy, therefore, must be brought about either by reduction in the standards of lighting, space heating, etc., previously recognised, or by eliminating unnecessary usage.

Definite Policy Essential

If efficient utilisation of our fuel resources is to become a cardinal point in post-war domestic policy and developed on a rational basis, then the order of its importance relative to other considerations associated with it must be clarified in the public mind, not only by words, but by some adjustment of opinion and attitude in official circles. There exists no process or application, for instance, in which fuel is consumed which could not be more efficiently developed, but would the small increment of thermal efficiency justify the additional cost, and *vice versa*. The realisation of such increased efficiency might involve usage of new materials, or as will be the case in post-war years, necessitate the installation of new plant of a more modern type, which, as a means of securing fuel economy during the war, has been officially discouraged. Clearly, then, in the early days of peace it will be essential to lay down some definite policy in this direction in which such factors are arranged in the order of their priority relative to the changed circumstances, financial and otherwise. Nor, in assessing its value, must the contribution of any particular fuel towards the solution of other social problems, such as smoke abatement, labour saving, better conditions in industry, etc., be forgotten. The problem must inevitably resolve itself in the future into how far can increased efficiency in the utilisation of fuel justify higher relative capital expenditure and operation cost? The difficulty in determining a practical formula for the solution of such a problem is self-evident. As in the past, the attitude in official circles—but it is hoped in a somewhat reversed direction—will supply some indication as to policy to be pursued.

During the war fuel economy has taken the form of encouraging large scale fuel users to avoid wastage, to make their processes as efficient as possible and employ any thermal leakage for some useful purpose—often erroneously assumed to be close at hand. In the domestic field the policy has been to exhort householders to avoid wastage, cut down consumption and, what is especially interesting to electrical engineers, adopt generally many of the expedients which have been employed in domestic electric circles for many years as a matter of course. To those taking the long view, such a policy must appear fundamentally unsound if perpetuated in peace time. In the industrial field, replacement of obsolete and inefficient plant by more modern alternatives, obviously should provide the key-note of post-war fuel policy if any permanent benefit is to be secured; the type of plant or installation selected, both in these and new projects, being related to any special circumstances or conditions in usage. Here it is not sufficient to consider boiler efficiency, etc., alone, but the overall efficiency of any particular thermal process. This is being increasingly recognised in connection with space heating installations.

Fuel Saving in the Home

In the domestic sphere continuation of the policy of " elbow nudging " in the fuel-saving direction will certainly prove very unpopular. Some reasonable relaxation will be expected and schemes of a more positive and permanent nature substituted, such as the installation of efficient fuel consuming appliances in post-war housing, etc., the design of such buildings, together with the appliances installed, being such as to ensure maximum fuel economy without perpetual vigilance on the part of householders. Movements in regard to appliances are also clearly perceptable in the ranks of electricity's contemporaries. More efficient coal grates, which, it is claimed, eliminate all the disadvantages of their predecessors and retain only their virtues, are to be produced. How this is to be achieved without robbing coal fires of much of their alleged " cheerfulness " is not clear, and the result may be the subject of much disappointment.

Slow combustion stoves of higher efficiency, but strictly limited heating capacity, will undoubtedly emerge, but whether these will prove as popular as open coal fires of conventional type, time alone can tell. In any event the question of coal transportation—and the consumption of more fuel in the process—remains to be solved. The production of smokeless fuel, as recommended, on a large scale basis remains in the embryo; also the increased storage space required for such fuel seems to have been forgotten in many designs of post-war houses.

Solid Fuel Fires

The writer recently inspected some post-war designs of coal fires. The chief departures from pre-war practice appear to be more effective draught control—which assumes very intelligent manipulation on the part of the user—also advocacy of under the floor draught, thereby eliminating (it is claimed) objectionable surface draughts at low level and promoting better room ventilation. Continuous burning of coal fires is recommended, together with the employment of better methods of ash removal. Generally, smokeless fuel, anthracite, or at least very good quality coal of low ash content will, it is assumed, be used. Full marks must be given for ingenuity, but it is doubtful whether such conditions will exist in the average post-war house.

Bearing in mind that the consumption of raw fuel in the domestic sphere must inevitably be a relatively inefficient process, and the popular tendency towards cooking by other means, one might have considered official discouragement of its usage would have been a wiser if, perhaps, bolder course. As it is, post-war policy appears to consist of bolstering up usage of an out-of-date and admittedly dirty and inefficient method of heating, which sooner or later must be abandoned.

Design of Buildings

Besides installing efficient methods of space heating, cooking and water heating and providing thermal insulation, more attention must also be paid to the general design of buildings, and the habits of householders must undergo some adjustment if long term fuel economy is to be fully realised. The position and type of front entrance, etc., to a public building can have a pronounced influence on fuel consumption, as can also badly fitted doors, windows and skirtings. If the loading bays of a factory or warehouse are open to the main body of such buildings, then the heating requirements obviously will be heavier. Similarly in the domestic sphere, if housewives leave their front doors or windows open during severe weather while talking to neighbours, then their houses will be colder and more fuel will be consumed. Viewed from this angle it is not difficult to appreciate why many Canadians, for instance, have little respect for the design of the average English house and are perplexed at the behaviour of its occupants during severe weather.

Heating of Public Buildings

The fuel saving which could be effected in this direction and in non-industrial spheres is no better demonstrated than by examination of the conditions prevailing in the average hotel, road-house and in licensed premises generally in pre-war days. Thermostatic and automatic regulation of heating systems—and here the advantages of such controls should be self-evident—were more an exception than the rule. The value from a fuel saving viewpoint of isolation of any particular section of the heating installation to cater for varying requirements was seldom considered. It was not unusual, therefore, to find in winter months, large dining rooms, lounges, etc., fully heated even if the possibility of their use was very remote. When designing such buildings in the future, architects would serve the purpose of fuel economy to a considerable degree by making provision in their layouts for dealing efficiently with any diversity in the numbers catered for according to season. This also applies to the design of kitchen installations. Here it was not uncommon to find large ranges, etc., capable of catering for several hundreds, being used to cook for a few people only. Obviously it is by intelligent forethought in the design of buildings and in the selection of the type of installation that the interests of fuel economy can be best served in the long run. Measures of the austerity type, to which the public have been submitted during the war under the banner of fuel economy, such as regulation of central heating by the calander rather than by the thermometer, and the bureaucratic muddle resulting thereby due to eccentricity in weather conditions, will certainly not be tolerated in the future. The amount of fuel saved by such expedients is a matter for conjecture, especially with modern automatically controlled installations and bearing in mind that maximum wastage takes place when starting up and shutting down boilers. Its results in the way of colds and other illnesses require no emphasis, and many occupants of offices have learnt the value of a southerly aspect of buildings.

Going from one extreme to the other, however, it has been the experience of most people to attend a meeting or dance in some public building in winter time

when the room temperature has been moderate at the outset, but has steadily mounted as to become unsufferable, due to the non-automatic features of the heating installation—usually low pressure hot water. This in striking manner reveals the desirability, from a fuel economy viewpoint, of selecting a type of space heating installation ideally suited to the requirements—in this case a system of low thermal capacity, but of quick response to temperature variations, i.e., thermostatically-controlled direct electric heating. For such purposes this method of space heating is unrivalled. In instances where coal fires are also employed, or where central heating is of a supplementary nature and the occupational factor varies considerably —such as in licensed premises—the advantages of thermostatic control are most pronounced. Speaking generally, the additional cost and fuel consumed to maintain temperatures in excess of 45° F for greenhouse heating and 60° F for normal space heating during severe weather is not sufficiently appreciated.

Question of Temperature

To talk casually of indoor temperatures being maintained somewhere between 60° and 70° F, reveals complete bankruptcy of knowledge on the whole question of relative fuel consumption and operation costs of space heating installations. In the case of non-thermostatically controlled installations, temperature variations up to 10° F. are seldom detected above 60° F. The additional operation cost and fuel consumption resulting from hand control is therefore self-evident.

Returning to the domestic sphere, and in particular greenhouse heating, the benefit of local ingenuity in a fuel saving direction and at the same time satisfying efficiently special requirements, was strikingly revealed to the writer some weeks ago. Here the consumer, instead of maintaining the whole of his greenhouse at approximately 45° F for frost protection under thermostatic control in the winter months, erected in his greenhouse a small portable cold frame—in other words a miniature greenhouse inside a larger one. In the cold frame sufficient heating was installed under thermostatic control to maintain temperatures in the neighbourhood of 55/60° F. The result was that the cold frame (which was removed each spring) could be employed for growing garden produce in midwinter, and at the same time it emitted sufficient heat to maintain the rest of the greenhouse at a temperature above 32° F. By this means the running cost, as compared with heating the whole of the greenhouse to 45° F., was substantially reduced and a double purpose served. The general analogy is that heating engineers in the future might well ask: "Is all this space to be heated really necessary for the requirements?"

Choice of Fuel

Considered in broad outline from the viewpoint of fuel economy alone, substantially increased usage of electricity is to be reasonably anticipated in post-war years. But as previously mentioned, difficulty may arise in assessing or at least combining in its true perspective, capital and running cost considerations. In addition, in the domestic field, there is the question of freedom of choice in the usage of various fuels, which further complicates the issue. In regard to the thermal efficiencies of various fuels secured in practice and employed for industrial and domestic purposes, it is remarkable that no reasonable identity of view exists among consultants and others, many basing their opinions on the most convenient data according to their outlook—often divorced from practical experience and introducing much wishful thinking. Admittedly type of installation, etc., is one of many influencing factors, but until some comparison can be reasonably made and generally agreed upon, assessment of the relative values of various fuels from a fuel economy viewpoint is clearly impossible. In the space heating field, standardisation of the method of estimating probable fuel consumption, etc., such as the Degree Days basis, and the publication of reliable thermal constants for post-war building materials, and so on, would be a step in the right direction.

Balance in Favour of Electricity

Certainly electrical development engineers may tire of the argument that since, under present conditions they cannot hope for greater efficiency, then the equivalent of a lb. of coal per unit of electricity, especially for heating purposes, must necessarily be wasteful. But even accepting this as a basis for comparison, and forgetting possible future hydro-electric development and the fact that some of the fuel consumed is unsuitable for use elsewhere, it can be shown from experience that there exist many installations of electricity's contemporaries where even that efficiency is by no means realised. Moreover, on the average, not only thermally, but financially, the balance is in favour of electricity, especially if the question is viewed in its true perspective and indirect advantages and savings considered. Much more may be heard of such factors in post-war years, as in the domestic sphere, for instance, the average housewife is determined that there shall be no return to the drudgery of pre-war housework.

Auckland Electric Power Board

Twenty-Second Annual Report—Revenue Increased by £72 611

IN his annual report covering the twenty-second year of the operation of the undertaking under the control of the board, the chairman of the Auckland Electric Power Board (Mr. S. J. Harbutt) states that the whole of the area, with the exception of a small section known as Kawakawa, has been reticulated and over 90 per cent. of the houses and factories, etc., are connected with the board's supply. Post-war development schemes are extensive and affect nearly all the departments of the undertaking. A large section of the system is to be redesigned for centralised control.

Despite adverse conditions the organisation had continued to prosper. Net revenue from all sources amounted to £1 008 944, an increase of £72 611 over the previous year. Operating expenses were £41 880 higher at £599 766, and capital charges £1 834 higher at £256 109. A surplus of £153 068 was shown in the accounts. The cost of power purchased was £32 249 higher at £418 863. This was the largest item in the operating expenses. The unit cost increased from .3190d. to .3227d. Of the additional revenue received, the increase in commercial power provided £46 081 and disclosed the greater demand being absorbed by industry for essential war requirements. Some of this demand would be reduced when war needs ceased, but in its place would arise new demands for increase in peace-time production and also in the domestic field when consumers would be able again to purchase freely their current-consuming appliances.

Plant Replacements

The board was faced with the replacement of a good deal of equipment in a number of its sub-stations. In some cases orders had already been issued for replacements, and other orders were being prepared. The cost was estimated at approximately £115 000, but they would be forced to carry on with the existing equipment until replacements were received from overseas.

The board now had some 71 000 consumers over an area of approximately 325 square miles, practically the whole of which was reticulated. The loading on the board's system had reached 79 285 kW, and the units sold last year were just over 311 millions.

Capital expenditure was, in round figures, £3 250 000; the total of loans raised was just over £3 300 000, and of this amount loans totalling approximately £1 500 000 had been repaid; the net loan liability was therefore just short of £2 000 000, against which the board had established sinking fund reserves, invested outside the business, totalling over £700 000, and its depreciation reserve was just under £800 000; other reserves totalled over £500 000. The board holds investments in outside securities, mostly in Government stock and local body debentures, totalling something over £1 000 000.

Power Shortage

Throughout the year numerous reports had been presented dealing with the power shortage and the restrictions which the Government had found it necessary to impose in order to conserve power and relieve the heavy loading on their generating system; the position was most unfortunate and it was felt that the position could have been relieved (at least to some extent) if the Government in the early war years had been prepared to order additional steam generating plant to supplement their hydro-electric development. The present outlook forced the board to realise that they must expect additional restrictions in increasing severity during the next few years, and it was difficult to see how the Government's proposals for rehabilitation could be given full effect to, and its comprehensive State housing proposals brought to completion, when the most vital necessity, that of an adequate supply of electric power would be lacking.

Following on the sale of the whole of the board's King's Wharf property, including its power station and other buildings, the board purchased land in Newmarket for the erection of a new works office block, designed to provide branch office accommodation, stores, workshops, garages, control room, meter department, repair shops, etc. Provision for extensive staff recreational facilities were also contemplated.

It was hoped that in the near future the final plans would be available for submission to the board, and that an early commencement could be made with the erection of this block.

Carnarvon.—The electricity accounts show a balance of £3 264, and acting upon the report of the manager, Mr. Pike, the Electricity Committee has recommended a reduction of ¼d. per unit in lighting (except in special cases) and power charges. It was decided that the proposed reductions should be retrospective as from the beginning of January last.

News in Brief

Vacuum Cleaner Purchase.—The Cardiff Electricity Committee has reported that 144 vacuum cleaners have been ordered at an approximate cost of £10 each, delivery to be spread over 12 months. The cleaners are to be sold for cash.

I.E.E. Transmission Section.—A paper on "Distribution of Tensile Load in Relation to Temperature and Sag of Steel-cored Aluminium Conductors" is to be read by Mr. E. W. W. Double, at the institution on April 11, at 5.30 p.m.

Rate Relief Allocation.—The Wallasey Electricity Committee recommends an allocation of £5 000 in aid of the rates.

School Lighting.—The West Hartlepool Education Committee is to spend £549 installing electricity at Lynnfield School in place of the present gas installation.

Works Change-over.—The Board of Trade has agreed to a change-over by the North-West Engineering Co., Fleetwood, from their present work to the manufacture of electric washing machines.

Social Item.—The Oxford branch of the Wessex Electricity Co., held a social and dance recently for employees and friends, over 200 attending, including the district manager, Mr. F. T. Bushroyd.

Philips (Blackburn) Extension Plan.—Blackburn General Purposes Committee has pledged full support to Philips (Blackburn) Works, Ltd., in the proposed extension plan and undertakes to give all possible help in securing licences for labour and materials and the supply of essential public utility services.

Analysis by X-ray Diffraction Methods.—The 1945 Conference of the X-ray Analysis Group of the Institute of Physics will be held on April 12 and 13, at the Royal Institution, London. Further particulars from Dr. H. Lipson, the hon. sec. of the group, Crystallographic Laboratory, Free School Lane, Cambridge.

Housing Schemes.—The Leicester Corporation has decided that the first batch of temporary houses to be erected shall be all-electric. The Swansea Water Committee in considering the requirements of housing developments, has approved the installation of electric plant in connection with a water scheme. The Ealing T.C., at a recent meeting, decided that all temporary houses to be erected within the borough should be fitted with an all-electric installation.

Television Society.—The annual meeting of the society will be held at the I.E.E., Savoy Place, London, W.C.2, on March 27, at 5.30 p.m., when a discussion on "Some Social Aspects of Television" will be opened by Captain C. H. Cazaley.

New Glasgow Power Station.—The Central Electricity Board has come to an agreement with the Corporation of Glasgow authorising the construction of a new generating station at Brachead. The agreement provides that the station shall have an ultimate capacity of not less than 200 000 kW. The first section is to consist of two 50 000 kW turbo-alternators.

Southwark Power Station.—The Electricity Committee, in connection with the rebuilding of the generating station, is making arrangements for the original foundation stone, which was laid in 1898, to be inserted in the wall of the new building.

New Research Organisation.—The Parsons and Marine Engineering Turbine Research and Development Association is the title of a new organisation formed by 30 British marine engineering firms to carry out experiments in marine propulsion at Wallsend-onTyne which will cost about £200 000. The station will include office and administration block, transformer and switch houses, research room, turbine house and boiler house. The head of the new association is Mr. T. W. F. Brown.

Durham Station Site.—It is understood that Mr. W. S. Morrison, Minister of Town and Country Planning, is making further inquiries before coming to a decision on the Durham power station scheme. An alternative site and an alternative method of supplying the power have been suggested. The deciding factor may be the discovery, reported recently, that the foundations of the proposed site at Kepier, Durham, are not as strong as was at first thought.

TWENTY-FIVE YEARS AGO

FROM THE ELECTRICIAN *of March 5, 1920: The problem of how to reduce the present universal high prices is now rather belatedly receiving attention from the Peace Conference assembled in London. The questions under consideration include rates of exchange, scarcity of commodities, transport, production, trusts, profits and taxation. The agenda is a long one and we shall await the results with interest, for the time for academical discussion of these absorbing subjects has past, and the time for action has arrived.*

Answers to Technical Questions

We produce below the answers to a selection of questions which have been sent to us by readers. The co-operation of students, and others in making this feature one of general interest is invited.

What causes the voltage at the terminals of an alternator to fall off as the load is applied ?

When a generator is running on no-load the current in the field winding produces a magneto-motive-force (m.m.f.) which sets up a flux around the whole magnetic circuit and across the gap. This flux, which of

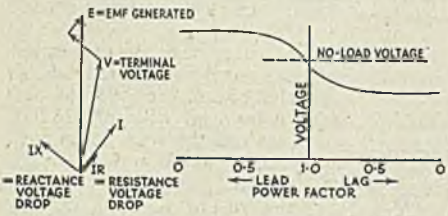


Fig. 1.

Fig. 2

course, is rotating at the same speed as the poles, cuts the stationary armature (stator) conductors and induces in them an e.m.f. in accordance with the ordinary e.m.f. equation. This generated e.m.f. appears at the terminals as terminal voltage.

When the machine is put on load three effects take place, viz.—armature reaction, armature resistance voltage drop, and armature leakage reactance voltage drop.

Each of these tend to cause a reduction of voltage at the terminals if, as is usual, the load is at unity or a lagging power factor.

The first of the above is the most important—the alternating currents in the armature set up an m.m.f. similar to that due to the d.c. in the field winding and the flux in the magnetic circuit, and the air gap is due to the resultant effect of these two m.m.fs. If the load current is 90° leading the two m.m.fs. will add together; if it is 90° lagging the armature m.m.f. will oppose that of the field winding and cause a reduction of the flux. In the former case there will be an increase of the e.m.f. generated for a given field current, while in the latter case there will be a reduction. At unity power factor the armature m.m.f. will have some demagnetising effect but not so great as at lower power factors. The effect of the load currents in the armature at unity or lagging power factor is therefore, to produce an m.m.f. which demagnetises the field causing a reduction of the flux in the machine and therefore a reduction of the e.m.f. generated, this reduction causing a corresponding reduction in the terminal voltage.

The e.m.f. generated does not all appear at the terminals if the machine is on load because there will be some voltage drop due to its flowing through the resistance and the leakage reactance of the armature winding. If E in Fig. 1 represents the e.m.f. generated in the winding and I represents the current (lagging), the voltage drop due to the resistance of the armature winding will be IR volts and will be in phase with the current as shown. Similarly the voltage drop due to the reactance of the armature winding will be 90° leading ahead of the current as shown (current lags behind voltage in a reactance). Subtracting these two voltage drops from the e.m.f. generated gives the voltage which appears at the terminals as shown and it can be seen that this will be, if the current is at unity power factor or lagging, less than the e.m.f. generated, i.e., a further drop in voltage is produced.

If the current had been leading the subtraction of the voltage drops in the vector diagram would have resulted in a rise in the terminal voltage above the generated e.m.f. and this would have added to the rise in the e.m.f. resulting from the adding together of the armature and field m.m.fs. mentioned above. Due to these effects the terminal voltage of an alternator running with a constant field excitation and delivering a constant current at various power factors would be as shown in Fig. 2.

An alternative way of considering the effect of the m.m.f. is to regard the alternator as an apparatus for producing (a) power or kW and (b) magnetising current or kVAR (reactive kVA). When the machine is running on no-load with the excitation adjusted to give the correct terminal voltage, the amount of magnetisation being produced by the field winding is exactly sufficient to meet the requirements of the alternator itself. Suppose now that the alternator is loaded by, say, an induction motor which takes a lagging power factor, i.e., which has to have its magnetisation supplied from the alternator. Some of the magnetisation produced by the field winding now has to be supplied to the induction motor so that there will not be sufficient for the requirements of the alternator, and its flux will consequently drop with a resulting drop in the e.m.f. generated.

E.O.T.

Electricity Supply

Bedford.—The Electricity Committee is to replace a faulty cable at a cost of £620.

Sheffield.—The Electricity Committee is to extend mains at a cost of £9 143.

Birkenhead.—Provision of supply to 120 temporary bungalows is to be made at a cost of £4 614.

St. Pancras (London).—The Electricity Committee is to provide additional distributing mains at a cost of £681.

Sheffield.—The Electricity Committee has obtained sanction to borrow £1 300 000 for extensions at Neepsend power station.

Chesham.—A fringe order to supply premises in Hemel Hempstead, has been obtained by the Chesham Electric Light and Power Co. Ltd.

Salford.—Sanction to borrow £1 000 for electricity meters and £4 000 for consumers' apparatus is being sought by the Corporation.

Brighton.—A revised scale of rentals for domestic electrical apparatus on hire to come into force on July 1 next is recommended by the Public Utilities Committee.

Hastings.—The Electricity Committee has arranged with the Bexhill Corporation to provide electricity supply to the pumping station at Ninfield at a cost of £2 613.

Lancashire.—The Public Assistance Committee proposes to have electrical wiring carried out at the County Institution at Ormskirk, at an estimated cost of £2 500.

Scarborough.—The Electricity Committee reports that in consequence of increased demands, the capacity of transformers in various sub-stations will require to be increased.

Stockton-on-Tees.—The T.C. has applied to the Electricity Commissioners for sanction to borrow £10 000 to cover miscellaneous expenditure in connection with low tension mains.

Salford.—The Corporation is seeking sanction for permission to increase all unit rates of charge for the supply of electricity which are not subject to a coal price variation clause by $\frac{1}{10}$d. per unit at the commencement of the September quarter next.

Billingham-on-Tees.—The North-Eastern Electric Supply Co., Ltd., has informed the U.C. that the cost of supplying electricity for all purposes would be about 2s. 6d. weekly for a three bedroomed house and 3s. 3d. for a four bedroomed house.

Stoke Newington (London).—The Electricity Committee reports that it has been informed by the Ministry of Health that on account of supply difficulties not more than 1 000 of the first 3 000 houses now being delivered can be fitted with electric cookers.

Blackpool.—During the war years the income of the electricity undertaking has steadily increased from £374 509 in 1940, to £481 667 in 1944. In 1940 the net profit was £18 672, in 1942 £46 011, and in 1944 £19 214.

Darlington — The Borough Electrical Engineer has prepared a report on steps to be taken to reduce condensation from the cooling towers at the electricity works. Application is being made to the Electricity Commissioners for sanction to put the work in hand.

Sunderland.—During the year ended March 31 last, the electricity undertaking earned a net surplus of £42 276. 93 698 575 units were sold, compared with 67 375 551 units in the year before the war. The cost per unit sold averaged .848d. and the average income was .937d.

Aberdeen.—At a recent meeting of the Electricity Committee, it was reported that Aberdeen will probably be a selected station under the Hydro-electric Board's scheme. This would mean that the generating station would still be owned by the Corporation but would be worked under the direction of the Hydro-electric Board.

Southport.—During the five war years, 1939/1944, the electricity undertaking has made a net profit of £83 118, of which £10 660 was allocated to rate relief. The undertaking set aside £41 097 as part of the purchase price of the Birkdale electricity undertaking, leaving the balance for capital expenditure and renewals.

Leeds.—The Electricity Committee recommends that application be made for authority for the further 5 per cent. increase in charges for electricity supplied to power consumers (making 10 per cent. in all) granted by the Ministry last August to be extended to tariffs which are subject to a coal clause.

South Shields.—The Borough Electrical Engineer has prepared revised plans and estimates for converting gas lamps to electricity and providing automatic control for lamps. The cost will be £27 200. Revenue will be about £12 188 and expenditure annually will be £10 978, leaving a revenue surplus of £1 210.

Glendale (Northumberland).—The R.C. has been informed that the post-war plans of the North-Eastern Electric Supply Co., Ltd., include the supply of electricity to the villages of Ingram, Old Bewick, New Bewick, Wooperton, Roseden, Ilderton, South and North Middleton, Chatton, Chillingham, Humbledon, Akeld, Doddington, and Nesbit.

Industrial Information

Cheerful Rationing.—Dishes that do not need attention and others easy to prepare are given in this month's card issued by the E.A.W., the object being to give the housewife more time for spring cleaning. Six uses of lemon are added.

Smokeless Air.—The spring number of the journal of the National Smoke Abatement Society states that Post-War Building Studies No. 10: Solid Fuel Installations, marks a further step in the recognition of smoke abatement in the way that the society has been demanding for many years.

A.E.I. News.—Last month's issue of the magazine for the employees of the A.E.I. group of companies contains a great variety of items of personal, social and sporting interest as well as news of men and women in the Forces.

New Low Voltage Soldering Irons.—The increase in the use of low voltage systems in all branches of industry has led to the addition of two new models to the range of "Solon" electrical soldering irons, these being suitable for 12 V and 24 V supply, respectively. The new models are rated at 65 W and are capable of the same work as the "Solons" of the same wattage for normal supply voltages. They are also of similar design and are constructed from similar standard parts with the exception of the elements and flexible leads. The elements are wound on mica formers and the element tails comprise silver wires with bead insulation. Two types of bit are fitted as standard.

Henley's "Solon" 65 W l.v. soldering iron

New Technique in Transformer Design.—The first catalogue issued by Radio Instruments, Ltd., since the war, gives brief details of the latest types of transformers and chokes, which are the result of developments that have taken place since 1939. They will be available for the use of the trade and constructors as soon as the necessary materials are issued for this purpose.

Essential Work (Electrical Contracting Industry) Order, 1945.—In agreement with representatives of both sides of the electrical contracting industry the Minister of Labour and National Service has made an Order, incorporating into the Essential Work (Electrical Contracting Industry) Order, 1942, provisions corresponding with those contained in the Essential Work (General Provisions) Order, 1944. It came into force on March 1.

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.

Plymouth T.C., March 10.—Supply of synchronous motor driven time switches. Specification from the City Electrical Engineer, Armada Street, Plymouth.

Barry T.C., March 10.—Supply of electric lamps over a period of 12 months. Particulars from Mr. J. Ll. Davies, Town Hall, Barry.

Lanarkshire Mental Hospitals Joint Committee, March 13.—Electrical work in connection with the proposed extensions to the sanatorium at Hartwood Mental Hospital. Applications to Wm. C. Brownlie, Lanarkshire House, 191, Ingram Street, Glasgow, C.1.

Stockport Education Committee, March 14.—Supply of electric lamps for the period April 1 to September 30, 1945. Forms of tender from Mr. G. Holgate, Director of Education.

Leeds T.C., March 14. — Supply and erection of one 750 kW automatic mercury arc rectifier equipment, complete with h.t. and l.t., d.c. switchgear. Specification from Mr. W. Vane Morland, 1, Swinegate, Leeds, 1; deposit, £1 1s.

Belfast T.C., March 15.—Supply of (1) field coils, and (2) tramcar springs. Particulars from the Acting General Manager, Transport Department, Sandy Row, Belfast.

Lincolnshire, March 16.—Supply of electrically-driven land drainage pumps for Witham Fifth District Internal Drainage Board, and Skegness Internal Drainage Board, Particulars from Mr. F. H. Tomas, 50, Wide Bargate, Boston; deposit £3 3s. each specification.

Abertillery U.D.C., March 17.—Supply of electrical materials for the period ending March 31, 1946. Particulars from Mr. Dawson Thomas, 40, Somerset Street, Abertillery.

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.

Oil-Immersed Tranformers

Some Notes on the Installation of the Naturally-Cooled Type

TRANSFORMERS are usually delivered oil-filled and ready for service and it is only necessary to make an inspection of the unit and its fittings to see that no damage has occurred during transport. Occasionally it is necessary to lower the oil level during transport and in the case of larger units to remove certain items which require to be reassembled in position on site. In such cases topping-up-oil to bring the oil to the working level is sent separately.

Connecting into Circuit

If the transformer is to be paralleled into an existing net-work the phasing before closing the second circuit-breaker should be verified. This is usually done by energising from the higher voltage side and testing with a voltmeter, using a v.t. when necessary, across corresponding terminals of the l.t. circuit-breaker to show that no material voltage difference exists. In making preparation for this test it should be borne in mind that incorrect connections can produce twice the normal line/neutral voltage across these points and the metering arrangement should be capable of withstanding this voltage without damage.

Once installed, very little maintenance is required, but it is desirable that the following details receive periodic attention.

(1) The calcium chloride or silica gel breathers should be examined at frequent intervals until experience has shown for what period the drying agent remains effective, this period will vary considerably with local atmospheric conditions. Silica gel is an expensive material and a spare charge should be available for use while the wet charge is reactivated by heating at between 150-200° C for a few hours. Silica gel contains a dye which changes from a blue colour to pink when it is moistened and the gel should be changed as soon as the blue tint has disappeared.

(2) At intervals of 12 months the oil levels should be verified and topping-up-oil added if necessary. The condition of the oil may be checked by withdrawing a sample from the bottom of the tank through the drain valve or the sampling cock if this is fitted. Extreme care must be exercised in taking it as the smallest trace of moisture or impurity from external sources may completely destroy the value of the results obtained. If in good order the oil should be bright and clear in appearance and should comply with the requirements of B.S.S.148-1933 for dryness and dielectric strength.

A sample should also be examined for acidity in the manner described in B.S.S.148-1933. Oil is liable to develop this characteristic with use and age, and the concentration should not be allowed to exceed the equivalent of 2.5 mgm.KOH/gram of oil. When this value is reached the oil should be removed and after the unit and tank have been washed down with a quantity of new oil (which must be discarded) the transformer should be refilled with new oil.

Sludging which is associated with acidity would be indicated by the oil being more or less thick and darkened in colour and in such case it is desirable to open the unit and examine the windings. If the deposit from the oil has settled on the transformer and is tending to close up the cooling ducts through the windings, a thorough cleansing of the core windings and tank must be undertaken.

(3) Transformers not provided with conservators should have an inspection cover removed so that the interior of the tank may be examined to ensure that the general condition is satisfactory. This precaution may be omitted with transformers fitted with oil conservators.

We are indebted to the British Electric Transformer Co. Ltd:, for the information upon which this article is based.

I.E.E. SCHOLARSHIPS FOR 1945

The Council of the Institution of Electrical Engineers will consider this year the award of three research scholarships and grants, and seven scholarships for undergraduates and students to attend universities and technical colleges. These awards will be subject to the regulations laid down by the Ministry of Labour and National Service regarding the candidates' ages at the commencement of their courses. Particulars and nomination forms may be obtained from the Secretary, the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. The closing date for applications is April 15.

BOOKS RECEIVED

Journal of the I.E.E. Part I (General). Vol. 92, No. 49. (January). (London: Spon.). 5s. net.

Journal of the I.E.E. Vol. 92. February. Part I (General), No. 50, 5s. net; Part II (Power Engineering), No. 25, 7s. 6d. net. (London: Spon).

Company News

AMERICAN TELEPHONE AND TELEGRAPH.—Reg. qtrly. $2.25.

RANSOME AND MARLES BEARING CO. LTD.—Intm. div. on ord. 9%, less tax (same).

CLYDE VALLEY ELECTRICAL POWER CO.—Fin. div. on ord., 5% (same), mkg. 8% (same).

MID-CHESIRE ELECTRICITY SUPPLY CO., LTD.—Fst. and fin. div. on ord. 8% (same).

SOUTH METROPOLITAN ELECTRIC LIGHT AND POWER CO., LTD.—Fst. and fin. div. 7% (same).

PARA TELEPHONE.—Pft. 1943 £5 478 (£4 751). Deprcn. £5 138 (£4 865), fwd. £2 218 (£1 879).

ELECTRICAL DISTRIBUTION OF YORKSHIRE LTD.—Fin div. 4½% (same) mkg. 9% less tax, for 1944.

DIRECT SPANISH TELEGRAPH CO., LTD.—Fst. and fin. on ord. 4½% (same), net pft. 1944, £5 967 (£5 881).

SOUTH LONDON ELECTRIC SUPPLY CORPN.—Fst. and fin. div. 7% (same). Net pft., 1944, £22 965 (£31 534).

RICHMOND (SURREY) ELECTRIC LIGHT AND POWER CO. LTD.—Fst. and fin. div. 6% (same). Net pft. 1944 £9 313 (£8 574).

RUSHDEN AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Fin. div. 5% (same), mkg. 9% (same). Taxed pft. £5 908 (£7 639). Fwd. £13 799 (£12 941).

NORTHAMPTON ELECTRIC LIGHT AND POWER CO., LTD.—Fin. div., 6% (same), mkg. 10% (same). Taxed pft. 1944, £62 365 (£66 421). Fwd. £98 290 (£95 738).

HOOVER LTD.—Fin. div. on ord. 11¾% (same) and bonus 10% (5%), mkg. 25% for 1944 (20%). Net pft. is stated as £574 967 (£452 659), £122 308 increase.

COVENTRY GAUGE AND TOOL CO. TTD.—Fin. div. 7½% (same), and bonus 7½% (same), again mkg. 15%, tax free. Trdg. pft. to Aug. 31, 1944, £136 361 (£149 514). Net pft. £27 753 (£24 021).

NOTTING HILL ELECTRIC LIGHTING CO.—Div. on 6% cum. pref. for 3½ yrs. from July 1, 1939, to Dec. 31, 1942. Net rev. is announced as £46 579 (£36 718). Fwd. blce. £55 317.

NEWCASTLE AND DISTRICT ELECTRIC LIGHTING CO., LTD.—Fst. and fin. 7% (same). Net. pft. 1944, £18 152 (£21 132) includg. £4 126 pft. from sale of investments.

MERSEY RAILWAY CO.—Net rev. 1944 £109 976 (same). After £800 (£704) to conting. fund and prov. int. deb. stks., blce. avail. for div., includg. £3 598 (£3 483) brot. in, £56 631 (£56 612). Full div. 3% on pref. (same) and 2⅜% on consd. ord. (same), fwd. £3 617.

WAYGOOD-OTIS, LTD.—Fin. div. 17½% (15%), mkg. 25%, less tax (27½%), on ord. Pft. for 1944 is stated as £81 637 (£85 309), after deprecn., exes., fees, taxatn., and £10 000 (same) to pensions. Carry fwd. £14 457 (£14 320).

Company Meeting

BRITISH INDUSTRIAL PLASTICS LTD.—The annual meeting will be held in London on March 15. In his statement, circulated with the report and accounts, Mr. Kenneth M. Chance, the chairman, said he took a more favourable view of the outlook for the company than ever before. Dealing with the need for cheap power, he said it was hard to believe that the best way of generating electric power in England and Wales was by digging coal from the mine and transporting it, often for considerable distances, to be burnt under boilers for conversion into steam for driving turbines connected to generators, then building huge cooling plants and pumping water through them in order to get rid of the heat which the turbines could not use. By this method all the valuable by-products of coal were destroyed and about 60% of its effective heat was wasted.

Metal Prices

		Monday, March 5. Price.	Inc.	Dec.
Copper—				
Best Selected (nom.)	per ton	£60 10 0	—	—
Electro Wirebars ...	,,	£62 0 0	—	—
H.C. Wires, basis ...	per lb.	9 7/16d.	¼d.	—
Sheet	,,	10⅞d.	—	—
Phosphor Bronze—				
Wire(Telephone)basis	per lb.	1s. 0⅜d.	⅜d.	—
Brass (60/40)—				
Rod, basis	per lb.	—	—	—
Sheet ,, ...	,,	—	—	—
Wire ,, ...	,,	10⅞d.	—	—
Iron and Steel—				
Pig Iron (E. Coast Hematite No. 1)...	per ton	£6 18 6	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ...	,,	£27 10 0	—	—
Mild Steel Tape (Cable Armouring) basis 0.04 in. ...	,,	£20 0 0	—	—
Galvanised Steel Wire No. 8 S.W.G. ...	,,	£26 0 0	—	—
Lead Pig—				
English	per ton	£26 10 0	—	—
Foreign or Colonial	,,	£25 0 0	—	—
Tin—				
Ingot (minimum of 99.9% purity) ...	per ton	£303 10 0	—	—
Wire, basis... ...	per lb.	3s. 10d.	—	—
Aluminium Ingots ...	per ton	£85 0 0	—	£25
Spelter...	,,	£25 15 0	—	—
Mercury (spot) Warehouse ...	...per bottle	£69 15 0	—	—

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

COMPANY MEETING

THE ENGLISH ELECTRIC COMPANY, LIMITED

Sir George Nelson on Nationalisation

The Twenty-sixth Annual General Meeting of The English Electric Company Limited was held in London on the 1st March, 1945.

Sir George H. Nelson, M.I.Mech.E., M.I.E.E. (Chairman and Managing Director), in the course of his speech said:—

The profit carried to the Balance Sheet was £434,984 and after providing for the Preference and Ordinary Dividends, plus £100,000 for General Reserve, we carry forward £87,870, which is £25,239 greater than the amount brought in.

Taxation

Having made frequent references to the unfair incidence of taxation in general, and on this Company in particular, I feel I must open my remarks under this heading with congratulations to the Chancellor on his wise statesmanship and understanding shown in the special Finance Bill that has been put before the House of Commons with the object of assisting Industry to meet future problems. Industry generally should be very grateful to the Chancellor for his vision and courage and should respond by a determination to see that the allowances now made will be used for the purpose for which they have been granted, viz.: to keep plant and buildings at the highest level of efficiency. The Company has paid very substantial sums in respect of E.P.T. and are proud of it as being an indication of our efficient contribution to the war effort, for this taxation had arisen from increased output and not from higher prices. We have been congratulated by the Ministries concerned as being the cheapest producer in the country of certain of our manufactures.

Some Outstanding Achievements

The Company's war products include Covenanter, Centaur and Cromwell tanks, Hampden and Halifax aeroplanes and submarine and ship equipments. Further, the performance of the Typhoon and Tempest aircraft had been made possible by the Sabre engines manufactured by D. Napier & Son, Limited, who also manufactured the "Lion" engine, which had won the Schneider Trophy and was used in M.T.B.'s and Air/Sea Rescue Boats. The English Electric Company alone has manufactured since E.P.T. was introduced, more than £60,000,000 of apparatus over and above its normal turnover of its established products, and for this immense extra effort it will receive no reward other than a post-war credit subject to income tax of approximately 1½% on the extra turnover.

Nationalisation

I am disturbed by some of the political propaganda on nationalisation which has been prevalent for some time. I say this not as representing the interests of proprietors of Industry, but because of the ultimate disadvantages I am sure nationalisation would bring to the masses of our people. I have heard no argument at all to show that nationalisation will ultimately achieve what is our greatest need, if we are to compete with the rest of the world, namely, improved efficiency. Moreover, the notion that nationalisation will relieve industry of an exorbitant tribute paid to Stockholders must appear strangely futile if it is remembered that in a Company such as ours at the present time Ordinary Dividends amount to no more than one per cent. of the turnover and the remaining ninety-nine per cent. goes in payment for materials, to staff, to workpeople, to taxation and to provide the normal trading reserves on which the future full employment of that staff and those workpeople is dependent. There is nothing political about these remarks. They are made in the interests of the people of the country and are purely economic.

Future Outlook

With regard to the future, orders for our normal products are reaching us in satisfactory volume, and we are taking steps to play our proper part in the export trade, in which we have always been prominent.

Violent competition had arisen in the Export Market by overseas manufacturers offering plant at prices considerably below their home prices and their cost of production.

Stability of Employment

Everything was being done to continue the Company's policy of achieving stability of employment for its employees. The Company believed in the improved social aims of the Government, and our workpeople had enjoyed many of them for a number of years.

The Report and Accounts were adopted and a dividend of ten per cent. was declared on the Ordinary Stock.

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.*

ELECTROFLOW BATTERY AND ENGINEERING CO. LTD., London, E.C.—Feb. 14, £750 deb., to M. Pomeracoy and Marcus Harris and Lewis Ltd.; general charge.

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.*

HAMPSHIRE AND SUSSEX INSTALLATIONS, Main Road, Middleton-on-Sea, electrical contractors. £17 1s. 4d. Jan. 8.

WRIGHT, LEONARD W. AND CO., Denmark Works, Burgess Street, Sheffield, electrical engineers. £23 15s. 11d. Jan. 23.

Notice of Intended Dividends

MILLER, George Thomas, 4, Harewood Close, Northolt, engineer, lately carrying on business under the style of Odeon Radio, at 335, Northolt Road, South Harrow, and 10, New Parade, Hayes, Middlesex, radio dealer. Claims to be sent by March 12, 1945, to the trustee, Lord Latham, 185-188, High Holborn, London, W.C.1.

BUTCHER, Norman Ernest, residing at "Reydon," Bluebridge Road, Brookman's Park, Hertford, and carrying on business at 2, Woodfield Road, Welwyn Garden City, under the name of Herts. Electrochemical Co., as a battery manufacturer. Claims to be sent by March 15, 1945, to the trustee, Stephen Pagden Child, College Hill Chambers, Cloak Lane, London, E.C.4.

Notice of Dividends

WAINWRIGHT, Basil Josolyne, 2, Hillcrest Gardens, Dollis Hill Lane, Cricklewood, N.W.2, lately carrying on business as Wainwright Neon Displays, at 197, Wells Road, Shepherds Bush, previously at 14, St. Thomas Road, Harlesden, N.W.10, electrician. First and final dividend of 7d. per £, payable March 9, 1945, Percy Phillips and Co., 76, New Cavendish Street, London, W.1.

JOHNSON, Alfred Thomas, residing and carrying on business at 73, Station Road, Winbotsham, Norfolk, wireless dealer. Supplemental dividend of 18s. 6¾d. per £, payable, March 12, 1945, at Official Receiver's Office, 41, Sidney Street, Cambridge.

Coming Events

Friday, March 9. (To-day.)

I.E.E., EAST MID. SUB-CENTRE.—Leicester. Joint meeting with the Leicester Society of Engineers.—CARDIFF STUDENTS' SECTION, Cardiff. "Carrier Telephony," W. P. Warren.

BIRMINGHAM ELECTRIC CLUB.—Grand Hotel, Annual dinner.

Saturday, March 10.

ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.—Connaught Rooms, London, W.C.2. Annual luncheon and reunion. *12.30* for *1 p.m.*

I.E.E., N. MID. STUDENTS' SECTION.—Leeds. Problems Afternoon. *2.30 p.m.*

Monday, March 12.

I.E.E., WESTERN CENTRE.—Cardiff. "Cable Terminations," D. B. Irving. *5 p.m.*—N.E. CENTRE, Newcastle-on-Tyne. "Operation, Maintenance and Testing of Overhead Lines and Associated Outdoor Equipment on A.C. Systems," R. C. Hatton and J. McCombe. *6.15 p.m*

Tuesday, March 13.

I.E.E., RADIO SECTION.—London, W.C.2. Discussion, "Colour Television," L. C. Jesty. *5.30 p.m.*—N.W. CENTRE, Manchester, "Operational Control of Electricity Supply Systems," W. Kidd and E. M. S. McWhirter. *6 p.m.*—SCOTTISH CENTRE, Glasgow. "Modern Submarine Cable Telephony, and the use of Submerged Repeaters," R. J. Halsey. *6.15 p.m.*

Wednesday, March 14.

I.E.E., TRANSMISSION SECTION.—London, W.C.2. "Operational Control of Electricity Supply Systems," W. Kidd and E. M. S. McWhirter. *5.30 p.m.*

BRITISH INSTITUTION OF RADIO ENGINEERS.—Newcastle-on-Tyne. "Proposals for Television and Broadcasting Transmission Systems," W. A. Beatty. *6 p.m.*

JUNIOR INSTITUTION OF ENGINEERS, SHEFFIELD SECTION. — Metallurgical Club. Presidential address followed by film, of the Tennessee Valley Authority. *7 p.m.*

Thursday, March 15.

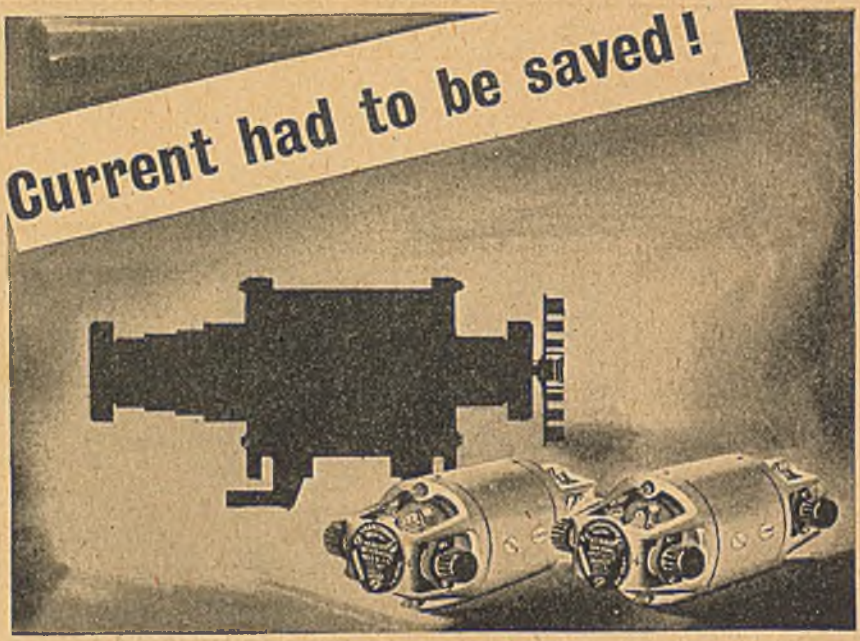
I.E.E., N.E. CENTRE.—Newcastle-on-Tyne. Lecture, "Some Hydro-Electric Developments and Achievements," W. A. Hatch (joint meeting with Students' Section). *6.15 p.m.*

ROYAL INSTITUTION OF GREAT BRITAIN.—London, W.1. Lecture III (course of four lectures), "Some Physical Problems of the Solid State," Sir L. Bragg, F.R.S. *5.15 p.m.*

Friday, March 16.

I.E.E., LONDON STUDENTS' SECTION.—Visit to J. Stone and Co., Ltd., New Cross, *2.30 p.m.*—S. MID. STUDENTS' SECTION, Loughborough. "Electrical Technique in Resistance Welding," T. E. Calverley. *7 p.m.*

BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION. — Connaught Rooms, London, W.C.2. Annual luncheon. *12.15 for 12.45 p.m.*



Hour after hour in the Libyan Desert our tanks had to " lie up " in hiding. Their radio sets dare not transmit, but they had to be able to receive.

With a dual output Rotary Transformer, " receiving only " was extravagant of current — over 5 amps. That was too much. The problem was passed to Hoover Ltd., who had designed and produced the dual instrument.

Their solution was the " Pup " — a small Rotary Transformer which cut current consumption when " receiving " to only 1.7 amps. — cut weight from 12 lb. to 8¾ lb. and cut cost too. Two of these " Pups," one for receiving, one for transmitting, are now in the " Power Pack " of the radio set on practically every British Army radio-equipped vehicle; including tanks, self-propelled guns, armoured cars, etc. Just another example of " practical " engineering !

Nearly 200,000 Hoover designed and built Rotary Transformers, of this type alone, help maintain battle-field communications.

If your post-war plans take into account Rotary Transformers for Radio Equipment, Fractional H.P. Motors, Generators or Blowers, get in touch with us now

HOOVER

LIMITED

makers of

THE WORLD'S BEST CLEANER

HOOVER LIMITED, PERIVALE, GREENFORD, MIDDLESEX

Printed in Great Britain by Straker Brothers Ltd., 194-200, Bishopsgate, E.C.2, and published by Benn Brothers, Ltd., at Bouverie House, 154, Fleet Street, London, E.C.4.—Friday, March 9, 1945.