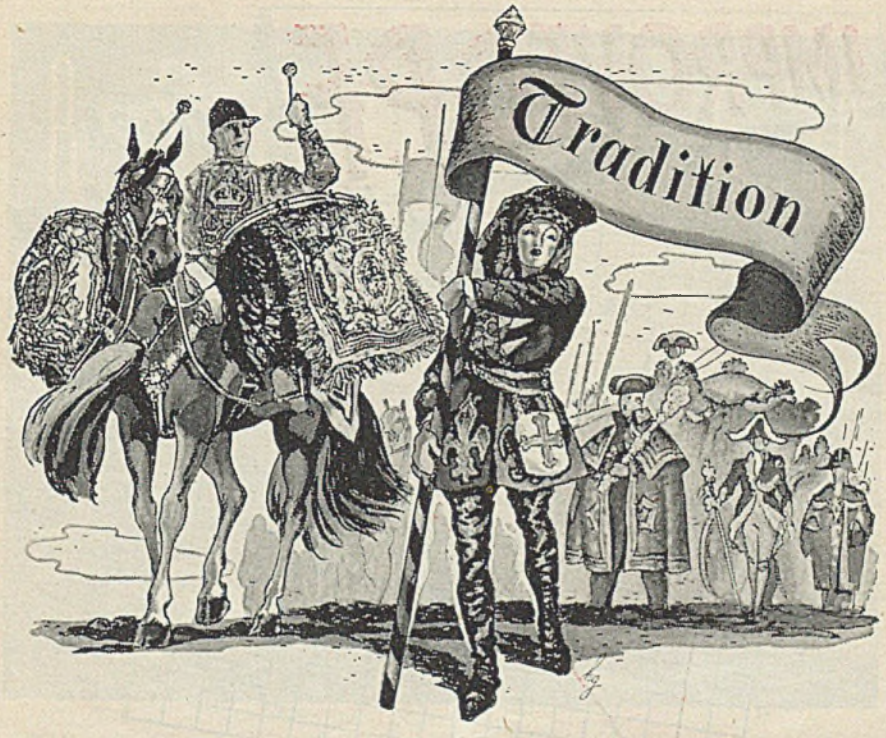
THE ELECTRICIAN

THE TECHNICAL NEWSPAPER OF THE ELECTRICAL INDUSTRY

18 APRIL, 1947
SIXPENCE



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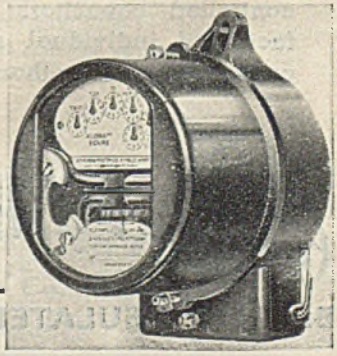

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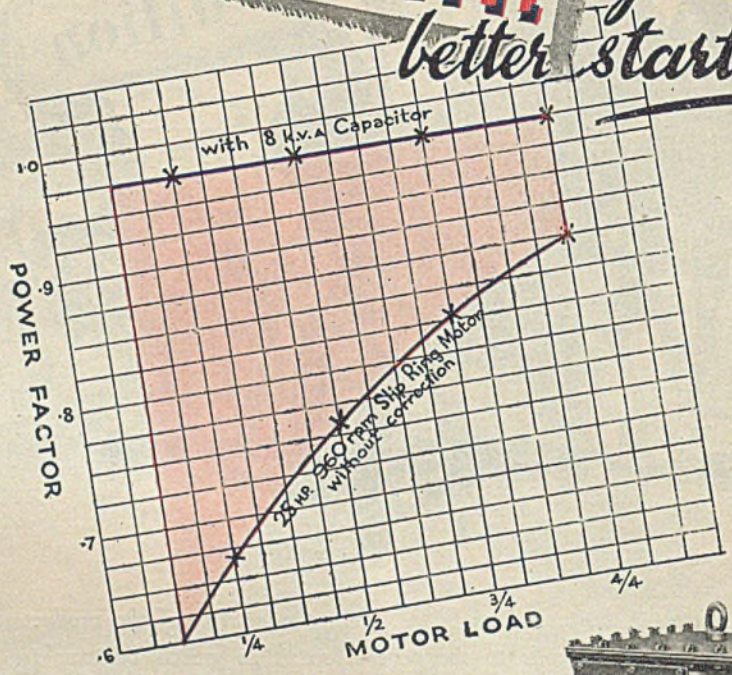

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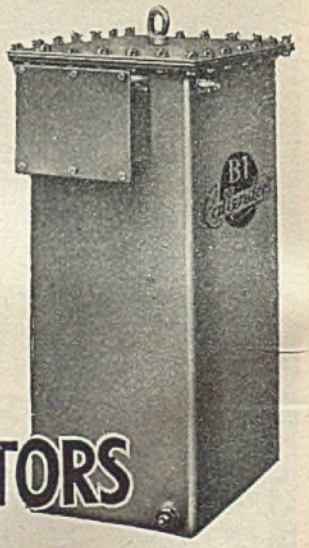

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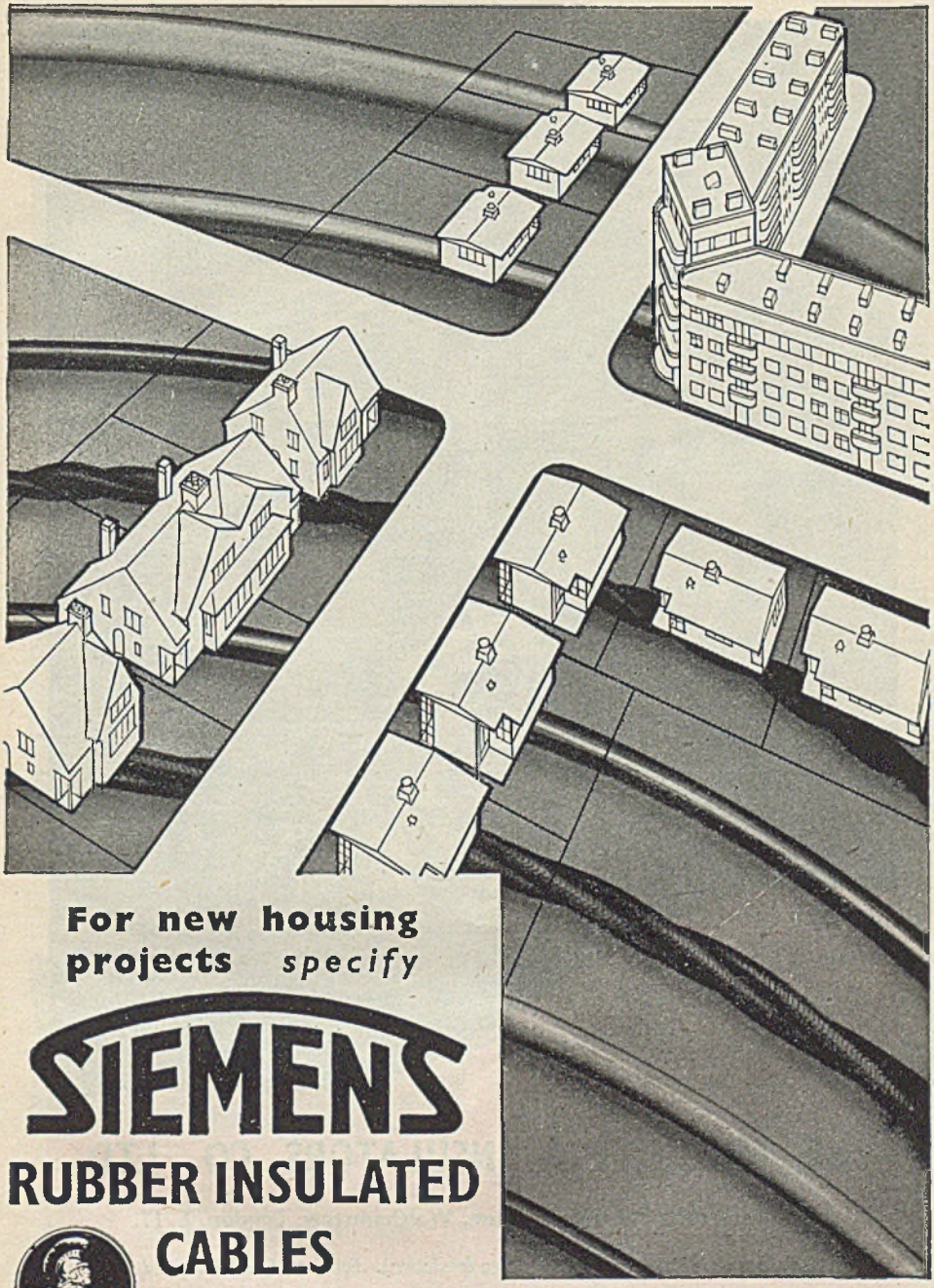

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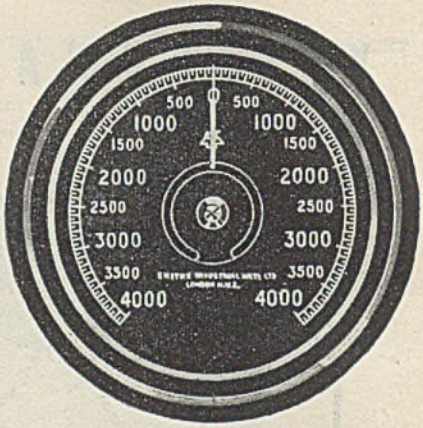

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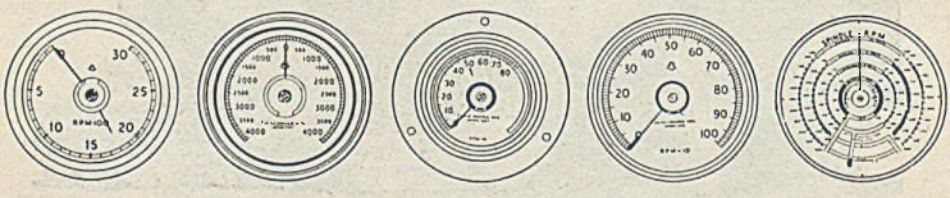

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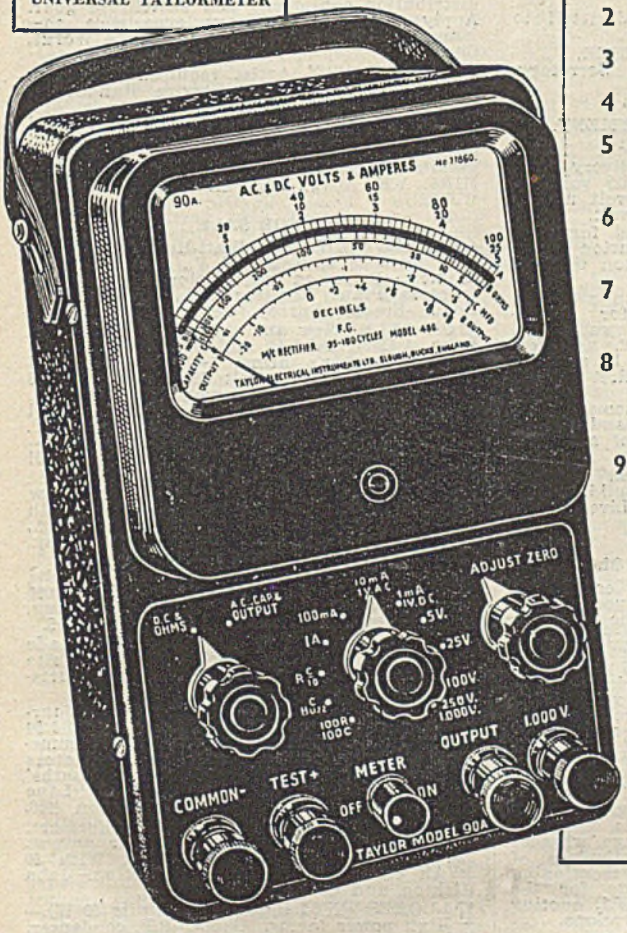

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Full particulars available from Agent-General for Victoria, Victoria House, Melbourne Place, The Strand, London, W.C.2.

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The Commission does not bind itself to accept the lowest or any tender.

W. C. PRICE,
Secretary.

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ELECTRIC SUPPLY DEPARTMENT.

THE Corporation of Liverpool invite tenders for the supply and delivery of 24 1 000 kVA transformers, 11 kV/415 volt; 12 500 kVA transformers, 11 kV/415 volt and 12 15 kVA transformers, 11 kV/240 volt.

Copies of the specifications and forms of tender may be obtained on application to the City Electrical Engineer, 24, Hatton Garden, Liverpool 3.

The tender must be enclosed in a sealed envelope endorsed "Tenders for Transformers," addressed to the Town Clerk, Municipal Buildings, Liverpool 2, and forwarded through the post so as to be received by him not later than the first postal delivery on May 14, 1947.

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Approved Appliances

IN view of the fact that the post-war years have produced a crop of domestic appliances doubtful in both efficiency and safety, out of all proportion to the number evident prior to 1939, the decision of the E.D.A. Council to establish in co-operation with the B.S.I. a testing house for domestic consumer equipment is timely. The new organisation—to be administered by an Electrical Appliances Approval Committee, made up of eight members nominated by the E.D.A. and eight by the B.S.I. Electrical Standards Committee—will have as its head an officer experienced in both electricity supply and manufacturing, and as a first step the B.S.I. is to proceed with all speed in the preparation of additional and more suitable specifications for domestic appliances with a view to applying a mark scheme.

Since the Housing Production Executive—a Cabinet Committee consisting of the Ministers of the five departments concerned with housing—have already drawn attention to the number of unsatisfactory electrical accessories being marketed by newcomers to the industry, it is reasonable to expect that the new organisation will receive the blessing of the Ministry of Fuel, on the one hand, and the Ministry of Supply on the other, with, it is hoped, facilities for obtaining the necessary materials for making the accessories in greater numbers than now.

The question of a testing house for domestic equipment has, it will be appreciated, been debated by the indus-

try for many years and the settlement of it is apparently, the outcome of informal discussions on the matter between the B.S.I. and the Housing Production Executive named above. Some doubt has been expressed, however, of the wisdom of setting up such an establishment at this time, in view of the altered conditions which may come about if and when the Electricity Bill becomes law, and the advisability has been questioned of proceeding with a scheme which envisages the outlay this year of £4 000 and an ultimate expenditure of the order of £20 000 a year.

Testing House Committee's Aim

ANSWERS by the Testing House Committee, of which Mr. E. E. HOADLEY is chairman, to criticism, are to the effect that the establishment of such a body has received official encouragement, that the E.D.A. is the right authority to lead the way, and that the administrative side of the organisation should be in being before the vesting day of the Electricity Bill, and before the Central Electricity Authority takes over. Official recognition should then be assured, and the claim of the E.D.A. to the right to continue its work as an essential and valuable adjunct of the supply industry considerably strengthened. According to Mr. HOADLEY the length of time in which the matter has been under consideration is not the responsibility of his Committee, but is due to the fact that so many different views had to be reconciled, in that each step taken seemed to attract some other interest, not excluding departments of the Government. The recommendation of the Committee is put forward as the best compromise that can be effected and, in Mr. HOADLEY'S view, may lead to something better and bigger in the future. The ultimate aim is the promotion of legislation which will protect the consumer from appliances and accessories of unsatisfactory design and performance by prohibiting the sale of such goods, and when that is achieved the Testing House Committee will claim to have accomplished what it set out to do.

New Housecraft Association

THE suggestion at the time of the I.M.E.A. Convention at Blackpool last June, that there was to be formed an association to watch the interests of electrical demonstrators, has already resulted in the formation of an organisation called the Association of Electrical Housecraft Advisors with a membership of 150. The association has as its objects the maintenance of a high standard of education for women entering the electrical industry on the demonstration side, the establishment of an adequate salary-scale, and the exchange among members of views and experience which may promote further the social services which members, both actual and potential, are performing daily among those many housewives new to electrical methods, as well as among those who, already experienced in the use of electrical appliances, are, nevertheless, not sufficiently familiar with their operation to reap the maximum possible benefit at minimum consumption of both current and human effort. The association is the first of its kind and the chairman, Miss M. G. GOSSE, includes among its objectives the work of stimulating among the many women who will enter the housecraft side of the industry in the next few years, the right professional spirit and sense of responsibility which will ensure the occupation of electrical housecraft advisor being looked upon as a career and "not just something to do for a salary." A sentiment in which the whole industry will give her support.

Purchase Tax Comes Back

AT the time of going to Press it was too early to give a considered review of the industry's reactions to the Budget proposals, but that part of them which has perhaps more than any other a direct electrical relation, is concerned with the reimposition of purchase tax at the rate of 66⅔ per cent. on domestic heating appliances; it was, it will be recalled, to some extent due to the efforts of the E.D.A. that the tax was withdrawn in the first place. Reimposition was not, however, altogether unexpected for in THE ELECTRICIAN of March 7 last indications were given of methods to be adopted for checking the popularity of domestic heating appliances, and their subjection to purchase tax at this stage is a further attempt to bring about a restriction of sales. It will be remembered that in that issue attention was drawn to the fact that the Ministry of

Supply proposed restricting this year the output of electrical space heaters for the home market, to one twelfth of the manufacturing capacity of the industry, and the reimposition of purchase tax has in it an official hope that of that twelfth sales may be so reduced that our already overloaded generating capacity may not be embarrassed more than it is. The public demand for things electrical is, however, based on an enthusiasm used to set-backs and difficulties, and so long as appliances are available it is reasonable to expect that they will continue to be connected to the mains, whether taxed or not.

Old Furniture for Benevolence

THOSE who have spare furniture for which they have had difficulty in "finding a home" because it had too many sentimental associations to be sold, could, suggests Mr. H. S. FOTHERGILL, secretary of the E.I.B.A., very well settle their problem by giving it to the association for use in the home for old people at Broome Park, Betchworth, Surrey. Large sizes of furniture, such as are often inconveniently big in a modern house, will be welcome as, of course, will soft furnishings, curtains and floor coverings. The association is showing courage in tackling such a furnishing undertaking in the face of present difficulties, and all offers of help should in the first instance be communicated to the Secretary at 32, Old Burlington Street, W.1, so that arrangements can be made for transport to the home itself.

Electric Space Heating

A DRAFT Code of Practice for the installation of domestic space heating equipment has been circulated for comment under the authority of the Codes of Practice Committee. Prepared by a committee convened by the I.E.E., it claims to be representative of standard practice, and, therefore, takes the form of recommendations, some of which are given on another page. Among the members of the Code and Drafting Committee is Miss CAROLINE HASLETT, director of the E.A.W., whose opinion not only on all matters concerned with the application of electricity to the home, but in a much wider sphere of industry and education, is frequently sought in Ministerial circles. No doubt she made good use of the opportunity of presenting adequately the women's point of view on a subject which has an important bearing on domestic activities. Electric space heating has received a temporary set-back as a result of the necessity for economy in the use of electricity due to the inadequacy of generating plant to meet the rapidly increasing domestic and industrial demand, but whilst official planners of new towns and reconstruction areas are turning their attention to district heating schemes to save coal and reduce atmospheric pollution, electrical appliances for principal or supplementary space heating are becoming universally popular with the housewife because of their cleanliness, efficiency and ease of operation. This was reflected in the unprecedented rise in the domestic load in the winter months, and in view of the diversity of fires and other apparatus, good, bad and indifferent, made available to consumers since the end of the war, the need for a standard code of practice for the guidance of those concerned with the erection and equipment of dwellings has become an urgent necessity.

Tailpiece

LAST week-end, at a dinner in Sunderland to celebrate the nationalisation of the mines, Mr. SHINWELL was presented by his Seaham constituents with an electric clock. Whether the gift was an innocent reward for services rendered, or whether the particular choice of article was the work of some subtle humorist in the area we shall probably never know, but the Minister apparently had his suspicions, for, after admiring the workmanship, he is reported to have remarked "I have no doubt there will be some headlines about this." Whatever the motives, Saturday's presentation could scarcely have been more appropriate, for during the chaotic winter which has just ended electric clocks recorded faithfully—if with doubtful utility—every vagary of the public supply from load-shedding to falling frequency. To paraphrase the Minister, "if we get the coal, and the plant" the gift may be a useful addition to the all-electric home of which, to his credit, he is reported to be the owner. If not, it will at least stand in dumb, and perhaps effective, reproach.

Appliance Testing House

Joint E.D.A. and B.S.I. Administrative Committee

JUST over a year ago the Council of the British Electrical Development Committee, in their 26th annual report, mentioned that the special committee appointed to consider the establishment and operation by the association of an electric domestic appliance testing house, which would furnish factual reports to members on the construction and performance of all types of apparatus, had submitted their report to the Council, and that it had been considered by area committees. Since then there have been further discussions and joint meetings with the B.S.I. Electrical Industry Standards Committee, and at its February meeting the E.D.A. Council unanimously decided to establish a testing house in co-operation with the British Standards Institution. It was also agreed that an officer with experience of both the supply and manufacturing sides of the industry, be appointed to take charge of the testing house under the direction of the general manager. In the first instance the testing house will be accommodated in the new E.D.A. offices for members of the technical staff, which are to be opened at Brettenham House, Lancaster Place, London, S.W.1, as soon as the work of reconversion has been completed. Permits for this have been granted.

COMPOSITION OF COMMITTEE

The testing house will be administered by a joint committee to be known as the Electrical Appliances Approval Committee, consisting of eight representatives of the British Electrical Development Association and eight representatives of the B.S.I. Electrical Industry Standards Committee. One of the E.D.A. representatives will act as chairman of the committee. We understand that this committee is almost complete and that the names may be available after the meeting of the E.D.A. Council this week. The establishment of the testing house will follow as soon as possible.

The Testing House Committee reported to the E.D.A. Council that they had considered the comments of the area committees on the following conclusions reached at a joint meeting of the Testing House Committee and the B.S.I. Electrical Industry Standards Committee:—

(1) The formation of an E.D.A./B.S.I. Testing House and Approvals Committee consisting of E.D.A. members and an equal number of representatives of other sections of the industry—the latter appointed by the B.S.I. Electrical Industry Committee—to test and adjudicate upon appliances which were the subject of complaint, unsatisfactory designs to be taken up with their makers with a view to the necessary improvements being made.

(2) The B.S.I. to proceed as quickly as possible with the preparation of additional and more suitable specifications for domestic appliances, with a view to applying the B.S.I. Mark Scheme. Test and inspection for the marking scheme would be in accordance with the usual B.S.I. procedure, and use would be made of the E.D.A. testing house in appropriate cases.

SCHEME TO COVER ALL APPARATUS

Five area committees approved of action being taken on the lines of the above conclusions and a sixth approved subject to "decisions on apparatus submitted being available within a reasonable time—say, one month—and to the scheme being rapidly extended to cover all apparatus on sale to the public." The Committee agreed with this proviso. The Committee did not accept the recommendations of an area executive committee that manufacturing interests should be barred from representation in the organisation and control of a testing house; they could not agree that such representation would be undesirable.

Two area committees questioned the desirability of expending £20 000 in establishing a testing house, and another thought that, in view of the pending reorganisation of the electrical industry, the matter should be deferred for twelve months. In reply to those comments, the Committee pointed out that £20 000 represented the capital expenditure on premises and testing equipment, but it was not expected that a sum exceeding £4 000 could be spent in making a start with the testing house in 1947. As the Ministry of Fuel had accepted the Simon Committee's recommendation as to the establishment of a testing house, the Committee felt that no stultifying action should be taken, despite the pending reorganisation of the electrical industry.

The Council agreed with the recommendations of the Testing House Committee that the E.D.A. testing house be put into operation as early as possible this year, and that a sum not exceeding £4 000 be allocated for that purpose.

MACHINERY RENEWAL PROBLEMS

by F. GEOFFREY MARSHALL, A.M.I.E.E.

WHEN the time comes to renew an important piece of machinery, the works engineer is faced with two alternatives, namely, to purchase and instal a similar type to that then in use, or to take the opportunity of providing one of a completely new design.

Assuming that the machine to be replaced has given satisfactory operation throughout its life, there are arguments to be considered for both procedures. By the former step advantage is taken of knowledge gained by past performance, and, by the latter, an opportunity occurs of gaining experience of a new type of equipment.

There are therefore certain points in favour of both views, and these will be examined in more detail.

ADVANTAGES OF STANDARDISATION

The question of standardisation of machinery in a large works is always of importance, as, if conscientiously pursued over a number of years, stocks of spare parts can be kept at a low figure, and loss of production due to breakdowns and failures can be reduced to a minimum; in considering the renewal of a machine that has completed its normal life, however, this should not be given too much prominence.

The introduction of a new type of equipment may in the first place necessitate the provision of more spares, but it must be remembered that other machines too, will probably need renewing in the not too distant future, and the good maintenance engineer has of necessity to think a long way ahead. Moreover, a new type of machine, installed this year as an experiment, may in ten years time be regarded as a basis of standardisation for the future.

What are the main reasons that make us consider changing a type of machine, when renewal is found to be necessary? Greater efficiency and production capacity are facts too obvious to need discussion, for, if the new machines as a result of progress in design can show large improvements in this respect, then a change to the improved type is justified.

In the majority of cases, however, the advantages to be obtained by departure from old and well-tried designs are not so obvious. On the one hand, there is the works' engineer's knowledge, gained through personal experience of what a machine will do and has done in the past, and on the other hand the claims put forward by the manufacturers, of a new machine, which, though probably quite true in fact, are nevertheless to the engineer concerned with the projected renewal possibly opinions awaiting con firmation.

Again, the proposed change may be from an appliance of known value to one whose capabilities are unknown to him personally. To take a typical example, let us consider an ordinary standard electrical vertical spindle borehole pump with the motor mounted on the surface, which it is proposed to displace in favour of a completely submersible unit. If there are a number of pumps in use in the factory, then, while there is still an advantage in keeping to the old type from the viewpoint of availability of spares, at the same time there is an even greater advantage in installing a submersible unit, as, by so doing, a valuable comparison can be made, and after a year or so of service, if the performance of the new unit is satisfactory, a decision can be made to adopt it as a standard for future renewals.

There is another reason that makes it desirable that a factory should not be too conservative in considering the question of renewals, even though the results of installing a new type of equipment may at the time be problematical. New forms of equipment lead to fresh ideas, and when a new unit is installed for the first time, the engineer often sees in it advantages which he was unable to visualise when the provision of the machine was first contemplated.

RELIABILITY OF NEW PLANT

It must also be kept in mind that, while the efficiency and performance of a machine can be positively and concisely stated in figures, which, when claimed for any new unit by its manufacturers can, of course, be substantiated by independent tests, the question of reliability and freedom from trouble is largely a matter of opinion, coupled with personal experience. Information can, of course, be obtained from other users who have had the new type of machine under their care, but this can only be relied upon to a limited extent, bearing in mind that practically every application varies to some extent in detail.

A final and conclusive opinion of the advantage of a new unit in a given situation over an old design, can only therefore be obtained by actual observation under the special conditions pertaining to a given factory, and it is therefore often

desirable that the works engineer should instal one of these purely as an experiment.

It is an advantage to pursue this same policy in the case of smaller components, such as, for example, motor starting equipments, though here the decision to depart from previously accepted standard is often easier to arrive at, as no heavy capital outlay is likely to be involved.

Considering then the problem in all its aspects, it appears that, speaking generally, the automatic replacement of an old machine by another of a similar type, merely because it has given satisfactory service, is not always to be recommended until the claims of newer types have first received careful consideration, even though they may differ radically in design from that formerly installed.

Electric Space Heating Code

A DRAFT British Standard Code of Practice (3.6421), "Installation of Domestic Electric Space Heating Equipment," has been issued under the authority of the Codes of Practice Committee for comment. It was prepared by a committee convened by the I.E.E., under the chairmanship of Mr. P. V. Hunter, and is a further addition to the Electrical Installation Series of Building Codes, to be read in conjunction with the main code 3.6, "Electrical Installations—General."

This draft code gives guidance for space heating of single family dwellings by the installation of independent electrical appliances, as distinct from central heating systems. The design of suitable installations (exclusive of wiring), the heat requirements and heat losses of typical dwellings and the classification of heaters, together with their characteristics are all dealt with in detail. Certain safety precautions are also recommended.

Collaboration at the planning stage between architect, owner, builder, electricity supply engineer and electrical contractor is essential, the draft code points out, to enable decisions to be reached as to the type or types of heating appliances to be used and to ensure that necessary structural provisions are made.

Socket-outlets should be provided in each living room, bedroom, kitchen and hall in every dwelling, irrespective of any provision made for solid fuel heating. Socket-outlets should conform to the requirements of code 3.6, "Electrical Installations—General."

The position of electric fires should be decided with a view to the use to which the room will be put, and the probable arrangement of the furniture. Electric fires should not be installed in such a position that the output of convected heat energy is lost up the chimney of an open fire-place. Heaters with an output of heat energy which is mainly convective should be installed under windows or on the external walls of a room. Tubular heaters are particularly useful in checking descending air currents from windows and should, wherever possible, be installed under the full width of windows. Electric fires of the reflector type installed in bathrooms should be high on wall or ceiling and not within reach of a person in the room.

In selecting inset fires and convectors, preference should be given to those which are so designed that hot air emerging from the top is thrown forward, thus minimising any tendency to discoloration of the wall.

I.M.E.A. Convention

IT was pointed out in THE ELECTRICIAN of December 6 last, that Messrs. R. Birt, of Ealing, and F. W. Lawton, of Birmingham, were preparing papers for delivery at the I.M.E.A. Convention at Bournemouth from June 23 to 25, the subjects being respectively, the law relating to electricity supply and recent developments in power station practice; it was at the same time indicated that a third paper might also be available for reading. Delivery of the papers by Messrs. Birt and Lawton has now been confirmed, but the possibility of a third paper being ready is still open. The preliminary programme which has been arranged opens on Monday, June 23, with the issuing of badges at the Pavilion Lounge, followed in the evening by the President's reception. On Tuesday morning, the Mayor of Bournemouth will offer a civic welcome, following which the Presidential Address will be read. In the afternoon Mr. Lawton will deliver his paper and at 3.30 p.m. there will be a ladies' tea to meet Mrs. Pickles. In the evening the Mayor and Mayoress of Bournemouth will hold a reception. For Wednesday, whole day trips have been arranged, by steamer round the Isle of Wight, by coach to Cheddar, and half-day trips by coach to Swanage and the New Forest. On Thursday morning Mr. Birt will deliver his paper followed by a banquet and ball in the evening. The ordinary general meeting of the association will be held on the Friday morning, June 25.

As already reported in THE ELECTRICIAN an exhibition will be held.

INSULATION AND UNEARTHED D.C.

By G. W. STUBBINGS, B.Sc., A.M.I.E.E

THERE are several methods whereby the state of the insulation of an isolated low pressure unearthed d.c. supply system can be indicated or approximately measured whilst it is working. The simplest indicating device is a pair of lamps connected in series to the two mains of the system with the common junction of the lamps put to earth. If two voltmeters are substituted for the lamps, then the insulation resistance of the system can be determined by observing the voltmeter readings when each is connected to earth alone. This method can

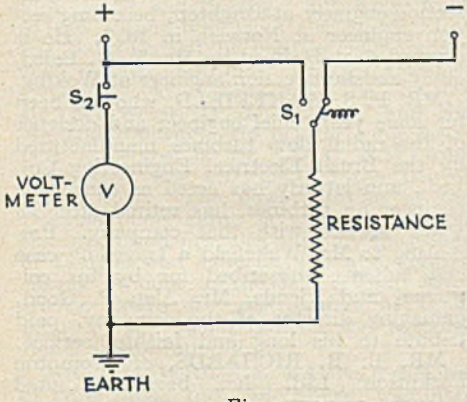


Fig. 1.

be used with a single voltmeter by connecting it in turn to the two mains, but the single instrument does not afford the continuous indication of the state of the insulation given by two instruments or two lamps in series. The circuit of Fig. 1 is a convenient arrangement whereby, with a single instrument, the continuous indication is given, and by a simple manipulation of the connections and an attachment to the instrument, the insulation resistance of the system is directly indicated on a scale marked in ohms. S_1 is a double-throw switch for connecting the resistance, having an ohmic value exactly equal to that of the voltmeter, either to the positive or the negative main. S_2 is a spring-controlled switch for temporarily disconnecting the voltmeter, and S_1 is preferably spring controlled also, so that the resistance is normally connected to the negative main and in series with the voltmeter. With this series connection the voltmeter reading will be approximately equal to $\frac{1}{2}V$ where V is the supply pressure, as long as the system is free from any but minute leakage.

The insulation resistance of the system can be determined by first observing its reading v_1 with S_1 in the normal position, and then the reading v_2 with the resistance connected to the positive main. Let r and g stand respectively for the common resistance and conductance of the voltmeter and resistance, G_1 for the leakage conductance of the positive main, G_2 for the leakage conductance of the negative main G and R respectively for the combined leakage conductance and the combined insulation resistance of the whole system. Then $G = G_1 + G_2$. With S_1 connecting the resistance to the negative main, we have, equating the currents flowing from the positive and the negative mains to earth

$$G_1 v_1 + g v_1 = G_2(V - v_1) + g(V - v_1)$$

or, $$Gv - G_2 V = g(V - 2v_1) \quad \text{.....(i)}$$

With S_2 connecting the resistance to the positive main in parallel with the voltmeter, we similarly have

$$G_1 v_2 + 2g v_2 = G_2(V - v_2)$$

or, $$G v_2 - G_2 V = -2g v_2 \quad \text{.....(ii)}$$

From equations (i) and (ii) we obtain

$$G(v_1 - v_2) = g[V - 2(v_1 - v_2)]$$

whence $$R = \frac{r}{2} \times \frac{v_1 - v_2}{\frac{1}{2}V - (v_1 - v_2)}$$

If the voltmeter is provided with an external zero-adjusting knob the value of $\frac{1}{2}V - (v_1 - v_2)$ can be indicated directly, and the instrument marked with a scale of ohms so that the value of R can be read off without calculation. With S_1 set to give v_1 the pointer of the instrument is adjusted so that it stands at the $\frac{1}{2}V$ mark of the volt scale. The instrument now has a positive mechanical zero error of $\frac{1}{2}V - v_1$. With S_1 set to indicate v_2 the actual reading will, owing to this zero error, be $v_2 + \frac{1}{2}V - v_1 = \frac{1}{2}V - (v_1 - v_2)$. Call this reading d. Then the insulation resistance in terms of d is given by the expression

$$R = \frac{v}{2} \times \frac{\frac{1}{2}V - d}{d}$$

so that R is a simple function of d only, and the pointer giving d can be made to read in ohms direct on a suitably marked scale. The expression for R is easily transformed to

$$d = \frac{V}{2} \times \frac{v}{2R + r}$$

whence, assigning values to R on the ohms scale, the corresponding points on the volt scale can be easily calculated. This ohms scale will extend from zero on the volt scale to the $\frac{1}{2}V$ point. Zero on the volt scale will correspond to infinity on the ohms scale, while the $\frac{1}{2}V$ point will be the zero of resistance.

After the insulation resistance has been determined by this method, the pointer of the voltmeter must be set to zero with the switch S_2 opened temporarily, so that

the instrument is free from zero error to indicate v_1 correctly. To avoid having direct connections to the two mains of the supply in the one switch S_1, a 32 c.p. carbon lamp can be connected between the switch and the positive main. This, with a high resistance instrument, will have negligible effect on the accuracy of the measurement, and it will prevent the risk of a short-circuit in the switch. The accuracy of the method, as with all voltmeters scaled in ohms, depends upon the actual supply pressure being equal to the value V used in marking the scale of the instrument.

Electrical Personalities

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

MR. F. C. LOUGHBOROUGH has been appointed sales manager, equipment division (commercial) of the Plessey Co., Ltd. Latterly with Associated British Oil Engines, Ltd., in charge of sales of light and Diesel engines in the western area of Britain, Mr. Loughborough was, before the war, wholesale sales manager with Lex Garages, Ltd., and a director of Lexington Products, Ltd., the associated factoring company.

MR. F. C. LOUGHBOROUGH

MR. FRED G. HOLMES, late of the Barrow Hæmatite Steel Co., Ltd., has been appointed commercial manager of Max-Arc Welders, Ltd., and the Max Electric Co., Ltd.

MR. E. J. LOLLAR has been appointed a director of the Mersey Power Co., Ltd.

MR. H. MURRAY MARKLEW, lecturer at the Borough Polytechnic, London, has been appointed head of the department of electrical and mechanical engineering at the Northampton College of Technology.

DR. OTTO ROBERT FRISCH, head of the nuclear physics division of the Atomic Energy Research Establishment, Harwell, is to receive the honorary degree of D.Sc., at the University of Birmingham on July 4. During the early part of the war, Dr. Frische, who had previously carried out nuclear research in Copenhagen, worked in the physics laboratory at Birmingham University with Prof. M. L. Oliphant. Dr. Frisch later worked on the atomic bomb in Liverpool and in the United States.

MR. THOMAS ADIE has left the service of the Central Electricity Board to take up his appointment as chief electrical surveyor to the Norwich Union Fire Insurance Society. He had been section engineer at Bedford, where he succeeded Mr. J. H. M. Sykes in 1945. Mr. Adie was apprenticed to the English Electric Company, and after some industrial experience he joined the C.E.B. in 1931 as assistant section engineer at Brighton, becoming section engineer at Norwich in 1937. He is succeeded at Bedford by Mr. T. G. Baird, lately assistant section engineer at Woking.

MR. P. S. WAKEFIELD, who has been for some years chief engineer and designer of the radial flow turbines manufactured by the Brush Electrical Engineering Co., Ltd., and latterly has acted as consulting engineer on turbines, has retired after 23 years' service with that company. Presenting to Mr. Wakefield a travelling case and suitcase subscribed for by his colleagues and friends, Mr. Alan P. Good, managing director of the company, paid tribute to his long and faithful service.

MR. L. R. RICHARDS, of Crompton Parkinson, Ltd. has been appointed branch manager of the Belfast plant office, a position previously held by the late Mr. Webb. Mr. Richards left Smethwick (Staffs) Technical College in 1923 to join the General Electric Co., Ltd., at Witton. In 1929 he went to Bull Motors, Ipswich, and became assistant to their London agent in 1931. In 1938 he joined the London office of Crompton Parkinson, Ltd., and volunteered for service with R.E.M.E. in 1942. Demobilised last June with the rank of Major, he resumed his appointment with the company.

MR. L. R. RICHARDS

ENGINEER VICE-ADMIRAL SIR HAROLD A. BROWN, has been appointed by the Minister of Supply as chairman of the Machine Tool Advisory Council in succession to Mr. S. F. Steward, who has resigned in order to give full time to his business interests. Sir Harold Brown retired from the position of Engineer-in-

Chief of the Fleet in 1936, to take up the appointment of Director-General of Munitions Production with which went membership of the Army Council, at the War Office, which he held until 1942. He then became Senior Supply Officer and retained that post until March, 1946. He is the Ministry's representative on the General Council of the B.S.I. and the Industrial Grants Committee of the Department of Scientific and Industrial Research.

MR. BERTRAM KELLY, engineer and manager of the Douglas electricity department, will be retiring on superannuation at an early date, and the Council has placed on record its sincere appreciation of the services rendered by him over a period of 25 years, i.e., from the inception of the undertaking. Mr. Kelly went to the corporation from the Manx Electric Railway, but he had previous experience with Lowdon Bros., Dundee, Cromptons at Chelmsford, the L.C.C., Hornsey electricity department, and the Midland Railway. He has for some years been a member of the E.D.A., N.W. Area Committee, and chairman of the Isle of Man Circle. The power station of the Douglas undertaking is the only one on the island and provides not only the needs of Douglas and suburbs, but also gives a supply in bulk to the Isle of Man Electricity Board for distribution in those parts of the island outside the corporation's area of supply.

MR. FREDERICK L. PARK, a director of Park Bros., Ltd., Blackburn, was married at Hapton on April 10 to Miss Gladys M. Brown, a director of F. H. Brown, Ltd., Burnley.

MR. J. BROADHURST, who served with the Royal Indian Engineers during the war and was formerly resident engineer Upper Ganges Valley Electricity Supply, India, has been appointed assistant electrical engineer with the State Electricity Commission of Queensland.

MR. F. W. H. WHEADON, chief engineer and manager of the Adelaide Electricity Supply Co., Ltd., Australia, is retiring after 48 years' service. He will be succeeded by Mr. R. M. H. Lea, formerly deputy chief engineer. Mr. J. R. Brookman has been appointed district engineer and deputy manager.

MR. W. GRIMSTER has been appointed president of the Electrical and Radio Federation of Victoria.

MR. CECIL MYERS, senior representative in Lancashire and North West England of Edgar Allen and Co., Ltd., has retired. He joined the company in October, 1901, as an assistant in the laboratory, and was later transferred to the Tropenas steel converting plant. He was lent to the inventor of the Tropenas process, M. Tropenas, in America for two years. Later he erected Tropenas converter plants in Sheffield and stockton, and in Japan for the Japanese Navy. He had the distinction of holding commissioned rank in the Imperial Japanese Navy. In 1914 to 1918, he held the rank of captain in the British Army, and during the late war was security officer at the Imperial Steel Works, with the rank of Major in the Home Guard. He will act as a consultant until the end of the year.

Obituary

MR. J. E. S. GLADWIN, Bristol, founder of the firm of J. E. S. Gladwin and Sons, electrical contractors, Bristol, aged 55 years.

LIEUT.-COLONEL S. E. MONKHOUSE, late managing director of the North-Eastern Electric Supply Co., Ltd., on April 10, aged 61 years. He joined the company in 1904, when it was known as the Newcastle-upon-Tyne Electric Supply Co., Ltd., and, after having had experience in the operation and construction departments, he was appointed head of the power department in 1926. Three years later he was made chief assistant to the general manager and, in 1931, became assistant general manager. In 1937 he succeeded the late Mr. H. A. Couves as general manager, was elected a director of the company in the same year, and appointed managing director in 1939. At the end of last September he retired from that office, but retained his seat on the board. Lieut.-Colonel Monkhouse was a past-president of the Incorporated Association of Electric Power Companies, past chairman of the Joint Committee of Electricity Supply Associations, and a past vice-president of the B.E.D.A. He had also been a member of the B.E.A.I.R.A., the National Joint Board and National Joint Industrial Council of the Electricity Supply Industry, the Central Electricity Board's National Consultative Committee and Technical Consultative Committee for North-East England (of which he was chairman), the Electricity Commissioners' Man-Power Consultative Committee, the Council of the Conjoint Conference of Public Utility Associations, the Engineering Divisional Council of the B.S.I., the Electrical Engineering Committee of King's College, University of Durham, and the North-East Coast Institution of Engineers and Shipbuilders. He was also a Governor of the Electrical Industries Benevolent Association, and had been a full member of the I.E.E. since 1917. During the 1914-18 war, he served with the Royal Engineers and was prominently associated with the development of anti-aircraft defence.

Harrogate Electricity Jubilee

Half-a-Century of Public Service Celebrated

THE Golden Jubilee of the Harrogate electricity undertaking was celebrated on Tuesday, April 15, with a dinner, conversazione and cabaret at the Hotel Majestic attended by a large and representative gathering. Many of the guests had spent the day, which was fine and sunny, touring the undertaking's area of supply by coach, halting in Upper Nidderdale, at Ripon, for lunch, and at Knaresborough for tea. Councillor M. E. Mail, chairman of the Electricity Committee, presided at the dinner.

MR. A. KELSO

Sir John M. Kennedy, deputy chairman of the Electricity Commission, in proposing the toast of "The Harrogate Corporation Electricity Undertaking and its Jubilee," said they had really attempted to get down to the problem of rural electrification and had given supplies of electricity even to the smallest cottages in out-of-the-way parts. They and their predecessors on the Council were to be congratulated on their great achievement. In the period from 1921 up to date the consumers had multiplied seven-fold, and the units sold per consumer were two and a half times as great as they were.

Referring to the amalgamations that would take place under nationalisation, Sir John Kennedy said he realised that they must feel some grievance and sense of personal loss in losing direct control over the robust and healthy child whose growth they had looked after with such pride, but, on the other hand, if it was in the national interest that there should be those wider amalgamations they must recognise that it was impossible to exclude certain selected areas because they happened to be good, when they were surrounded by other areas which were not so good. It was by a combination of the mediocre, or of the good and the bad, that a better result could be achieved. Dealing with compensation, Sir John Kennedy said it was no good thinking that in the future they could lightly add to the burdens of the new Area Boards. Everything was more expensive than it was before the war and they could not supply electricity at low prices unless they cut down capital expenditure to a minimum, and if undue "subs." were taken by way of compensation, the cost of electricity would undoubtedly be put up. That was a point which must be thoroughly realised.

Ald. H. Bolland, chairman of the Corporation Finance Committee, replying to the toast, said they were celebrating that night fifty years of light, fifty years of energetic administration and fifty years of good service. He paid tributes to all who had helped to build up the undertaking, including Mr. George Wilkinson, the first borough electrical engineer, whom they rejoiced in welcoming among them that evening, who truly and soundly laid the foundations of the undertaking; their late esteemed engineer, Mr. Neil McLean, who carried out the scheme of rural electrification; and their present engineer, Mr. A. Kelso. Mr. Bolland also mentioned that the undertaking had given £140 000 to rate relief.

The Mayor of Harrogate, Ald. H. Hesselwood, submitted the toast of "Our Guests."

Mr. J. S. Pickles, president of the I.M.E.A., responding for the electrical industry, said they hoped that in the reorganisation the powers that were to be appointed would remember that the spirit of an industry, though an intangible thing, was a very important factor, and in their reorganisation proposals they should try in every way to maintain the excellent spirit which existed in the industry to-day.

Mr. B. Kenyon replied on behalf of neighbouring local authorities and Mr. A. Kelso responded for the undertaking's staff —past and present.

The undertaking now supplies, in addition to the borough of Harrogate, the urban district of Knaresborough, the rural district of Nidderdale, the city of Ripon, the rural district of Ripon and Pateley Bridge, and part of the rural district of Wath, a total area of approximately 296 square miles. Over 400 farms are connected. The first electric crematorium in Britain—the third in Europe—was installed in Harrogate in 1936 and is giving satisfactory service. In 1898 the units sold numbered 291 363, the gross income was £1 360, the maximum demand was 198 kW and the number of consumers 246. This year the estimated number of units sold is 47 515 000, gross income £281 000, maximum demand 16 000 kW and number of consumers 22 700.

Light and Colour

Factors Influencing Factory Lighting and Decoration

THE advantages to be gained from the application of modern methods of light and colour to works equipment were described by Mr. W. Robinson at the meeting of the Association of Supervising Electrical Engineers, on April 15.

Providing ideal visual conditions for maximum output, Mr. Robinson explained, was the overall problem, and this involved two factors: the easing of manual and visual processes by properly applied lighting and colour and the production of a mental state conducive to continuous and cheerful effort by the same means.

The major factor determining the lighting on the job was the nature of the material the worker was handling, its size, degree of contrast and texture. If a small brilliant light source was used, a glossy surface would look different according to the relative angles between the worker, the surface and the light source. The ideal solution was to make the surface assume the characteristics of a uniformly white background, against which markings, scratches and fine detail would appear black, by using a source so large that its reflected image covered the entire surface. An indirect source, such as a well-illuminated white painted wall or canopy, or linen or other diffusing media stretched beneath the lamps, were practical methods.

When specular surfaces were curved or bent outwards, they gathered the image of the surroundings, including light sources, into a small space and the whole was seen as a highlight. For comfortable seeing, these highlights required to be broad and soft and this could only be achieved if the whole surroundings were both fairly bright and reasonably uniform in brightness. The provision of light ceilings, walls, etc., would considerably improve the facility of working on shiny materials.

With matt surfaces, Mr. Robinson went on, the problem was simplified, but it was often advisable, with materials such as single-coloured cloth, to improve the contrast by permitting the light to fall at an angle. As deliberate exceptions to the normal recommendations regarding relative brightness of the work and its background, silhouette methods might be used for special tasks.

While many workshops found that good general lighting fulfilled all their requirements, local lighting could be an economical and effective means of adjusting the brightness of the work and its background, but there were limits to the amount of local lighting permissible with a given value of general illumination. There was a strong case for bright interiors on psychological grounds, and good general lighting should fulfil the two-fold duty of providing adequate, uniform illumination for normal tasks and in addition ensure sufficient illumination upwards and sideways to provide the equivalent of sunshine at night.

Just as interior brightness produced certain psychological and visual effects, the author continued, so did the colour combinations used affect the individual in the factory. There were certain more or less universal reactions to colours—such as red for fire—which pointed to the use of certain colours for certain purposes, and there was the B.S.S. colour code for indicating factory services, of which white, for air, and orange, for electricity, were examples. So far as decorative colouring was concerned, the first essential was that walls and ceilings should have high reflection factors, with medium dadoes, and floors should be as light as convenient. Simultaneous contrast, by which colours assumed a different aspect when placed next to other colours, should be avoided, and the criterion was cheerfulness and appropriateness.

The application of colour to machinery had been made practicable by the introduction of enamels giving a durability equal to stoved enamels, and the colouring of machinery was a most important part of the entire light and colour scheme, the objectives being to avoid clashes with the general scheme, to facilitate work on the machines by using indicator colours at operative or focal points, and to make the machines stand out from the background.

Other points which, Mr. Robinson thought, deserved mention, were special applications of colour, such as having grey traffic lanes, edged with a contrasting colour, throughout the factory, and painting the outsides of bins to contrast with the floor covering and the insides with a light colour to reveal the contents at a glance. The effect of such measures on orderliness and housekeeping was obvious. Bench tops should be coloured both to provide a contrast between the work and the bench surface, and it should be arranged if practicable, for the bench top to be less bright than the work.

Summing up, Mr. Robinson emphasised that light and colour were indivisible, and that the quality and spectral composition of the lighting determined the effectiveness of colour schemes, and vice versa.

Generation Statistics

SUMMARY OF COMMISSIONERS' RETURN FOR 1945

BEFORE the war, the statistical returns compiled by the Electricity Commissioners were an annual feature, but publication was withheld, in 1939, for security reasons, and the last available reports were for the year ending December 31, 1938. Annual publication is now resumed with the issue of a statistical summary ("Generation of Electricity," H.M.S.O., 2s. 6d. net), for 1945, in which are given, for purposes of comparison, some of the more important figures relating to output and thermal efficiency for the intervening war years.

The returns from electricity undertakers which are summarised cover 346 stations—the sections of selected stations being counted as separate units—which were generating in 1945, an increase of one over the previous year. The difference is due to the discontinuance of generation at four stations during 1944, to the bringing in of four existing stations which did not generate during the previous year and to the commissioning of one new station, that of the Yorkshire Electric Power Co., at Mexborough.

Generation during the year, reflecting mainly the industrial change-over to peace production, showed a decrease, at 37 284 597 992 units, of 2.8 per cent. over 1944, of which figure approximately 5.7 per cent. was used in works. The stations consumed altogether 22 821 088 tons of coal and coke, a decrease of 2.7 per cent. and 19 741 tons of oil fuel, as compared with 18 008 in 1944.

The generating stations of railway, transport, and certain other non-statutory undertakers were responsible for an output of 1 384 383 374 units generated, of which total the largest single contribution was that of Lots Road (L.P.T.B.) with 508 186 500 units.

From the table below, it will be seen that the station with the highest thermal efficiency and the lowest average fuel consumption was that of the London Power Co., at Battersea, with figures of 26.74 per cent. and 0.96 lbs. of fuel per unit sent out, respectively. The highest recorded load factor was that of Hams Hall "B" station of the Birmingham Corporation, with 83.3 per cent. This station, which commenced supplying in 1942, showed a thermal efficiency of 26.39 per cent. and an average fuel consumption of 1.64 lbs. of coal per unit sent out.

AUTHORISED ELECTRICITY UNDERTAKERS

STEAM STATIONS WITH LOWEST AVERAGE FUEL CONSUMPTION AND HIGHEST THERMAL EFFICIENCY—1945
(The two sub-columns headed "Station" are exclusive of those new stations which only went into operation during the year.)

		Station with lowest average fuel consumption in each group				Station with highest thermal efficiency (approximate) in each group			
Output units generated	No. of steam stations in each group	Station	Fuel per unit sent out	Maximum load sent out by generators	Load factor based on units sent out	Station	Thermal efficiency (approx.) based on units sent out	Maximum load sent out by generators	Load factor based on units sent out
Millions			lb.	kW.	%		%	kW.	%
Over 1 000	6	*Battersea (L.P. Co., Ltd.)	0.96	239 100	64.1(A)	*Battersea (L.P. Co., Ltd.)	26.74	239 100	64.1(A)
500—1 000	15	*Kearsley (Lancs. E.P. Co.)	1.22	163 400	64.0(A)	*Kearsley (Lancs. E.P. Co.)	24.73	163 400	64.0(A)
200—500	37	*Llynfi (S. Wales E.P. Co.)	1.06	58 600	70.9(B)	*Llynfi (S. Wales E.P. Co.)	25.70	58 600	70.9(B)
100—200	22	*Stretford and Dist. E. Bd.	1.22	33,892	56.0(B)	*Willesden (Northmet)	24.57	68 800	34.6(B)
50—100	13	*Bonnybridge (Scottish P.Co.)	1.64	35 800	19.5(B)	*Bonnybridge (Scottish P.Co.)	19.59	35 800	19.5(B)
25—50	16	Isle of Wight E.L. and P. Co., Ltd.	1.81	11 600	33.0(A)	Isle of Wight E.L. and P. Co., Ltd.	16.47	11 600	33.0(A)
10—25	28	*Rawtenstall Corp.	1.80	9 075	15.8(B)	Cambridge E.S. Co., Ltd.	16.09	7 820	24.5(B)
5—10	19	Chepping Wycombe Corp.	2.06	3 030(g)	45.2(C)	Chepping Wycombe Corp.	14.77	3 030	45.2(C)
2.5—5	16	Penarth U.D.C.	2.60 (g)	1 260	34.5(g)(C)	Penarth U.D.C.	12.17	1 260 (g)	34.5(g)(C)
Under 2.5	35	Weston-super-Mare and Dist. E.S. Co., Ltd.	2.63	2 250	36.0(C)	Weston-super-Mare and Dist. E.S. Co., Ltd.	11.27	2 250	36.0(C)

* = Selected stations ; (A) = 8 760 hrs. ; (B) = 6 600-8 760 hrs. : (C) = 2 400-6 599 hrs. ; (g) = based on units generated.

Electrical Notes from India

From Our Own Correspondent

THE conclusions of a technical survey, now being undertaken by the Central Technical Power Board, may involve the future policy of power supply to the whole of Delhi Province. The object is the investigation of a possible interconnection of two of the largest provincial systems in India—the South East Punjab and Delhi Province and the North Western United Provinces—by high voltage transmission lines. A good deal of preliminary work has already been done by the load survey staff of the Board. Since its establishment in November, 1944, the Board has investigated 12 other projects and has submitted, so far, six reports. The investigations include the Damodar River project, the North Calcutta rural electrification project, now being carried out, and the Board has also made recommendations on the North Western United Provinces power transmission systems which, if approved, may cost Rs. 15 crores.

* * *

Available water-power resources in the South Indian State of Mysore are sufficient for the development of hydro-electric schemes of major magnitude. The State has four rivers—Cauvery, Shimsha, Sharavati and Bhadra—of which the most important is the Cauvery. The first generating station, at Sivasamudram power house on the Cauvery Falls, was started in 1902, with six water-wheel sets each of 720 kW capacity. Increasing demands for power led to extensions, and to-day the capacity is 42 000 kW, supplied at 2.2 kV, three-phase, 25 c.p.s. Even this, however, became insufficient, and a new station was constructed at Shimshapura, near the junction of the Cauvery and Shimsha rivers. The station derives its water supply through a 5½ miles canal, a feature of which is that it includes two steel syphons each about 3 000 ft. long, and is at present equipped with two 8 600 kW generators, each driven by a 12 100 H.P. reaction turbine. Among the modern features of design incorporated in the station may be mentioned the closed system of ventilation provided for the generators, whereby the cooling air travels in a completely closed circuit.

* * *

The Ceylon postal authorities are making efforts to improve the telephone and telegraph systems of the island, and equipment has been ordered to extend the service in Colombo and give some of the provincial services automatic exchanges. Estimates for the extensions are nearly one million rupees, and it is proposed to increase the number of lines in Colombo itself from 5 000 to 7 000. Orders for the necessary equipment have been placed.

* * *

The possibilities of a third station, at Jog Falls, were investigated in 1918, and to meet the seasonal fluctuation of stream flow, the Government constructed a reservoir of 25 000 million cubic feet capacity about 13 miles upstream from the falls. Four 17 000 H.P. impulse turbines working at a net head of more than 1 150 ft. will each drive a 12 000 kW three-phase 50 c.p.s. alternator. Initial transmission will be at 115 kV, and power will pass over two transmission lines to Bhadravati, where a step-down transformer is being constructed for the purpose of supplying power to the Mysore Iron and Steel Works, in the first place, and also the Southern and Eastern parts of the State. Arrangements are also being made for the installation of two 10 000 kW frequency changers, which will couple the Jog Falls system with the existing 25 c.p.s. network. The initial capacity of the station at Jog after the completion of the first scheme will be 48 000 kW. A second stage will increase this to 120 000 kW.

* * *

An increase in net profit, brought about by increased demand and the resumption of street-lighting after the war is recorded in the report of the Chief Engineer and Manager of the Government electrical undertakings, Ceylon, for the last year. There is still considerable scope for expansion in Ceylon, but a limiting factor at the moment is inadequate plant capacity. It has been decided that the preliminary work, such as the necessary surveys and preparation of plans and estimates for the second stage of the Ceylon hydro-electric scheme should now be taken in hand.

London Students' Dance

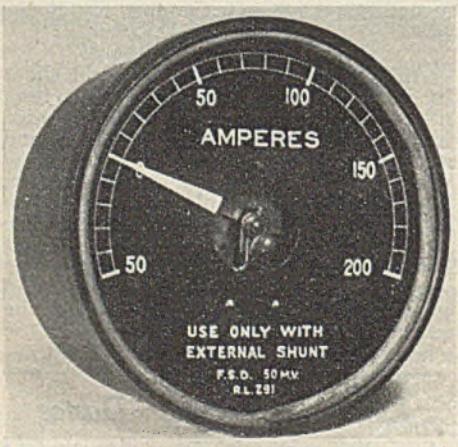
A VERY successful dance given by the I.E.E. London Students' Section at the Oak Restaurant, Kensington, on April 11, was attended by some 250 enthusiasts, when one of the high lights of the evening was the awarding of spot prizes. The proceedings commenced at 7.30 p.m. and passed all too quickly until the " stand down " at 11 p.m.

Physical Society Exhibition

Concluding Review of an Important Display

THE annual exhibition of the Physical Society, which ended on Saturday last, appears, in retrospect, to have been notable in several respects. A feature common to many of the electrical exhibits was the close attention now being paid to external design and appearance, and it was noticeable, too, that wartime manufacturing experience on radar and allied subjects had suggested many new industrial applications of electronic techniques. Some of the new apparatus on view was concerned with atomic energy research, and several manufacturers displayed electronic counters for high-speed particle recording.

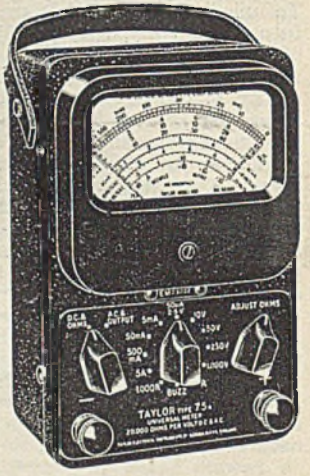
We continue from last week our review of the trade section of the exhibition with Salford Electrical Instruments, Ltd., who displayed a range of test gear and other apparatus, the most complex of which was a six-channel electronic blast-pressure recorder, designed for the analysis of explosive shock-waves. Among the smaller exhibits on the stand were the "Miniscope" cathode-ray tube which, in a unit weighing only 7½ lbs., combines most of the features, including a "Y" plate amplifier, normally found only on larger instruments; an additional tube attachment, which permits simultaneous exam-



A 3¼ in. moving coil d.c. ammeter, with wide angular deflection, made by Elliott Bros.

ination of two variables, as in double-beam tubes, was shown. A magnetic sorting bridge, capable of checking up to 3 000 pairs of aircraft valve springs daily, was demonstrated.

Taylor Electrical Instruments, Ltd., showed a circuit analyser in which a high-frequency pentode detector valve is carried in a probe, and coupled to an audio amplifier and loudspeaker. The use of the instrument is for checking through the stages of radio receivers and audio frequency amplifiers, the presence of a signal at any point being indicated by an audible note in the loudspeaker. Very weak signals are detected by plugging in a pair of headphones, while those exceeding one volt are sufficient to operate a tuning indicator. The company was also showing a 50-range universal meter of sensitivity 20 000 Ω /V and measuring up to 10 MΩ on the internal battery.



The Taylor 50-range universal meter, with a sensitivity of 20 000 ohms per volt

The Westinghouse Brake and Signal Co., Ltd., were demonstrating, by means of cathode-ray tubes, the action of their voltage stabilisers when fed with a supply of varying voltage and frequency. An interesting illustration of the way in which copper-oxide rectifiers can now be made insensitive to humidity was provided by a small unshielded rectifier working under water. This was made possible by a new method of making contact with the oxide without the use of graphite.

The main feature on the stand of the Zenith Electric Co., Ltd., was a testing equipment, checking, by reference to substandard instruments, the accuracy of house service meters. Variac voltage regulating transformers, incorporating two regulating mechanisms, enabling two separate circuits to be controlled independently of each other, were also shown, and there were, in addition, a number of vitreous resistors and other components.

Thermometers, both for industrial and clinical use, were seen on the stand of the British Rototherm Co., Ltd., and a selec-

tion of bimetallic elements were shown. One semi-electrical exhibit was a heavy industrial thermometer fitted with contacts to give "on-off" temperature control when used in conjunction with a relay, or to give audible alarms.

An a.c./d.c. comparator, designed for the standardisation of laboratory wattmeters, voltmeters and ammeters, was shown by Elliott Bros. (London), Ltd., who state that, with an equivalent scale length of 18 ft., the instrument is accurate to within 0.05 per cent. Split-core current transformers, made to enable current transformers to be tested for ratio and phase angle without disconnecting were also shown and, amongst the more conventional instruments was a long-scale moving coil d.c. ammeter. Although only 3½ in. in diameter, this meter has a 228° angular deflection with a scale of 5 in. and measures from 50-0-200 A. The full-scale deflection is 50 mV.

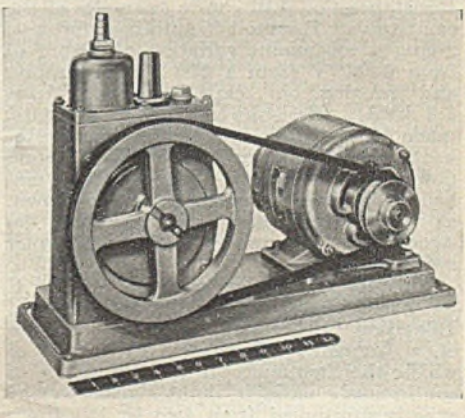
Visitors to the exhibition showed very considerable interest in a display by the Electrical and Allied Industries Research Association of a range of instruments, developed by the E.R.A. during the war, for the location of bombs and mines. On the secret list until quite recently, these instruments were shown publicly for the first time, and comprised three main types. The first class of locator, of which three examples were on view, was designed for the detection of ferrous type objects by magnetic methods. Another instrument, using an oscillator, located non-ferrous conducting materials while a third, employing a remote field source, could be used for the detection of any discrete metallic objects, either magnetic or conducting. These instruments, which have important peace-time applications, will be more fully described in our next issue.

Vacuum pumps of many sizes were being shown by W. Edwards and Co. (London), Ltd., and included a model 1a rotary pump, a light and compact equipment with a pumping speed of 1¼-2 cu. ft. per minute at a vacuum of 0.005 mm. of mercury. This model, which is suitable for a number of laboratory and industrial uses, can be used for backing diffusion pumps, of which several were shown, operating with mercury, oil or other fluids, and running from speeds of a few to several hundred litres per second.

Two new instruments which attracted attention on the stand of Kelvin, Bottomley and Baird, Ltd., were a paper testing apparatus and an electric barograph. In the former, which is used for indicating the true average sizing degree of paper in terms of time by stop watch, no batteries or external energy source are employed, and the results obtained are independent of texture irregularities, variations in paper colour, indifferent lighting conditions and the personal element. The electric barograph, which embodies some new design features, runs from the normal lighting supply and uses a roll chart, of which ten inches are always visible, sufficient to run for a year without changing. An electrical pen eliminates the need for recording ink.

An instrument measuring small currents down to 10^{-11} A, with an accuracy of ± 1 per cent. was shown by the Baldwin Instrument Co., Ltd., who had also on view a meter for measuring mains resistance, several other measuring instruments and an X-ray dosemeter, calibrated in röntgen units, for controlling X-ray dosage in radiological work. An allied apparatus was the Baldwin-Farmer electrometer for voltage measurements up to 280 V, and with an input impedance of 10^{16} Ω and capacity less than 0.5 pF.

Standard Telephones and Cables, Ltd., showed both instruments and components, and of the latter a new SenTerCel selenium rectifier, designed to replace the rectifying valve in radio receivers, was of interest. This component, which is small and unbreakable, is capable of a maximum output of 60 mA and will handle an input of 110-250 V, only three wiring-up connections being required. A variety of Uniplate selenium rectifiers, suitable for low-current power packs, spark quenching, detectors, etc., were also shown. Among the test gear which this company displayed was a portable frequency standard, in which a crystal oscillator with a frequency of 100 kc/s is counted down to provide outputs of 10 kc/s and 1 000 cycles. A heterodyne oscillator, covering a range of 100 cycles to 150 kc/s in 50 cycles steps, was shown, and there was a demonstration



Model 1a Speedivac vacuum pump, shown by W. Edwards and Co., Ltd.

showing the effectiveness of selenium rectifiers in spark quenching circuits.

As well as a number of specialised optical and electrical instruments, Pye, Ltd., dis-

The Baldwin-Farmer electrometer, designed for radiological work

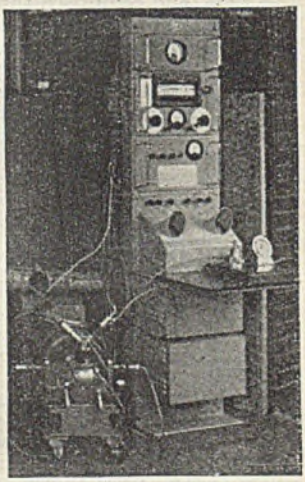
played several items of equipment suitable for the service engineer's workshop. One of these, a workshop test rack, was a compound instrument containing a signal generator, covering from 110 kc/s to 50 Mc/s in seven ranges, with 400 cycles modulation available, a 50 cycles bridge circuit for component testing, and an output power meter.

On the stand of the British Electric Resistance Co., Ltd., were examples of the company's "Regavolt" auto-transformers, giving a continuous variation of output of from 0-300 V from a 230 V a.c. supply, and ranging, in capacity, from 1.25-3.3 kVA. Resistors for heavy currents, made of tape wound on edge to give better heat dissipation, and toroidally wound power rheostats with their windings embedded in vitreous enamel were also shown, as were Berco rotary stud switches, designed for instrument and transformer switching.

An interesting development of c.r.t. technique was shown by the International Television Corporation, Ltd., in the form of a frequency multiplier, by means of which the frequency of a large range of continuously variable input signals can be exactly multiplied from two to ten times without the use of tuned circuits. Essentially, the valve consists of a deflection modulated c.r.t., with the normal anodes and deflection plates but, in addition, a multiplier screen and an output electrode. The screen has five equal gaps, and when the beam is deflected by a signal applied to one of the deflecting plates, it passes through the gaps alternately, so that the beam current falling on the collecting electrode is interrupted.

Examples of metallic materials with electrical applications were displayed by the Mond Nickel Co., Ltd., and included nickel sealing alloys, high-permeability nickel-iron alloys and permanent magnet materials. Bimetallic strips, elements for magneto-striction oscillators and thodium-plated contacts were also shown. On the stand of Tufnol, Ltd., various machined and moulded parts, such as silent-running gearwheels, etc., illustrated the uses to which this material could be put.

Electronic instruments designed for internal combustion engine development comprised the stand of D. Napier and Son, Ltd., and included an aeration meter, for measuring the air content of engine lubricating systems under dynamic conditions. Another apparatus indicates combustion efficiency, by smoke detection, and temperature, with a differential thermo-couple arrangement. Presentation is on two double-beam cathode-ray tubes, one providing an indication of the entire cycle of the phenomenum to be examined, whilst the other enables a part of the cycle to be expanded in order to obtain increased accuracy. The second beam on each tube is used for time-scale marking, and the synchronising circuits automatically lock the time-base repetition frequency to that of the engine.



Engine testing equipment, shown by D. Napier and Son, Ltd., connected to a compressor

Finally, a word should be said of the demonstration of centimetric waves, arranged by Prof. J. T. Randall, who developed the modern cavity magnetron. A magnetron was connected to a rectangular waveguide at various points along which were located instruments, such as standing wave indicators and pulse monitors. At the output, the radiations were used for a number of attractive "experiments" illustrating polarisation, attenuation, reflection, and the effects of high-frequency radiation when passing through discharge tubes.

Consumer-Service Development

I.E.E. Discussion of Requirements and Load Building

AT a meeting of the I.E.E. on April 10, Mr. C. T. Melling delivered a paper on the "Commercial Development of Electricity Supply as a Consumer-Service."

The paper approached electricity supply from the viewpoint of the consumer, about the service to whom, the author said, little had been published. The industry had, however, always felt a keen responsibility to the consumer; from the first to provide him with a cheap and abundant supply, and latterly to provide a thorough and helpful service so that he might obtain the many advantages of electrification, with the maximum value for his expenditure. The organisation to achieve the requirements of service was discussed, particularly in regard to personal relations with the consumer. The same personal relationship of the engineer-manager of the small undertaking was, said the author, desirable in a regional organisation with branch offices, but delegated authority without bureaucratic control could not easily be attained unless the future large-scale organisation of the industry was flexible to local requirements and regarded consumer services as a first essential. Cheapness of supply—an essential feature of consumer-service—was closely related to load development and commercial control, which were briefly discussed.

MR. J. ECCLES (Liverpool) welcomed the paper as a record of practice and principles which had been found acceptable under a free competitive system, and a record which might be found useful when the industry passed into a more regimented form. The industry had not grown up of its own accord; it had been nurtured by enthusiastic people with sufficient vision to realise its place and purpose in our national life, and with sufficient tenacity to overcome technical difficulties and competitive setbacks. It would be a mistake to assume that because it had been successfully managed in the past its administration had been easy. It could not continue to be successful without that keen attention to detail which was the main theme of the paper. Dealing with the suggestion that district representatives should be appointed, he said that he had never been enamoured of the idea, and it presented certain practical difficulties. One was to get the right men, and another was that of maintaining records at a sufficient number of points to ensure that they were kept constantly posted with the necessary information, and of preserving up-to-date central records. Moreover, the cost would be considerable; such men could hardly be paid less than £500 to £600 a year, and if one were appointed for every thousand consumers the cost to an undertaking with 300 000 consumers might be £180 000 a year.

MR. FORBES JACKSON (L.C.C.) pointed out that rising output was not a true yardstick of progress, because the object of the consumer was to use the minimum number of units consistent with obtaining the amenities he required. Although an electric cooker was better than a gas cooker, someone with a reasonable gas cooker might be well advised to go on using it for a time, and spend any money available on a washing machine; but, since the washing machine would use only one-thirtieth the units used by a cooker, could a supply engineer be expected to give that advice? The industry and the consumers owed a great deal to the fact that for the last fifty years there had been a large number of enthusiastic supply engineers, whose enthusiasm had been allowed full scope. It was important that in the new set-up nothing should be done to discourage this personal and collective enthusiasm. On the other hand, consumers should, in a collective sense, have more say in the development of an industry in which they were a very large partner, and for that reason he regarded the proposal to have consumers' councils with interest. If their members were suitably chosen, the net result might be good. A possible fault of electricity supply was the measurement of its success in terms of output, and a council of consumers, not concerned with the growth of the undertaking, might lead to the greater use of electricity for some labour-saving devices which the present set-up had tended to ignore.

MR. R. H. RAWLL (Shoreditch) maintained that the success of present legislation would depend on the recognition that consumers' requirements were different in various localities, and emphasised the need for the creation of a team spirit which would ensure that from top to bottom all the staff came into the picture, whatever was going on. It was easy to blame a man who made a mistake, but it was sometimes forgotten that it was

equally easy to praise him for a good job of work.

MR. A. H. YOUNG (Edmundson's) emphasised the importance of the personal relationship of the engineer-manager with the consumers and employees of a small undertaking being retained in the large undertaking by further delegation of authority. Every employee, moreover, should be encouraged to look on the business as his own, because an organisation was judged by the individuals whom the public met who were connected with it. During the past twelve months his organisation had conducted a series of meetings for various grades of employees, covering almost all categories. The course lasted about a week, and was made as informal as possible. In addition to covering technical matters, consumer relations, and so on, the general manager of the area gave a talk on the policy and history of the company and its future objectives. Even some of the senior employees, who felt to start with that there was nothing they could learn in that way, had become enthusiastic about the courses. The electrical industry could afford to extend that method of discussing its problems frankly with employees in every category. Dealing with Mr. Forbes Jackson's reference to consultative councils, he emphasised the difficulty of finding people who were really representative of consumers. It was very difficult to find out what consumers wanted, because many of them did not know. To train employees to keep their ears to the ground when making their daily contacts with the public was perhaps the best way to ascertain how the industry could be of greater service.

MR. W. N. C. CLINCH (Northmet) suggested that one way of extending consumer service was by means of films which showed something of the activities of the undertaking and of what lay behind the operation of a switch by the consumer. Such films could be shown to clubs and women's guilds and on other social occasions. At the end of the meeting Mr. Clinch showed such a film, relating to his own undertaking.

MR. A. E. MORGAN (Leyton) maintained that in addition to the simplification and standardisation of tariffs, which was under investigation at the moment, there must be a simplification and streamlining of the business of connecting the consumer to the supply. At present delays were too long, and too many employees went to see one consumer. Application forms should be standardised, and annoying items such as meter rent and small service charges should be cut out. There was not at present a proper appreciation of the need for some simple tariff to offer to shops, business premises, hotels and so on. There was need for the development of the technical sales assistant as a more qualified person who could advise industrial consumers on the many new industrial applications which were coming forward to-day. It was not sufficient to provide a cheap supply of electricity; there must be facilities for domestic consumers to obtain the usual appliances on easy terms. He saw no reason why hire or hire-purchase should not be offered for the same type of appliance; the arrangements must be flexible. The gas companies allowed the consumer to hire apparatus, and if he ultimately wanted to buy it he could offset the amount paid in hire against the purchase price. The hiring of a piece of apparatus should include the necessary connection to the installation; it was wrong to hire a wash-boiler and then charge the consumer £4 for the 15 A plug and connection.

MR. G. V. HARRAP (Norwich) pointed out that, particularly in dealing with industrialists, distribution engineers could do a great deal for consumer service, and should be made to realise that they were part of the consumer service of the department. In two undertakings with which he had been connected, he said, it was the practice to hold meetings of elected representatives of all the different sections of the undertaking, at which the manager went through his report and accounts, which he had previously presented to the municipal committee. That did a great deal of good.

MR. C. T. MELLING, replying to the discussion, mentioned what was being done in Luton to find out whether the service given on the new housing estates was satisfactory. The tenants there, by the decision of the corporation, had to use electric cookers, and hardly any of them had had an electric cooker before. As soon as they were connected they were visited by a well-trained demonstrator and helped to become skilled in the art of electric cooking. Up to the present there had not been a single case where the consumer was dissatisfied with the cooker or the service.

He agreed with Mr. Forbes Jackson that size was no proof of the efficacy of a consumer service. The close relationship which was desirable was easier to obtain in small undertakings; on the other hand, it was easier for the relatively large undertaking to provide the specialised staff required. It did not follow that to combine little undertakings into big ones would at once lead to efficiency; there might be discouragement of the personnel, loss of enthusiasm, and hence loss of consumer service. That had to be guarded against

in the reorganisation of the industry. It was important to encourage employees to look on the undertaking as their own. That again required a relatively small unit; not a small undertaking, but a small unit in the undertaking, where the man in charge could be held to be responsible and would be regarded by his employees and consumers as responsible.

Technical sales assistants for industrial application of electricity to industry and applications were of great importance. The job of the supply undertaking in industrial applications was to help and guide the consumer on new uses of electricity, and perhaps to lay out his factory for him electrically, providing what was virtually a free consulting service. For the sake of national survival, we must increase the horse-power per man. American standards were far in advance of our own in that respect.

Relaxation Methods

IN the long vacations of the last two years, summer schools in 'Relaxation Methods' have been held at the Imperial College of Science and Technology, South Kensington, the success of which has encouraged the provision of a similar course in the coming long vacation, planned for the four weeks July 8 to August 1.

It would seem that there is no great difficulty in acquiring such knowledge of the relaxational technique as is required to solve ordinary engineering problems (frameworks, electrical networks, etc.), but that for partial differential equations in two independent variables, although techniques have been described in published papers, these have necessarily been made too concise to meet the needs of readers working without supervision. Accordingly it is proposed to concentrate on problems of this second kind, involving such equations as

$$\nabla^2\Psi = Z(x, y),$$

$$\frac{\delta^2\Psi}{\delta x^2} = k\frac{\delta\Psi}{\delta t},$$

$$\nabla^4\Psi = Z(x, y),$$

. . . . . *etc.*

The course will consist of more or less formal lectures with numerous examples to be solved under supervision. To meet the convenience of those who enrol, it is proposed that lectures be given on Tuesdays-Fridays only, but that facilities for practical work be also provided on Mondays and (if requested) on Saturday mornings. The inaugural lecture will be delivered on Tuesday, July 8, when every student should be present. The fee for the course will be £5, payable to the Imperial College. The college will endeavour to provide bedroom accommodation in its Hostel buildings; but it may prove necessary to restrict the number so accommodated. The daily charge for a room and breakfast would be 7s. 6d.; other meals are obtainable in the college refectory. Separate applications for each individual should be addressed to Mr. D. N. de G. Allen, Imperial College, London, S.W.7, stating (1) the amount of time that can be given to the course, (2) whether bedroom accommodation is desired and if so, (3) whether for the whole period (1) or for that period excluding week-ends.

I.E.E. Installations Section

MEMBERS of the Installations Section of the I.E.E. met in London on Wednesday, for an informal luncheon, with the chairman, Mr. J. F. Shipley, presiding, and supported, among others, by the President, Mr. V. Z. de Ferranti, Miss Caroline Haslett, Mr. L. J. Matthews, chairman, Measurements Section, Prof. Willis Jackson, chairman, Radio Section, Mr. Percy Good, of the B.S.I., and Mr. Andrew Lee, C.E.B.

After some witty remarks by the President—who recalled the early days of installations when, he had been told, more than 80 fires started in London in one night as a result of a rise in voltage—Mr. Shipley made a short speech, in which he said that the Installations Section had about 2 300 members, representing 10 per cent. of the total membership of the institution. Responsible for the safety of installations, it was a section comprising engineers of all types, from contractors to large and small manufacturers. Speaking of the I.E.E. as a whole, Mr. Shipley said he had travelled in many countries but had yet to meet a body with so high a standard, or which performed its duties with such energy.

Mr. Shipley was followed by Mr. L. J. Matthews, who, speaking as a manufacturer, made some remarks about present shortages and the previous day's Budget statement.

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

How does an increase in size of a transformer affect its behaviour?

In designing a transformer as high a flux density as possible is used in order to keep down the amount of iron required—if, however, the value exceeds 10 000-12 000 lines per sq. cm. (1.0 to 1.2 webers/sq. m.) the magnetising current becomes excessive, the transformer may be noisy and there may be trouble due to harmonics. All transformers, therefore, whatever their size, generally employ a flux density within the above range. The current density in the windings is limited by heating considerations and also does not vary over a very wide range in different sizes of transformer; values between 200 and 300 A per sq. cm. being typical.

An increase of n times in the linear dimensions of a transformer, i.e., multiplying all dimensions by n, will result in an increase of n^2 times in the total flux (since flux = B × area of core). Thus, if all dimensions are doubled, the area of the core and therefore the flux will be quadrupled.

Similarly, if the current density is assumed constant, an increase of n times in the dimensions will result in a conductor area of n^2 times and therefore a current of n^2 times.

The well-known e.m.f. equation for the transformer is:—

$E = 4.44\ f\ T\ \Phi$ volts per phase (Φ in webers).

Multiplying both sides of the expression by $\frac{3\ I}{1000}$ gives

$$\frac{3\ E\ I}{1000} = kVA = 4.44\ f\ I\ T\ \Phi\ \frac{3}{1000}$$
$$= k\ \Phi\ I\ T\ kVA.$$

If the dimensions are increased n times, both Φ and I are increased n^2 times, so that the kVA output will be increased n^4 times. Doubling all dimensions of a given design of transformer would thus result in a design having 16 ($= 2^4$) times the output.

Losses and Efficiency.—The iron loss for a fixed flux density is proportional to the volume of iron and similarly, the copper loss, for a fixed current density, is proportional to the volume of copper. Increasing the linear dimensions n times results in an increase of volume of iron and copper, and therefore of the losses, by n^3 times. The loss thus does not increase so rapidly as the output; the loss per kVA varies as $n^3/n^4 = 1/n$, so that the efficiency increases with increasing size. Typical figures are shown in Table I.

Temperature Rise.—The surface area from which the heat produced by the losses must be dissipated increases as the square of the linear dimensions for a given type of tank, i.e., as n^2. The loss to be dissipated per unit area therefore increases as n^3/n^2, i.e., in proportion to n. This means a larger temperature rise for larger sizes. This, however, is not permissible, the temperature rise being fixed at about 30°C for the tank surface, this corresponding to 50 or 60°C in the winding. With larger transformers, therefore, special means must be provided for dissipating the losses. A plain tank is suitable up to about 100 kVA—above this and up to about 10 000 kVA the tank surface area can be increased by the use of ribs, tubes running from top to bottom or by special radiators attached to the tank. Above 10 000 kVA, means must be provided for circulating the oil through a separate cooler.

Reactance.—In the core type of transformer the leakage flux follows an annular path between the high and low voltage windings—if the dimensions are increased n times, the area of this path is increased n^2 times. The length of the path is equal to the height of the winding; the m.m.f. producing the leakage flux is, for a given number of turns, proportional to the current, and the leakage flux *density* produced in the annular space is proportional to the m.m.f. per cm. length. Increasing the dimensions n times thus increases the leakage flux density by $n^2/n = n$ times. Since the area available for the flux increases n^2 times, the increase of leakage flux is n^3 times. The main flux, however, increases n^2 times, so that the percentage leakage flux, and therefore the percentage reactance increases $n^3/n^2 = n$ times. The percentage reactance thus increases with the size of the transformer, although, for a given increase in linear dimensions, it is not so great as the increase in output. Typical values of reactance illustrating this are shown in Table I.

TABLE I.

Transformer Rating kVA	10	100	1 000	5 000	10 000
Efficiency per cent...	97.5	98	98.5	98.75	99
Percentage reactance	3	4	8	9	10

It may be noted that similar considerations apply to rotating electric machines, although other factors tend to complicate the above simple relations.—E. O. T.

Industrial Information

E.W.F. New Members

The Manchester Insulating and Electrical Co., Ltd., 8, Fairfield Street, Manchester, 1, has been elected a member of the Electrical Wholesalers Federation, Ltd.

To Study American Methods

A chance to study American production and administrative methods for one year is being given by Hoover, Ltd., to factory and office workers who have had three or more years' continuous service at the company's factories at Perivale, High Wycombe, Cambuslang or Pentrebach.

Reports on Fuel Economy

In the series of "Reports on Fuel Economy since 1939," the Central Office of the World Power Conference, 201-2, Grand Buildings, Trafalgar Square, London, has now published reports by the Irish Committee (price 6d.) and by the French National Committee (price 1s. 6d.).

War Factory and Refrigerators

The International Refrigerator Co., a subsidiary of Associated Electrical Industries, Ltd., has been allocated the tenancy of a Government war-time factory at Llandudno Junction, North Wales, and will use the premises for the manufacture of commercial refrigerators and for certain engineering works transferred from other factories belonging to the group.

Empire Scientific Conference

The Royal Society has issued a Preliminary Report of the Empire Scientific Conference, held in London in June and July of last year. A brief account is given of each of the morning discussions, together with recommendations adopted at the final session. A list of papers presented by delegates and others is included. The report also contains such recommendations as emerged from certain of the informal discussions held in the evenings.

"Signal Service"

Under the appropriate title of "Signal Service," an admirably produced booklet, illustrated with a large number of interesting photographs, tells the story of the war-time achievements of Pritchett and Gold and E.P.S. Co., Ltd., and Peto and Radford, whose works are at Dagenham Dock, Essex. Signals batteries formed their main contribution to Service requirements, and over five million 2 V units were produced for the Ministries of Supply and Aircraft Production, for tanks and aircraft as well as for airborne equipment, and various secret weapons. At least three completely new types of batteries were developed for the Ministry of Supply. The Parvic micro-porous separator was another war-time development.

National Plastics Deal

National Plastics, Ltd., announce that they have acquired the shares of De La

Televising the E.D.A. kitchen at the Modern Homes Exhibition, while JOSEPHINE TERRY *talks with* PHILLIP HARBEN *about kitchens in general, and electrical appliances in particular*

Rue Plastics, Ltd., from Thomas De La Rue and Co., Ltd., and as and from April 9 the company's name will be changed from De La Rue Plastics, Ltd., to British Moulded Plastics, Ltd. Scottish Plastics, Ltd., and Lanarkite, Ltd., formerly subsidiaries of De La Rue Plastics, Ltd., will now become subsidiaries of British Moulded Plastics, Ltd. An offer is being made to the shareholders of Moulded Products, Ltd., to acquire their shares, and a further announcement will be made in due course. The policy and management of all the factories will remain the same.

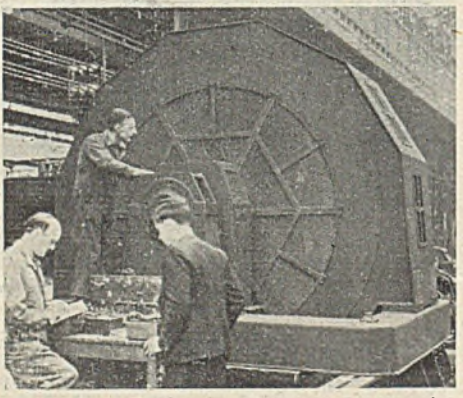
Electricity Supply in Tasmania

The report of the Tasmanian Hydro-Electric Commission for the year ended June 30, 1946, shows that a total of 817 736 491 units of electricity was generated by hydro-electric power in the island during the year, 759 364 120 being generated by the Commission. There was a net profit of £108 744. Sales of electricity in retail supply areas increased from 164 570 988 to 178 965 891 units, or 8.7 per cent., as compared with an increase in consumers from 55 073 to 57 641, or 4.66 per cent. The total of 2 568 new consumers connected represented an increase of 78.3 per cent., contrasted with that for the previous year, and included

1 877, or 73 per cent., in country districts. The Commission's development proposals contemplate the diversion of waters by the construction of canals to augment the supply to the Great Lake Waddamana system and to the Upper Derwent-Tarraleah system, and the commencement of another major power scheme.

All-Welded Induction Motor for Australia

Vast strides have been made in the technique of fabrication of electrical plant with the aid of oxy-coal gas cutting and electric arc-welding equipment. An example of this method of construction is provided by the 900 B.H.P. 163 r.p.m. slip-ring induction motors built by Bruce Peebles and Co., Ltd., Edinburgh, for



All-welded slip-ring induction motor for Australia, undergoing tests at the works of Bruce Peebles and Co., Ltd.

driving tube mills in an Australian cement works. Fabrication of the motors from steel plates resulted in important savings in cost of production, economy in materials, and shorter manufacturing time when compared with castings. Moreover, the method of construction adopted gave the added advantage of increased strength and rigidity. Oil lubricated roller bearings provide for easy starting. The motors are self-ventilated. A powerful stream of air is drawn into the machine by paddle type fans, and propelled through the core ventilating ducts and over the windings, the heated air being expelled through openings in the stator frame.

Warrington Centenary Exhibition

The Centenary Industrial Exhibition, which opens at Parr Hall, Warrington, tomorrow, April 19, and will continue all next week, except Sunday, is designed to show the progress of the county borough's industries during the last 100 years. The organisers on behalf of the Corporation are Ultra Displays, Ltd. The exhibitors include Salford Electrical Instruments, Ltd., South Avenue, Warrington, whose display of a selection of instruments made by them has particular emphasis on post-war requirements and includes the "Selectest" and "Miniscope" of special interest to radio-service men; the British Aluminium Co., Ltd.; Electro-Hydraulics, Ltd., Warrington, showing a conveyancer lifting truck and electro-hydraulic and electrical equipment; and the Corporation electricity department with models of generating plant installed at the new generating station at Howley, cable exhibits and industrial metering equipment.

New Housecraft Association

IT will be remembered that following the E.A.W. luncheon at Blackpool on June 25 last, both Mrs. F. N. Rendell Baker and Ald. Sir William Walker, referred to the possible formation of an association designed to watch the interests of electrical demonstrators. Since that date there has come into being the Association of Electrical Housecraft Advisors, with Miss M. G. Gosse as chairman, and Mrs. J. Pavitt as treasurer.

An opportunity of meeting Miss Gosse was accorded us last week when it was explained that the association, consisting as it does mainly of the established women in the industry, has for its primary aim the promotion of high standards of pride of service among its members. "But," says Miss Gosse, "we need 100 per cent. membership if our work is to be professionally effective in stimulating the right type of 'career consciousness' and professional attitude to the job among the younger women coming along. At the same time, the association exists to keep an eye on the conditions of work among members, and naturally, in this connection, it is interested in maintaining an adequate salary scale for them. That there is need for a professional association to cover the special needs of the trained women within the industry has been a widespread feeling for many years. It was, however, the newer situations and social developments ariisng from the war that hastened its formation. Now there are approximately 150 members."

In view of the fact that war-time removals and subsequent changes of address among the more experienced women in the industry have made it difficult for everyone to be notified of the formation of the association personally, Mrs. A. A. Windsor (hon. secretary), of 39, Sharon Gardens, Hackney, London, E.9, will be delighted to hear from them, and to send on particulars of membership.

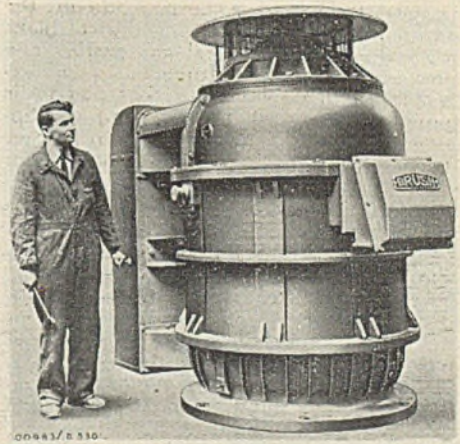
What Manufacturers Are Doing

Brush Electrical Orders and Achievements

THE steady expansion in export trade is reflected in the large volume of overseas orders on hand in the Falcon Works of the Brush Electrical Engineering Co., Ltd., at Loughborough. Contracts received or completed last year for generating plant exceeded 200 000 kW, a large proportion being for oil-engine driven alternators. Bookings included thirty-five 100 kW and 220 kW low-tension sets for the Argentine Government and a number of 930 kW 3 300 V units for industrial installations in Buenos Aires. Other large orders for this type of plant were received from countries as widely separated as Iceland and Australia, Finland and India. Among oil-engine generating sets for Australia are six 750 kW, 7 200 V salient-pole alternators. Several 1 500 kW low-tension and 7 000 kW 6 300 V Brush Ljungstrom turbo-alternator sets have been completed for the U.S.S.R., as well as a 3 750 kW 11 000 V unit for a large steel works.

An interesting order completed for South Africa consisted of six 600 H.P. vertical squirrel cage induction motors for driving ash-disposal pumps in the open at 3 500 ft. above sea level. These were four-pole machines, of totally enclosed fan-cooled construction, the rotor being suspended by a Michell thrust-bearing. Starting is by switching direct on to the line at 2 200 V.

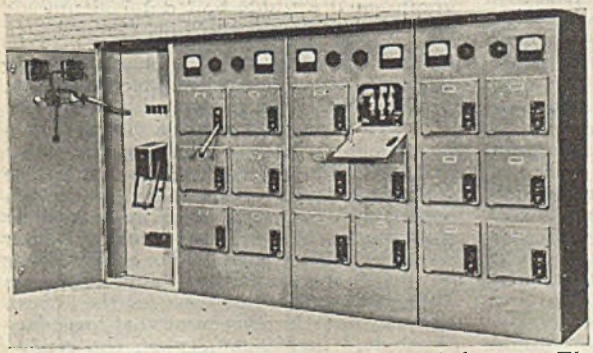
Approximately 850 000 kVA of transformers on order or completed, ranged from 20 000 kVA three-phase (33/11 kV) units for the C.E.B., Neath, down to small 5 kVA single-phase distribution transformers of surge-proof design for the Electricity Supply Board, Eire. Over half of the export orders were for Sweden. Many of the transformers incorporate on-load tap-changing gear. Numerous distribution transformers for Russia, Jugoslavia, India, South Africa and for the French Purchasing Commission have been completed and shipped.



600 H.P. pump motor for ash disposal plant at Klip power station, South Africa

A considerable amount of research and development work has been done in connection with impulse tested, surge-resisting transformers for use in areas where lightning disturbances are frequent. While activity in the switchgear works has been devoted mainly to the production of control boards for engine-driven alternators, 11 kV 250 MVA ring main units and standard industrial power switchgear, several new developments of interest have taken place. A range of low-tension, heavy current, vertical draw-out oil circuit-breakers has been produced for use up to 3 000 A, also low-tension horizontal draw-out industrial iron-clad switchgear.

Developments in the company's range of low-tension switch-fuse distribution gear to line up with existing flush-fronted circuit-breaker cubicles have produced a new style of factory sub-station switchboards.



Oil circuit-breaker unit matched to fuse-switch-gear. The door of the circuit-breaker unit is opened to show operating mechanism. A push trip on the front of the door permits emergency opening of circuit-breaker with the door closed

Book Reviews

Reference Data for Radio Engineers, compiled by W. L. MoPherson, B.Sc., M.I.E.E., S.M.I.R.E. (London: Standard Telephones and Cables, Ltd.) Pp. 175. Price 5s. net.

This now well-known book of data made its first appearance in 1942, and its possession, in those days, was a matter for some considerable satisfaction. Since then, it has run through several reprints, and it now appears in a new and enlarged edition. Many of the general engineering and mathematical tables will be of value to technicians in all branches of electrical engineering, but it can be fairly confidently stated that, for the radio engineer, so many valuable tables and formulæ have not before been collected together in so handy and moderate-priced a volume. Amongst the new sections, there is considerable material on very-high frequency technique, with special emphasis on wave-guides and resonators, and there are also useful formulæ for the analysis of the now important pulse waveforms. A minor error, on p. 25, is that supplies in Great Britain are to be standardised at 230 V.

Factory Management, by P. H. Billington. "Mechanical World" Monograph, No. 34. (Manchester: Emmott and Co., Ltd.). Pp. 111. Price 3s. 6d. net.

The reader might infer, from Mr. Billington's opening paragraph, that his book was directed only to those about to establish factories of their own, and that it had little application to the less ambitious. To fail to read it on that account, however, would be a pity, because the author has succeeded, by taking a broad view, in presenting a considerable amount of information about the running of an industrial organisation. In a large concern, the staff employee may work for many years without gaining much impression of the business as a whole. To these, this book will form a useful introduction. Mr. Billington begins with the general organisation of a firm and describes the duties performed by directors, various officials and works committees, and later discusses the layout of plant and buildings. The book then outlines drawing office procedure, production control and the duties of the various non-productive departments. Considerable use is made of text figures illustrating the typical forms and returns required in day-to-day administration, and at the end, there is a survey of the various items of legislation involved in the employment of labour. The author writes with a personal style which makes for easy reading in an introductory book of this nature, and his work is a useful addition to this series of monographs.

An Introduction to Transmission Lines.—By C. J. Mitchell, A.M.I.E.E. (London: Geo. C. Harrap and Co., Ltd.). Pp. 64, with 30 figs. Price, 3s. 6d. net.

The necessity, during the war, of giving to some thousands of semi-technical service students a working acquaintanceship with the somewhat esoteric subject of transmission line theory, led to the evolution, in many training centres, of a streamlined and almost non-mathematical method of instruction. Of this technique, Mr. Mitchell's little book is a fair example, which will be welcomed by many who lack the mathematical equipment to follow recognised works on line theory. With a liberal use of diagrams and vectors, and developing his mathematical expressions in detail, the author begins with the characteristics of the infinite line and then explains the mechanism of standing and travelling waves and the significance of characteristic impedance. He ends with a chapter on quarter-wave transformers and other forms of impedance matching. The section dealing with the behaviour of d.c. pulses on finite lines is of particular value, in view of the importance of the subject in radar and pulse communication techniques. Little more than basic algebra, trigonometry and vectors is required for a thorough understanding of Mr. Mitchell's treatment. In these circumstances, it is a pity that a paragraph on "j" notation did not precede its introduction, in the first chapter.

Patents of Invention.—By A. A. Gomme. (London: Longmans, Green and Co., for the British Council.) Pp. 48, with seven plates and a chart. Price, 1s. 6d. net.

If Great Britain cannot claim to be the birthplace of the patents system, it has, at least, by its patent laws, had much to do with the present day systems of other countries. Mr. Gomme, who, retiring after 40 years' service in the Patent Office in 1944, has written this book for the British Council, finds his first somewhat legendary "patent" in 500 B.C., when the confectioners in the Greek colony of Sybaris were granted one year monopolies for the manufacture of any "peculiar and exclusive dish." The true ancestry of British patents, however, he traces from 1552, since when just under one million applications have been granted.

Electricity Supply

Cardiff.—Mains extensions and the erection of sub-stations will cost £19 936.

Battersea.—Sanction has been obtained to borrow £10 195 for mains and £6 630 for plant.

Barrow-in-Furness. — Industrial consumers in the rural area are to be supplied, at a cost of £39 600.

Wallasey.—The Electricity Committee has obtained sanction to borrow £29 890 for mains, services, etc.

Sheffield.—It is planned to extend mains at a cost of £13 780, and sanction has been obtained to borrow £25 000 for meters.

Darlington.—Sanction has been requested to borrow £52 185 for the laying of h.t. feeder cables. Four new sub-stations are proposed.

Exeter.—The sanction of the Commissioners is being sought to borrow £10 000 for mains and services, £3 000 for transformers and sub-station equipment and £6 000 for domestic apparatus.

South Shields.—The Town Council is to increase the capacity of the Prince Edward Road sub-station from 250 to 500 kW, by the installation of a rectifier cubicle and the necessary switchgear. The alterations will cost £1 450.

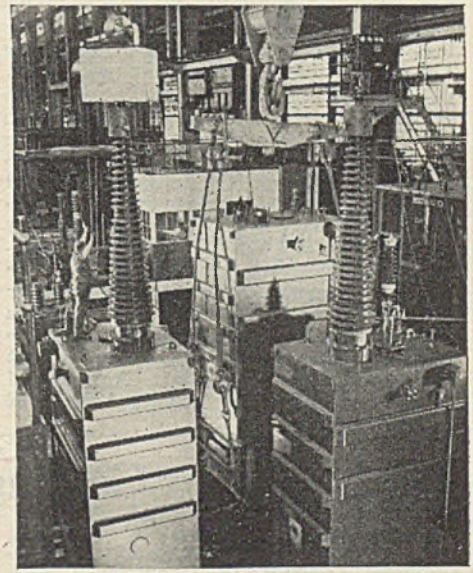
Hull.—Capital expenditure of £639 660 for 1948-9, and £564 770 for 1949-50, has been approved by the Electricity Committee. This will include a sum of £30 000 for a two-year plan for new and modified electric street lighting installations.

Liverpool.—A sum of £21 855 is to be borrowed for the purchase, from the Ministry of Supply and the Ministry of Aircraft Production, of plant and switchgear connected with the supply of electricity to three factories in East Lancashire Road.

Birkenhead.—The Electricity Committee has obtained sanction to borrow £50 000 for mains and services, £19 688 for supply to two housing estates, £2 754 for factory supply, and £5 000 for various purposes. Sub-stations are to be provided on three estates, at a cost of £17 353.

Birkenhead.—Consent for the final extension of the power station by a further 50 000 kW set has been obtained. The Electricity Committee has obtained sanction to borrow £8 438 for sub-station equipment, £11 124 for switchgear and transformers and £7 429 for mains and services.

Blackpool.—After meeting a deputation from the electrical contractors in regard to wiring charges, the Electricity Committee has agreed upon the following schedule as a temporary expedient: cookers, £1 plus 1s. 6d. per ft. run, and washboilers, immersion heaters, etc., 15s. plus 1s. 3d. per ft. run. The Committee is in communication with other authorities to ascertain prices paid.



Three transformers for 500 000 V transmission in the test pit of Westinghouse Electric Corporation's transformer division. Each, 37 ft. high, is being built for the American Gas and Electric Service Corporation's experimental line near Brilliant, Ohio. The test is to determine the feasibility of transmitting power over longer distances at greater voltages than before attempted. A 287 000 V line is already used to transmit power over a distance of approximately 250 miles.

Poole.—The initial work of preparing the site for the £7 000 000 power station to be erected by the Bournemouth and Poole Electricity Supply Co. at Noles Bay, Poole Harbour, is now almost completed. The 30-acre site, which is nearly all under water at high tide, has provided an immense task of reclamation. For this purpose, about 216 000 tons of chalk brought from the hills near Sturminster Marshall, eight miles away, have been used

since the work began last June. Before the foundations of the station could be begun the site had to be surrounded by two rows of sheet piling driven about 20 ft. into the clay. Between the piling thousands of tons of silt and clay were excavated and the space thus created filled with concrete. Surrounding the site will be a concrete wall about 15 ft. wide and 20 ft. deep. Initially the station will accommodate three 50 000 kW sets of generating plant, but provision will be made for a fourth set of the same capacity to be installed. The scheme includes two 310 ft. chimneys. Generation will begin, it is expected, in 1950 or 1951.

Southport.—Speaking on a decision to advance the town rate by one shilling to 12s. 6d. in the £, the Chairman of the Finance Committee (Counc. Barber) stated that the estimated increase in the income of the electricity undertaking for the year 1946/7 was £20 950. Expenditure, however, had increased by £26 482 and the gross profit was therefore reduced by £5 522. Interest and sinking fund charges were slightly less than last year, with the result that at £7 068 the estimated net profit was down by £5 267. A figure of £11 734 would be added to the balance of £56 576 brought forward at April 1, 1946, giving a total available balance of £68 310. Of this had been paid £2 186 in aid of the general rate for 1946/7, £4 653 for items of capital expenditure, £1 104 for change-over of consumers' apparatus and £110 for purchase of a ground rent, making a total of £8 053. The estimated balance to be carried forward at March 31, 1947, was £60 257. Referring to the Electricity Bill, Counc. Barber said that the approximate amount of the loans outstanding at Southport on March 31, 1947, was £148 549, while the reserves of the department on the same date totalled approximately £139 720, which was only £8 829 less than the outstanding debt. For this sum, therefore, the Government would acquire an undertaking with capital assets amounting to £1 050 743 belonging to the ratepayers. In addition, he continued, the corporation would lose the contribution in aid of rates.

Eccles.—At a cost of £12 982, works held up by the war are to be resumed. Two new sub-stations will be erected, and existing equipment in four other sub-stations will be replaced by 500 kVA transformers. The work will also include the laying of l.t. cables.

Coming Events

Friday, April 18 (To-day)

ILLUMINATING ENGINEERING SOCIETY, BIRMINGHAM CENTRE.—At Imperial Hotel. "Portable Photometers," by J. S. Preston. *6 p.m.*

I.E.E., N. EASTERN STUDENTS' SECTION.—Newcastle-on-Tyne. Visit of Mr. J. H. Reyner. "Compressed Air Equipment for Air-Blast Circuit Breakers," by J. L. Morris. *6.30 p.m.*

I.E.E., N. WESTERN STUDENTS' SECTION.—At the Engineers' Club, Manchester. "The Layout and Design of Electric Power Stations," by J. C. Goward. *6.45 p.m.*

Saturday, April 19

I.E.E., N. EASTERN CENTRE.—Newcastle-on-Tyne. Visit to Newcastle and District Electric Lighting Co.

Monday, April 21

I.E.E., MERSEY AND N. WALES CENTRE.—Liverpool. Annual General Meeting. *6 p.m.*

I.E.E.—London. At the Central Hall, Westminster. Faraday Lecture. "The Generation and Wholesale Distribution of Electricity," by J. Hacking. *6 p.m.*

BIRMINGHAM ELECTRIC CLUB.—Birmingham. At the Grand Hotel. "Television," by J. H. Watson. *6.30 p.m.*

Tuesday, April 22

INSTITUTION OF MECHANICAL ENGINEERS, S. WALES BRANCH.—Cardiff. "The Prospects of the Steam Cycle in the Central Power Station," by G. H. Martin.

I.E.E., S. MIDLAND CENTRE, RUGBY SUB-CENTRE.—Annual General Meeting. *6.45 p.m.*

I.E.E., N. WESTERN CENTRE.—In the Great Hall, Manchester College of Technology. Faraday Lecture. "The Generation and Wholesale Distribution of Electricity," by J. Hacking. *7.30 p.m.*

COVENTRY ELECTRIC CLUB.—"Nylon Yarn and Its Uses," by D. C. Bennett. *6.30 p.m.*

INSTITUTE OF PHYSICS.—London. Group Annual Meeting and Paper, "Electron Multipliers," by S. Rodda. *5.30 p.m.*

I.E.E., E. MIDLAND CENTRE.—Cambridge Radio Group. At the Cambridgeshire Technical College. "Dielectric Phenomena at High Radio Frequencies," by Prof. Willis Jackson. *6 p.m.*

I.E.E., SCOTTISH CENTRE.—Glasgow. At the Royal Technical College. "The British Grid System in War-time," by J. Hacking and J. D. Peattie. *6.15 p.m.*

I.E.E., N. MIDLAND CENTRE.—Leeds. At the Great Northern Hotel. "Industrial Applications of Electronic Techniques," by H. A. Thomas. *6 p.m.*

Wednesday, April 23

I.E.E.—London. Radio Section. "New Possibilities in Speech Transmission," by D. Gabor. *5.30 p.m.*

Thursday, April 24

I.E.E., SOUTHERN CENTRE.—Southampton. At the Institution of Mechanical Engineers. "Aids to Navigation."

I.E.E.—London. At the Kingsway Hall. Thirty-Eighth Kelvin Lecture. "Electrical Discharge Through Gases," by Prof. L. B. Loeb.

Friday, April 25

I.E.E., N. EASTERN CENTRE.—Newcastle-on-Tyne. Annual General Meeting. *6.15 p.m.*

I.E.E.—London. Measurements and Transmission Sections. "Ultra-High Speed Relays in the Fields of Measurement and Protection," W. Casson and F. H. Last. *5.30 p.m.*

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 Board of Trade, Millbank, London, S.W.1 (corner Horseferry Road), unless otherwise stated :—

Newark, April 21.—Supply and delivery of: (a) 11 kV ring main unit; (b) l.t. switchboard. Specifications from Borough Electrical Engineer, Municipal Buildings, Baldertongate, Newark.

Manchester, April 21.—Supply and delivery, for one year, of meters and street-lighting lanterns for 300/500 W tungsten lamps and 500/1 000 W tungsten lamps. Specifications from Chief Engineer and Manager, Electricity Department, Town Hall, Manchester, 2.

Heywood, April 21.—Tenders for: (a) Supply and delivery of one 5 000 kVA, three-phase, 50 cycles, oil-immersed naturally cooled transformer for outdoor installation, ratio 11/6.6 kV; (b) supply and laying of 5 000 yds. 0.3 sq. in. 11 kV cable. Specifications from Borough Electrical Engineer, Electricity Department, Egerton Street, Heywood.

Ebbw Vale, April 21.—Supply and delivery of electricity meters for year ending March 31, 1948. Specification from Electrical Engineer, Council Offices, Ebbw Vale, Mon.

Heston and Isleworth, April 26.—Supply and delivery of one 10 cwt. electric vehicle (enclosed van type). Particulars from Borough Electrical Engineer and Manager, 11, Staines Road, Hounslow.

Middlesbrough, April 26.—Supply and delivery of: (a) one 11 kV, three-phase oil-immersed and compound filled metal-clad ring main tee-off unit, comprising two oil-break isolators and one circuit-breaker; (b) one 250 kVA, 11 000/440/250 V three-phase oil-cooled indoor transformer; (c) one meter testing set, single-phase, 0/500 V, 0/100 A. unity/zero power factor, complete with voltmeter, ammeter and power-factor meter and suitable for use on 240 V, single-phase supply or a three-phase four-wire 415/240 V, 50 cycles supply. Specification for items (a) and (b) from Borough Electrical Engineer. Corporation Electricity Department, Snowdon Road, Middlesbrough; deposit, £1 1s. each.

Newcastle-under-Lyme, April 29.—Supply and delivery of: (a) one 500 kVA rectifier, with transformer; (b) sub-station switchgear, comprising 14 panels for 11 kV and seven for 400 V, with ancillary equipment; (c) four 250 kVA, one 400 kVA and three 500 kVA sub-station transformers. Specifications from Messrs. Mackness and Shipney, Consulting Engineers, Parliament Mansions, Abbey Orchard Street, London, S.W.1.

Blackpool, April 30.—Supply and delivery of p.i. lead covered underground cables for 12 months. Specification from Borough Electrical Engineer, Electricity Offices, Shannon Street, Blackpool.

Cleethorpes, April 30.—Supply and delivery of l.t. cables. Specification from Electrical Engineer and Manager, Grimsby Road, Cleethorpes.

Madras, May 1.—Supply, delivery, erection and commissioning of transformers having the following ratings, for the Basin Bridge "B" power station, Madras: Two of 7 500 kVA, 11/5 kV; two of 1 750 kVA, 11 000/415 V; one of 1 250 kVA, 11 000/415 V and two of 200 kVA, 415/415 V. Copies of form of tender and specification from Merz and McLennan, Milburn, Esher, Surrey; deposit, £5 5s.

Spenborough, May 2.—Supply and delivery of mercury discharge street lighting equipment. Specification from Electrical Engineer and Manager, Electricity Department, 24, Market Street, Cleckheaton, Yorks.

Salford, May 3.—Supply of: (a) 500 MVA, 33 kV, metalclad switchgear; (b) four 15 000 kVA, 33/6.6 kV transformers; (c) 4 300 yds. 0.3 sq. in., 33 kV, three-core cable; (d) four neutral earthing resistors; (e) 250 MVA, 6.6 kV, metalclad switchgear. Specifications from City Electrical Engineer, Electricity Department, Frederick Road, Salford, 6.

Hastings, May 5.—Supply, delivery and erection at Broomgrove power station of one 11 kV, three-phase, 500 MVA, rupturing capacity switchboard, comprising five units. Specification from Borough Electrical Engineer and Manager, York Buildings, Hastings.

Sale, May 5.—(a) Supply, delivery and laying of 1 700 yds. 0.2 sq. in., 6.6 kV cable and the laying of 1 200 yds. 0.25 sq. in. l.t. cable in same track; (b) supply and delivery of two 500 kVA, three-phase standard indoor core-type double-wound O.N. cooled transformers. Specifications from Borough Electrical Engineer, Town Hall, Sale, Manchester.

Plymouth, May 10.—Supply, delivery and erection of one 100-ton, overhead electric travelling crane. Specification from City Electrical Engineer, Armada Street, Plymouth.

Dartford, May 10.—Provision of additional light points in houses on the Council's estates. Specification from Town Clerk, Town Clerk's Office, Dartford, Kent.

Company News

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—The directors have declared a dividend of $1 per share on the issued ordinary shares of no par value, payable June 2, 1947, to holders of record at the close of business on April 11, 1947.

SHANGHAI ELECTRIC CONSTRUCTION CO.—It has been officially stated that notices have been sent to this British owned company, which operates tramway and trolley-'bus services in the former International Zone of the city, that their permit to operate has been extended for a period of seven years. The permission would otherwise have expired on October 10.

VENNER TIME SWITCHES, LTD.—A forthcoming issue of 432 000 Ordinary shares of 5s. each, which will be offered to existing ordinary stockholders at 9s. per share in the proportion of one new share for every 5s. nominal of Ordinary stock held, is announced. The net proceeds of the issue will be applied towards repaying the temporary bank advances obtained by the company to meet its greatly increased requirements in respect of permanent working capital.

E. K. COLE, LTD.—Trdg. prft. for yr. to Sept. 30, £160 392 (£265 500). Deduct dirs.' fees £3 000 (same), deprecn. £35 376 (£34 035), taxn. res. £61 500 (£131 000), lvg. net prft. £60 516 (£97 465). Pref. and pfd. ord. divs. absorbed £13 998 (£13 332) and a 3% (same) ptpg. div. on prefd. ord. £3 044 (£2 767), fin. ord. div. 12%, mkg. 20% (same), gen. res. nil (£50 000); fwd. £98 005 (£76 758). Floating assets £1 513 205 (£1 415 447) and curr. liab., incldg. bank overdraft, £333 523 (nil), £977 004 (£770 649). Prft. and loss acct. of Ensign Lamps, which are appended to E. K. Cole accts., show trdg. prft. 15 mos. to Sept. 30, £9 133 (£27 394, 12 mos.), plus rent of fixed assets from parent co. £4 250 (£4 491), and net prft. £4 538 (£11 363).

INTERNATIONAL COMBUSTION, LTD.—Trdg. prft. to September 30 £257 812 (£237 062). Add divs. from invests., etc., £15 522 (£4 212), mkg. prft. £273 334 (£241 274). To fees, deprecn., etc., £39 567 (£34 991), lvg. £233 767 (£206 283). To E.P.T. £37 500 (£30 186), inc.-tax £107 218 (£104 613); net prft. £89 049 (£71 484). Div. on pref. £4 725 (same), intm. 10% (5) on ord. £19 343 (£8 792), fin. div. on ord. 22½% £43 523 (27½% £48 359), cash bonus 5%, mkg. 37½%, less tax (32½), £9 672 (nil), fwd. £112 789 (£101 003). Consd. blce-sheet shows curr. assets £3 245 314. Current liabilities £2 615 186. Consolidated profits £279 727. With divs., etc., total is £296 318. Deduct fees, depcn., invest. res. and patents written off £52 046, taxn. £155 223, lvg. net prft. £89 049.

HOOVER, LTD.—Speaking at the annual meeting, Mr. C. B. Colston (chairman) said that he believed the company's electric cleaners were the only manufactured products of importance in the country which were now being marketed on a large scale at pre-war prices. This had been achieved partly as a result of increased efficiency of production and in a greater measure to substantial economies in the costs of distribution. The distribution cost was bound to increase in the future, when we changed from a sellers' market to a buyers' market, but by then technological improvements would have been introduced to enable them to avoid any increase in the price of the cleaners. Substantial progress had been made in the manufacture of F.H.P. motors at the new Cambuslang factory, although 30 per cent. of the workers had been put off as a result of steel shortage, and at High Wycombe their new type of commutator, which they believed to be a great improvement, was in full production. Passing on to review some of the other new products of the company, the Chairman disclosed that in a new factory which was being set up in Merthyr Tydfil they would manufacture a small electric washing machine, constructed, he claimed, on an entirely new principle. It would be, he believed, the lowest priced machine of good quality on the market, and would do a better job in a shorter time than any other they had been able to test. Failing major economic dislocations, it was hoped that production would start this autumn. There were large potential markets in Great Britain and overseas.

CENTRAL STATES ELECTRIC CORP.—The Trustees have announced a payment to holders of the 5 per cent. Convertible Debentures, series due 1948, and the Optional 5½ per cent. Debentures, series due 1954, on account of the principal amount of $100 for each $1 000. British holders of the Convertible Debentures, desiring to obtain payment, should communicate with the Central Hanover Bank and Trust Co., 7, Princes Street, London, E.C.2, and holders of the Optional Debentures with the Chase National Bank, 6, Lombard Street, London, E.C.3, for information. It is pointed out that power is reserved to direct that at any time after September 24, 1947, the balance of the funds set apart for this payment and not paid to Debenture

(*Continued on p.* 1030)

holders shall be returned to the trustees of the debtor as general assets of the estate. The Corporation, a general investment trust, has been in bankruptcy since July, 1942, and this is the first payment in respect of these Debentures to be made during the pending reorganisation proceedings.

United Kingdom Provident Institution

IN his statement to members of the United Kingdom Provident Institution on Wednesday, Sir Ernest Benn, chairman, said that the year 1946 was a period of exceptional difficulties, enhanced by the general sense of disappointment at the absence of reliefs expected to come from the ending of the war. " Our figures continue, on paper, the story of our uninterrupted progress, and as our obligation is to deliver benefits, when due, in pounds sterling, the technical position of the institution is stronger than ever." The institution, continued the chairman, had yet to experience the full effects of the nationalisation policy, now engaging the attention of Parliament and the Government. The institution held between three and four millions of stocks which had been, or were due to be, compulsorily exchanged into what were called gilt-edged securities. In some cases, as for instance coal, it would take time before the loss of income caused by the exchange could be accurately measured. In others, such as railways, it was possible to make close estimates on the assumption that the schemes now before Parliament reached the final stages without amendment. With gas and electricity they still awaited the detailed proposals, but, when all these risks were added together, the loss of income to be suffered by the institution might well be in the neighbourhood of £100 000 per annum. The nationalisation of further industries would, of course, enlarge the loss: £100 000 was 7½ per cent. of their total income from all investments, including mortgage interest and rents: if quoted Stock Exchange securities were the basis of the calculation, then 15 per cent. was the nearer measure of loss of income with which they were threatened.

The accumulated funds of the institution amounted in round figures to £30 000 000 and the sums assured by policies totalled £65 000 000. The interest on funds, added to premium income, had therefore to provide rather more than half of the total benefits which members looked to receive as and when their policies qualified for claims. It followed that if interest rates fell, rates of premium must rise. The shallow impression that cheap money was only a matter of concern to the wealthy should be corrected by a wider knowledge of the affairs of provident trusts such as theirs. The average value of their policies on maturity was £700 and the average personal share in total funds was seen to be, at the present cash value, a little over £300. The loss of £100 000 a year interest might be thought to be of minor importance to a great life office whose financial position was impregnable, but if that loss was considered as a new tax of a pound a year upon all those thrifty people who in their careful way had accumulated a capital sum of £300, one of the results of the nationalisation of industry became easier to understand.

Cheap money, against which he, the chairman, had always protested, had provided them with a very considerable enhancement, or inflation, of capital values, but the calculations on which insurance contracts were based were concerned almost entirely with income. A low rate of premium assumed a high rate of interest and *vice versa*: a good bonus was contingent upon a good income-earning capacity.

Metal Prices

		Monday, Price	Inc.	April 14 Dec.
Copper—				
Best Selected (nom.)	per ton	£135 10 0	—	—
Electro Wire bars	„	£137 0 0	—	—
H.C. Wires, basis	„	£155 0 0	—	—
Sheet	„	£178 10 0	—	—
Bronze Electrical quality 1% *Tin*—				
Wire (Telephone) basis	per ton	£177 15 0	—	—
Brass (60/40)—				
Rod basis	„	1s. 2¼d.	—	—
Wire	„	1s. 6½d.	—	—
Iron and Steel—				
Pig Iron (E. Coast Hematite No. 1)	per ton	£8 19 0	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in.	„	£34 5 0	—	—
Mild Steel Tape (Cable Armouring) basis 0.04 in.)	„	£21 15 0	—	—
Lead Pig—				
English	„	£91 10 0	—	—
Foreign and Colonial	„	£90 0 0	—	—
Tin—				
Ingot (minimum of 99.9% purity)	„	£440 10 0	—	—
Wire, basis	per lb.	5s. 6¾d.	—	—
Aluminium Ingots	per ton	£80 0 0	—	—
Spelter		£70 0 0	—	—
Mercury (spot)	per bott.	£21 0 0	—	—

Prices of galvanised steel wire and steel tape supplied by C.M.A. Other metal prices supplied by B.I. Callender's Cables, Ltd. The latter prices are nominal only and do not include any allowances for tariff charges.

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 creaion, as shown in the annual summary, is given—matked with an *—followed by the date of the summary, but such total may have been reduced.*

TELEFUSION, LTD., Burnley.—February 21, charge, to Burnley Building Society securing £2 000 and any other money, etc.; charged on 160, Warwick Road, Derby. *£1 476. May 30, 1946.

THERMO PLASTICS, LTD., Dunstable.—February 28, charge, to Midland Bank, Ltd., securing all moneys due or to become due to the Bank; charged on freehold land at Luton Road, Dunstable, for site of new factory. *Nil. December 31, 1945.

BRENTFORD TRANSFORMERS, LTD. (formerly BRITISH RADIO ELECTRICS, LTD.), London, S.E.—February 24, mortgage, to Swiss Bank Corporation, securing £3 200 and any further advances; charged on sundry lathes, cutting and grinding machines, plant and equipment. *Nil. October 9, 1946.

A. E. POWELL, LTD., Richmond, Surrey, wireless dealers.—February 26, debenture, to British Mutual Bank, Ltd., securing all moneys due or to become due to the Bank; general charge. *Nil. October 24, 1946.

QUALRAD PRODUCTS, LTD., Richmond, Surrey, manufacturers of wireless apparatus.—February 26, debenture, to British Mutual Bank, Ltd., securing all moneys due or to become due to the Bank; general charge.

HIRE-A-RADIO (NORTHERN), LTD. (formerly HASLINGDEN RADIO RELAY CO., LTD.), Newchuch-in-Rossendale.—February 25, £500 debenture, to G. Clayton, Waterfoot; general charge. *£500. September 22, 1946.

ELECTRONIC DEVELOPMENTS (SURREY), LTD., Surbiton.—February 21, £2 500 debenture, to Branch Nominees, Ltd.; general charge.

INTERBORO ELECTRICAL INSTALLATIONS, LTD., London, N.W.—February 13, £500 debenture, to Mrs. C. M. D. King, Bath; general charge.

Satisfactions

G. E. T. INSTALLATION CO., LTD., London, W.C., electrical engineers.—Satisfaction February 20, £2 000, registered April 26, 1939.

RADIO TRADERS, LTD., London, W.C.—Satisfaction February 13, £800, registered December 12, 1936, and £400, registered January 27, 1939.

ELECTRICITY DISTRIBUTION OF NORTH WALES AND DISTRICT, LTD., Wrexham.—Satisfaction February 12, £36 770, registered January 4, 1935.

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 book within 21 days.*

STAIT-GARDNER, Eric, 158, Holders Hill Road, Mill Hill, Mddx., wireless dealer. £34 7s. 9d. February 5.

BRISCOW, W. H. (sued as a firm), 196, Oldham Road, Failsworth, Lancs, radio engineers. £14 18s. 9d. November 27.

WHITEHOUSE, G. (male), 29, Walsall Road, Fallings Heath, Staffs, electrical dealer. £17 4s. 11d. November 29.

ELLIS, W. C. (male), 95, College Road, Moseley, Warks, electrical contractor. £20 18s. 2d. November 25.

MOORE, Wilfrid Henry, 429, Stourport Road, Kidderminster, Worcs, electrical engineer. £11 11s. November 26.

SWARBRICK, J. (male), Church Street, Garstang, Lancs., radio services. £11 4s. 1d. January 31.

LACKIE, W. L. (male), 38, High Street, Pwllheli, Flint, radio dealer. £49 9s. 6d. February 5.

MANBY, Kenneth Wm., 199, London Road, Stoke-on-Trent, radio dealer. £10 15s. 6d. January 30.

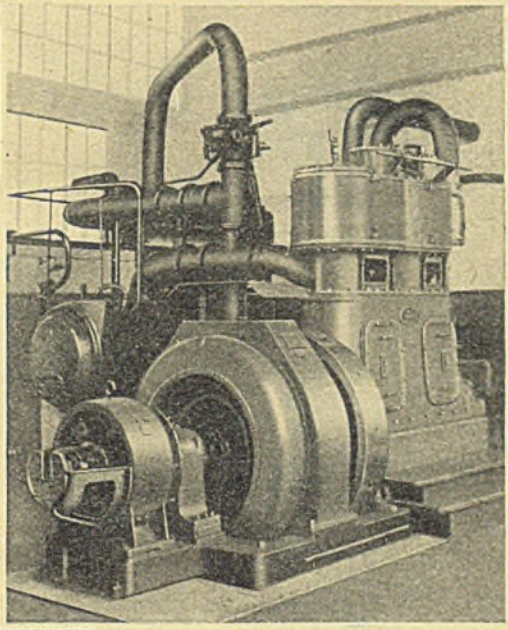
SAVAGE RADIO SERVICE (a firm), Ness Road, Shoeburyness, radio dealers. £22. January 30.

Adjudications

BROOKS, Albert Edward George, trading as Bertken Electrical Installations, at 213, Boston Road, London, W.7, electrical engineer. Court: Brentford. Date of Order, March 10, 1947. Date of Filing Petition, January 30, 1947.

JACKSON, Charles Joseph, "Cot Letitia," East End Lane, Ditchling, Sussex, radio and electrical engineer, carrying on business at 14, Newburgh Street, Regent Street, London, W.1, formerly at Tower Works, Clapham, London, S.W.4, under the style of Industrial Amplifier and Telephone Company, electrician. Court: High Court of Justice. Date of Order: March 11, 1947. Date of Filing Petition: February 11, 1947.

Electrical Generation



375 B.Hp. 375 r.p.m. Browett Lindley Steam Engine driving a Metrovick 250 kW 4,000 Volt Generator at a Chinese Coal Mine.

The Metropolitan-Vickers Electrical Co. Ltd. can supply Engine Type Generators from the smallest unit to 1,000 kW. and upwards.

For all types of Engine Driven Generators send your enquiries to:

ASSOCIATED ELECTRICAL INDUSTRIES LTD.

AEI

METROPOLITAN Vickers

ELECTRICAL CO., LTD.

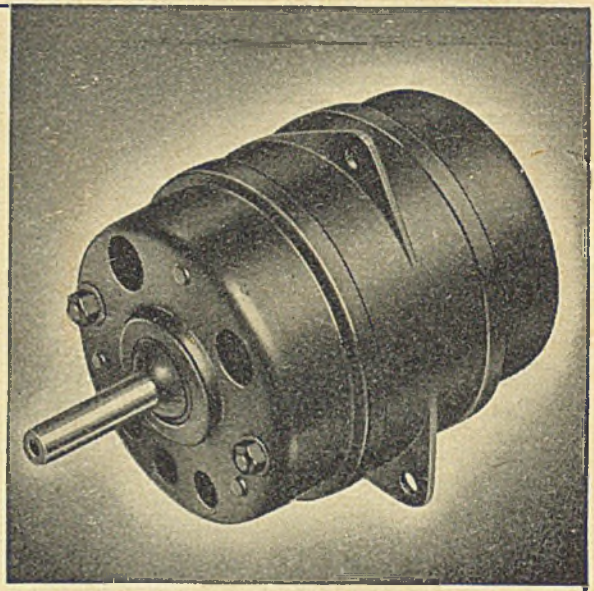
TRAFFORD PARK · MANCHESTER 17

C/A602

Another new HOOVER product to be launched shortly

SHADED POLE MOTORS

of entirely new design



If you make Refrigerator condensers, Air conditioning units, Room Heaters, Fans, or similar appliances you will find these motors particularly effective on account of their

high starting Torque
silence in operation
reliability

and we would strongly advise that you get in touch with us now as to your future requirements.

ALSO FRACTIONAL H.P. MOTORS

Squirrel Cage Induction Motors. Split Phase, Capacitor or Three Phase Types. Solid or Resilient mounting. Ball or Sleeve Bearings.

H.P.	Overall Length	Body Diameter	Approx. Weight
1/6	10 7/32 in.	6 9/16 in.	24 lbs.
¼	10 15/32 in.	6 9/16 in.	26 lbs.
½	11 25/32 in.	6 9/16 in.	36 lbs.

Performance curves and data on other types supplied on request.

TWO TYPES TO BE AVAILABLE

Large . . . . . 400 grm/cms.

Small . . . . . 130 grm/cms.

Speed . . approx. 1,100 R.P.M. on load.

Suitable for 200/250 volts 50 cycle A.C.

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PERIVALE

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