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ELECTRICIAN

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MANUFACTURERS' SUPPLIES SECTION

MISCELLANEOUS ADVERTISEMENTS

TENDERS

CITY AND COUNTY BOROUGH OF BELFAST ELECTRICITY DEPARTMENT STORES

TENDERS are invited for the supply of the undermentioned materials.

Form No.

4. Spare Parts for Mechanical Stokers and Ash Conveyors.
6. Refined Bitumen.
9. Feeder and Section Pillars.
10. Armourclad Compound Filled 6600 Volt Switchgear.
11. Meters and Instrument Transformers.
14. L.T. Fuse Units, House Service Cut-Outs and House Service Connector Boxes.
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29. V.I.R. Electric Cables, Wires and Flexibles.
30. Electric Lamps.
31. Oilskin Coats, Tarpaulins, Rubber Jointing, etc.
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Note.—Forms Nos. 29, 30 and 31 are in respect of materials which shall be supplied to any Department of the Corporation.

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An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.

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PLANT WANTED

URGENTLY wanted Megger Circuit Tester (battery type. 0-300, ohms.).—The "Great Met" Ltd., 75. Kinnerton St., Knightsbridge, S.W.1.

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CHIEF CONTENTS OF THIS ISSUE.

Fair Trading

THOUGH it must not be inferred that in its dealings with the public, the electrical industry has in any period of its history been unduly criticised, it is a fact that since the 1926 Electricity Act became law, the industry has operated under a voluntary system of fair trading in which the welfare of the consumer is as much the concern of the industry as is that of the many sections which go to make up its trading machinery.

This spirit of fair trading first found material expression in "Committee D" and in 1933 that body gave way to the Fair Trading Council, charged with the task of formulating an agreed code of trading practice for general adoption. In 1936 the Council published its first trading policy, its second in 1939 and, as is generally well known, voluntary acceptance by the major interests of the industry of the Council's ruling, proved of considerable benefit to both the public and the industry up to the outbreak of the war, when by virtue of the various Supply Orders, trading became controlled and normal procedure was interrupted.

During the war years the work of the Council has been less publicised and its progress is not in consequence, so generally appreciated. It may be now understood, however, that the work has gone on; that those public spirited enthusiasts who form its membership—in spite of enemy action, tedious railway journeys and other inconveniences—have during the past five years facilitated discussions with respect to price regulation to a degree which has been most beneficial to the industry.

Trading conditions during the war years cannot reasonably be expected to bear much resemblance to those which will obtain after the war, and the Fair Trading Council has, in consequence, been considering what changes, if any, should be made in its policy to meet the altered circumstances. Early proposals were based on a conception of compulsory agreements, the breaking of which would result in unpleasant action, but better reasoning prevailed and the Council now takes the view that whether or not a mandate was possible, a more satisfactory position would be created by the Council establishing on a voluntary basis between all interested sections of the industry, the principles of good trading practice and promoting the use thereof by all engaged in the industry.

The electrical industry, though highly enthusiastic, is essentially honest both in its dealings with its own trading sections and the public. This is shown no more convincingly than by the fact that discounts and other trade matters have on occasion been settled to the advantage of the consumer at the expense of the industry, it being realised that the ultimate

prosperity of the latter, rests not so much in the hands of the manufacturer, the distributor or the contractor, as upon the goodwill of the general public, and the offering of appliances at a fair and economic price. The policy advocated by the Fair Trading Council, formed on these lines, has always been open for general acceptance and represents a general basis upon which negotiations on trading between various sections of the industry can take place, and as a result of which agreements may be entered into between the various trade associations concerned. There is in the policy no suggestion of eliminating competition, no suggestion of loss of individuality, but merely an acceptance by all parties of the fact that fair trading will produce for the trader, the industry and the consumer, the best results.

Plea for United Front

THE Council has in the past been representative of the majority of the sectional interests of the industry, but it is the intention of the Council to publish within the next few months a newly drawn up policy based on the results of a review of the circumstances as now existing which, it is hoped, will attract to it the support of the whole of the electrical industry. It must not be inferred from this that the road so far travelled by the Council has been unduly stoney, far from it—but there are certain sections of the industry which still withhold their support. The changes which the Council intends putting into effect are designed as far as possible to overcome the difficulties which in the past have acted against representation of the whole industry, and those who wish the electrical trade well, cannot but hope that the ambitions of the Council will be realised.

I.E.E. Awards

THE action of the I.E.E. Council in electing Mr. J. S. HIGHFIELD an honorary member of the institution, and in awarding the twenty-third Faraday medal to Dr. C. C. PATERSON, will have the approval of everyone in the industry. Mr. HIGHFIELD is especially well known for his work in the supply field, for among his many contributions to this form of electrical engineering he originated the closed bar system for switchgear, discovered the reason for the failure of h.t. alternator windings, and introduced to this country the Thury system of high-voltage d.c. constant current generation and distribution. Dr. PATERSON is best known for his work in the advancement of electrical research, and in particular for his contributions to the investigations into new methods of artificial lighting and into electronic developments. He was, too, largely responsible for building up the electro-technical and photometric departments of the N.P.L. He has been director of the research laboratory of the G.E.C. at Wembley since its inception, guiding the whole of its activities which range from the heavy engineering field to electronics. Both Mr. HIGHFIELD and Dr. PATERSON are past presidents of the institution.

Electrical Research

THE report which the E.R.A. Council is to present at the annual meeting of the association today, Friday, shows that despite the attention which has been given to problems connected with the war effort, the needs of industry have been met to a very satisfactory degree. Since the publication of the last report the E.R.A. has undergone a number of domestic changes but the administrative ability of its late director, Mr. E. B. WEDMORE, was such that the work of the association has been in no way interrupted by the changes. The report is dealt with at some length elsewhere in this issue, and from the details given it will be apparent to everyone that the association's contribution to the success of the industry is reward for the confidence placed in it. The next president of the association is none other than Sir ARTHUR P. M. FLEMING, and as a leader of research himself his address, which will follow the annual meeting and luncheon, will be of special interest.

The E.R.A. and Exports

THE need for our developing electrical technique beyond the possible scope of other countries was emphasised by Sir ARTHUR, as chairman of the I.E.E. Sub-Committee concerned with the training of engineers, in his plea for a higher standard of ability and education among professional engineers, technicians and craftsmen. This need becomes more apparent when it is realised that local manufacture has already begun in many overseas

countries formerly importing from Great Britain, and that this will assuredly continue after the war. To recover these markets it will therefore be necessary for the industry to manufacture not equipment of the type which can be readily made overseas, but to produce plant and apparatus for new purposes, and equipment which is beyond the manufacturing ability of overseas countries. In this respect the E.R.A. has already shown remarkable initiative and led the industry in many cases far beyond the pace set by our overseas competitors. The work it has in hand, together with the investigations yet to be done show that the association is year by year growing in importance—a contributor to the capture of world trade.

Equipment for Post-War Development

IN order to maintain employment at the highest possible level on the conclusion of hostilities, or as and when war contracts are terminated, undertakers are being asked to consider the placing of orders for such equipment as meters, switchgear, and transformers, on the understanding that the Commissioners are prepared favourably to consider authorising the acquisition of the necessary controlled materials. It must not be inferred from this that there can be any relaxation for the time being in the restrictions on new development or connecting new consumers, though this aspect of the matter is constantly being kept in mind; the idea behind the placing of orders for servicing equipment is the maintenance of continuous employment in works which are at present, or have been, engaged on war production. All undertakings have substantial replacement orders awaiting the day when manufacturers can hope to satisfy them, and the suggestion upon which the note is based infers that by placing those orders now it is likely to result in their being executed within a reasonable period.

A Broadcast on Lighting

READERS who listened to the B.B.C. European Service on February 1, will no doubt have heard the voice of Mr. R. FREETH of the E.L.M.A. Bureau, tell how Britain will after the war be one of the best lighted countries in the world. Mr. FREETH is no stranger to the microphone for he has on other occasions done his best to make European listeners conscious of the importance of good lighting, while in his last broadcast his explanation of how the fluorescent lamp was pioneered in this country and widely developed by the United States may do something to give the British lamp-maker a little of the credit which is due to him.

Continental Trade Possibilities

THE contacts which have been made between this country and the Continent during the last five years have been such that little opportunity has been afforded for presenting the advances made in British electrical development, though the Continent will no doubt take full advantage of such advances in its rebuilding programmes. The talks on lighting which are the subject of this note, are therefore doubly welcome in that they not only serve to "show the flag" but they also make known to listeners something of our post-war intentions. With so much to be done in the way of re-equipping industry in Europe, with so much house building to be undertaken, it is just as well that our Continental friends should be kept advised of what the British lighting industry has to offer, for having been in enemy occupation so long most of their information will be out of date.

Electricity in Gas Kitchens

IN opening the gas industry's kitchen planning exhibition at Dorland Hall, Regent Street, on Monday, LORD WOOLTON, Minister of Reconstruction, said he was glad to see that electricity had been included where it was most useful. It was a tribute to the gas industry's broad-mindedness and business acumen, in giving recognition to the fact that electricity cannot be dispensed with altogether in a modern kitchen, but can be used with advantage for lighting and for the extraction of cooking odours when the major operations are by gas. While the two services can be complementary and alternative, electricity alone is able to offer a complete domestic service, supplying light, heat, refrigeration and power, and thus occupies a position that is unassailable. The competition of the gas industry is welcomed as a spur to further endeavour while we have yet to see an electric kitchen with gas lighting.

"Terror" Attacks on Southampton

How Electricity Undertaking Made Good the Damage

IN common with other south coast ports, Southampton suffered severely from concentrated attacks by the Luftwaffe with h.e. and incendiary bombs, and we have been supplied by Mr. W. G. Turner, the borough electrical engineer, with some details of the major raids and their effect upon the electricity undertaking and measures taken to maintain and restore the supply of electricity.

No Direct Hits on Power Station

The latter half of 1940 was marked by severe bombing of the electricity department's area of supply. The first air-raid "red" warning was on June 7, but bombs were not dropped until the early morning of June 20. Then, after a number of raids largely in daylight, the most severe being in September and early November, there followed a period chiefly of night raids which led up to three vicious "terror" week-end attacks. These started with parachute mines in the early morning of November 17, followed by high explosive and incendiary bombs for 13 hours on the following night, a shorter night raid on November 23, and two successive night "blitzes" on November 30 and December 1. Most of the town area of Southampton was devastated during these latter attacks by high explosive and fire, and the suburbs suffered considerable damage. Thereafter, to the end of 1943, the raids diminished in frequency and severity.

Altogether up to the end of 1943, there were 1 465 "red" warnings, and 71 raids when bombs were dropped. About 2 569 high explosive bombs and parachute mines fell on the county borough of Southampton, and 194 on the borough of Eastleigh. These figures do not include those for the rural area of supply. There were 4 269 residential properties totally destroyed or so damaged that they had to be pulled down, and 36 588 damaged, but repairable in Southampton, and a total of 4 199 destroyed or damaged in Eastleigh.

Whilst a number of high explosive bombs and a few parachute mines were dropped in the vicinity of the generating station, there were no direct hits, and only slight structural and plant damage, due to shell fragments, was suffered. Most of the glass in the roofs and windows of the buildings, to the extent of about 19 000 sq. ft., was destroyed by blast on November 23. The greater part of this was in the new glass-walled boiler house. The windows and glazed partitions of the department's administrative offices at the civic centre were also damaged on the same date, and again, but more seriously, on November 30, 1940. Fires at the generating station caused by incendiaries on this latter date were extinguished by the fire brigade and station staff. The Back-of-the-Walls rotary converter sub-station, workshops and transformer store suffered from fire, whilst the electricity showrooms, 161, Above Bar Street, and the showroom fittings store at Salisbury Street, were completely burnt out in the same raid. There was also extensive damage to the transmission and distribution systems (including sub-stations and transformer kiosks), involving about 4 000 street openings, up to the end of 1943. During the two-night "blitz," supplies covering seven districts and also 217 streets, or parts of streets, were interfered with, necessitating 223 major repairs. These were gradually restored during the following seven weeks. The flexible asbestos panels and other materials, which had replaced the glass at the generating station, were destroyed by blast from a parachute mine on June 22, 1941. Damage was done in the yard of the station on July 8, 1941, and incendiaries dropped during this raid caused a fire at Chapel Wharf sub-station. On the following day a serious fire broke out in the cable trench of the generating station due to a short circuit caused as an indirect result of bomb damage to a feeder at Millbrook on the previous day. Incendiaries which fell on the station on June 22, 1942, were dealt with by the fire brigade and station staff.

Appliances Renovated and Reissued

Immediately following each air raid, all "incidents" were examined and supplies were cut off where damage to consumers' installations was likely to prove dangerous; also consumers' damaged circuits were isolated, and heating, cooking and lighting were restored wherever possible. Where premises were too damaged for habitation, the meters and other apparatus were collected wherever possible. Approximately 14 805 premises were attended to in this manner up to the end of 1943, and mostly after the 1940 "blitzes."

Owing to consumers having left the area and houses being rendered uninhabitable by enemy action, a large number of hired appliances such as cookers, water-heaters, wash-boilers, etc., were collected and, where possible, were renovated and repaired; and 5 160 were re-issued. After the two 1940 attacks, considerable assistance was rendered to local institutions and emergency feeding centres by the provision of electric cookers and water heaters.

Work of the E.R.A.

Annual Report—Position at Leatherhead—Details of Research

WITH the prospect of an early termination of hostilities in Europe and a return in some measure to peace-time industrial production, the annual report of the British Electrical and Allied Industries Research Association, to be presented at its annual general meeting to-day, Friday, is of special interest in that it indicates considerable enlargement of the scope of the work of the association.

Special reference is made to the retirement of Mr. E. B. Wedmore, who, as director, had guided the operations of the E.R.A. since 1919, and the appointment of Dr. S. Whitehead as assistant director and then acting director, pending the permanent filling of the office, and Mr. R. A. McMahon as secretary. Prominence is given to the project for the establishment of new and much needed laboratory accommodation at Leatherhead. Although the plans are in an advanced stage, states the report, it is quite clear that it will not be possible to make a start until some time after the cessation of hostilities with Germany, and even then progress is likely to be slow. The opening of the new laboratories will enable the association to carry out programmes long overdue, and the scope of its work will be greatly enlarged, so that there will not only have to be provided further capital sums in addition to reserves to enable the project to be financed, but with the increased work which will be carried out a considerably larger annual expenditure will be incurred.

Post-war Reconstruction

Commenting upon the important part to be played by research in post-war reconstruction, the report states that having regard to the necessary expansion of research programmes and the necessity for securing that results are obtained in advance of the practical developments to which they apply, it is becoming increasingly evident that the limiting factor will be that arising from shortage of adequately trained personnel, a condition which can only be adequately relieved by even more extensive pooling of problems of common interest, for which the organisation of the E.R.A. is peculiarly fashioned and adapted. The training of personnel, including ex-Service men, should prove an important feature.

The co-operative work of the E.R.A. still serves to co-ordinate a large amount of cognate work and commercial technical developments in all sections of the industry. The industry and the national interests are indebted to many Committee members who take such an important part in E.R.A. activities.

The latest agreement with the Department of Scientific and Industrial Research was due to terminate at the end of the year covered by the report, but in view of the difficulty of arriving at a satisfactory basis for post-war years until measures for post-war reconstruction are further advanced, the association requested the Department to extend the present agreements for a maximum period of two years. In doing so, the Department gave a token of appreciation by restoring the sliding scale grant to the £1 for £1 basis.

Publication of Brochure

For the enlightenment of influential persons in the electrical industry who are not closely in touch with the details of technical and scientific developments and are not fully informed as to the nature and importance of the use that is made of the E.R.A. by the industry, and for the information generally of interested parties, the Council has put in hand the preparation of a descriptive and illustrated brochure.

The accounts show that the reserves, provided under three heads, represent a total of £175 680. To cover these reserves it was necessary to add to the investments (£102 813) and cash (£57 782) an item of Government grant amounting to £17 000 not yet payable. The problem of financing the project for the new laboratories is still under consideration.

Space does not permit mention of all researches carried out by the association, but the following were among the most important and interesting:—

The confidential research on capacitor tissue paper for the Ministry of Aircraft Production and the Ministry of Supply has been continued; and a comprehensive programme has been drafted for parallel research of industrial interest co-ordinated with the above, but owing to urgent war work only limited progress has been made.

Research on effect of varnish on insulated wires has been continued; another report has been received from the investigator, and this completes the work covered by the programme under which the research is being carried out. Consideration is being given to extending the research on a more comprehensive scale.

The subject of insulating varnish to withstand higher temperatures is receiving consideration, with special reference to its use with glass fibre insulation, and a programme has been drafted for an investigation on one type of resin to ascertain its suitability as the base of an insulating varnish for this purpose.

Work on the main programme on mica capacitors is still deferred, but the investigations suggested by the Post Office engineering department have been continued and extended.

A first report giving short-circuit ratings for paper insulated cables, based on deterioration of the dielectric has been completed. Further experimental confirmation of the temperature conditions which result in charring of impregnated paper for cables has been considered desirable, and an additional programme has been drafted covering both short-circuit tests on cables and model tests on samples of paper removed from them, to obtain data on the possible variation between cables obtained from different manufacturers and designed for different voltages. Consideration has also been given to the effects of short-circuits on cable joints, to the question of reclosure of circuit-breakers and to the limitations imposed by the bursting strength of cables.

Facilities have been offered for tests to be made on buried cables at Earley power station near Reading which afford special facilities for the study of some outstanding problems. Preliminary discussions have been held with the interests affected, and a panel has been formed to direct the work, which it is hoped to carry out in the coming year. The run comprises groups of 1 sq. in., single-core, 33 kV cables, partly laid direct in the ground and partly drawn in trefoil ducts. It is hoped to obtain information correlating current and temperature rise for each condition of laying, both for single circuits of three cables and for two such circuits adjacent to one another.

Air-blast Switchgear

Further work has been done on problems arising in the study of the basic principles of the " hard gas " switch and the results have been reported to the Committee. A tentative explanation of certain apparently contradictory results has been suggested, but further work is necessary before it can be assumed that the explanation is satisfactory.

Work on the effect of phase angle on blast pressure in an air-blast breaker has been continued, and by the end of the year a report on the influence of low frequency factors on clearing pressure, dealing with phase angle, was in an advanced stage of preparation.

By the end of September a considerable number of heavy tests had been carried out at a proving station on the laboratory model designed for heavy gas blast research work. The general performance of the apparatus was satisfactory and much useful data has been obtained, but the tests brought out the need for further work on the problems under examination. This model provided for tests at pressures up to 500 lb./sq. in. and sufficient reservoir capacity and cross-section of control valve aperture to make possible the investigation of air blast problems up to nozzle sizes of 3 in. internal diameter. The breaker can be closed and opened by remote control. A new laboratory model has been designed for use in work on high voltage breakdown of nozzles for voltages up to several hundred kV, and free from the magnetic field associated with the twin gas-blast switch. In this, certain suspected causes of variation will be under greater control and intentional changes in variables will be effected more easily. The new design, which is practically completed, can be used for both double and single blast and makes provision for arc photography and spectrographic work.

Research on Steels

Considerable progress has been made during the year in the research on steels for use at high temperatures. Further work has been done on carbon steels of abnormal and normal creep characteristics, many creep and tensile tests on which were made during the preceding year. To complete the work, experiments have now been carried out on the grain size of selected steels after heat-treatment at various temperatures. A report on the characteristics of carbon steels in relation to creep strength, with particular reference to grain size effects, is in course of preparation, and will deal with the selection and sources of twenty steels. A correlation of creep resistance and structure is being made together with a consideration of the effects of coarsening, spheroidisation and renormalising. Prolonged creep tests are in hand, and are intended to continue for five years or more, on certain carbon steels to provide data as a check on the extrapolation to 100 000 hours of data already available, and to compare the behaviour of the steels on this long time basis. A programme of work has been drawn up on the effect of various commercial heat-treatments on the creep properties of carbon steel superheater tube material, and the necessary samples are awaited.

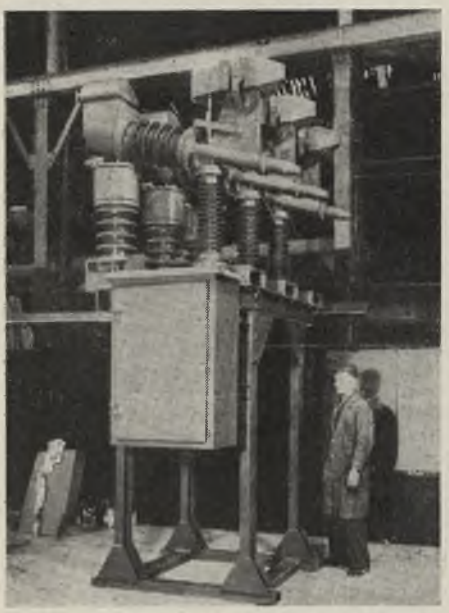
Work on the development of a new series of alloys for condenser tubes has been carried out. The alloys have been examined by means of the jet test, deposit test and metallographic examination.

With a view to establishing a basis for improvements in the design of house-service meters, and for the selection of the most suitable type, research has been put in hand into the characteristics of the load of individual domestic consumers.

Manchester Switchgear Exhibition

Samples of Improved Indoor and Outdoor Types

DEVELOPMENTS in switchgear design and production were shown at an exhibition opened last week-end at the works of Cooke and Ferguson, Ltd., at Openshaw, Manchester. This firm which during the



Type OE6, low-oil content circuit-breaker for 1500 MVA, 33kV

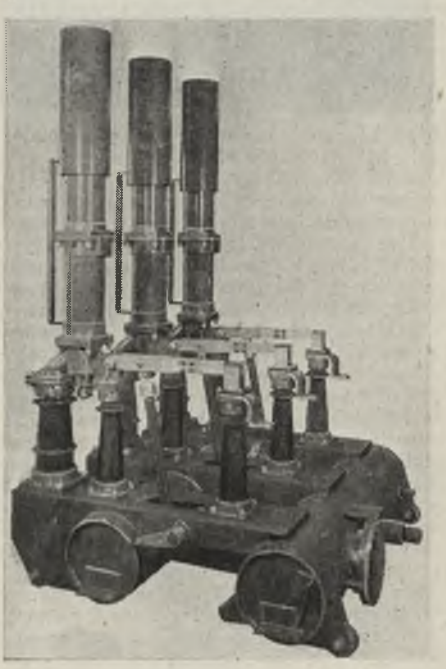
war years has been, and still is, engaged on special work may soon be in a position to embark upon a programme of post-war production.

The exhibition, which was inspected by engineers from the C.E.B. and from numerous electricity undertakings, was held in one of the bays of the company's Victoria Street works. The units on view, outdoor and indoor patterns, were samples of the quality of product which may be expected when the works can switch over to specialised functional output.

The D-4 oil circuit-breaker is of the low-oil-content earthed tank type, employing single-break arc-controlled contacts, the three phases being incorporated in one tank. The breaker is certificated for ratings of 250 MVA, 6.6 kV, and 250 MVA, 11 kV. The arc-control device is a cross-jet pot, consisting of a " stack " of insulating plates, bolted to the fixed contact housing. The arc is extinguished by the high-pressure turbulence and cross-jet action of the pot. High fluid pressures are restricted to within the cross-jet pot and external tank pressures are slight.

The fixed contact consists of a multi-segment high-pressure line-contact type tulip. The segments are suitably restrained to prevent welding together and also to provide initial contact pressure. The moving contact is a copper rod of circular section. Contact replacements are carried out without removing the cross-jet pots.

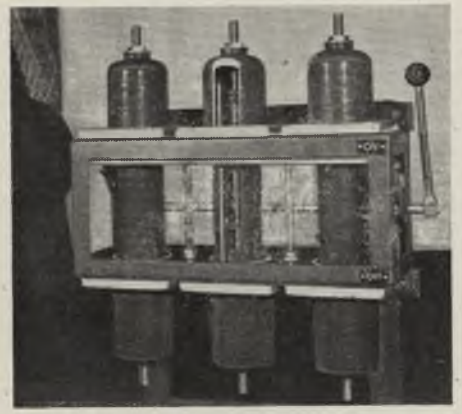
The sliding contact provides a multi-point, high pressure, contact, which has been proved to be entirely free from burning or seizing during short-circuit operation. The tank is of fabricated construction, hydraulically tested up to 150 lbs./sq. inch and lined with insulating material. In addition, interphase insulating barriers are provided.



Type EA4, indoor air-blast circuit breaker for 33kV, 1000 MVA

Another unit has single action, lanyard release and spring-close mechanism. Type MM2 incorporates double action, spring-close mechanism. In the same series is the solenoid operated type C4, a low-oil-

content circuit-breaker (the total quantity of oil is seven gallons), for normal current ratings, 400 and 800 A, with rupturing capacity up to 150 MVA, 3.3 kV. Also on view were an air-insulated metalclad unit 6.6/11 kV, normal current ratings 400 and 800 A; an oil-immersed, load-breaking, metalclad isolator unit with earthing and testing plugs, 6.6/11 kV, normal current



Type T1, gang operated telescopic isolator, 400 A, 11 kV

ratings 400 and 800 A; and gang operated, telescopic isolating switches.

The outdoor oil circuit-breaker (type OE 6) 22/33 kV, up to 1 200 A, rupturing capacity up to 1 000 MVA, 22 kV, 1 500 MVA, 33 kV, has a high speed operating characteristic. Driving shaft entries are above oil level thus obviating undesirable oil seals. The arcing and main contacts are of the multi-segment, tulip self-aligning, high initial pressure, line contact type, ensuring minimum contact burning on load and short-circuit operation, contact replacement being effected without removing the arc control devices. These contacts are designed to eliminate electro-magnetic contact grip, so that the breaker opening time is unaffected by the magnitude of short-circuit current. The sliding contacts are of the multi-point spring-loaded pattern, completely free from burning, pitting and seizing. The moving contacts are copper rods of circular section running in guides to ensure correct alignment.

Positive arc extinction is effected by compensated cross-jet pot arc controlling devices, which give consistent operation with short arc durations over the entire range of short-circuit currents and the total interrupting time is within the range of " high-speed " operation. The tank containing each cross-jet pot is of fabricated steel construction, fitted with an arc resisting lining. This tank also incorporates a venting chamber and baffle, with a removable cover. The total oil content per three-phase breaker is 24 gallons.

The circuit-breaker incorporates current transformers of the low-oil-content pedestal type. Three types of mechanism are available for the operation of this breaker, viz.: solenoid, motor-wound spring-close or pneumatic, all in weatherproof housings; the drive is transmitted through torsional driving/supporting insulators and shafts to push-bolt operated driving links, which are coupled to the individual moving contact rods.

One of the most interesting exhibits was the indoor air-blast circuit breaker (EA 4), 33 kV, 1 000 MVA, maximum current rating 1 200 A. It is of the axial blast type, each phase consisting of a single retractable nozzle contact in series with an external isolating switch. The operating of the contacts is co-ordinated so that interruption of current takes place between the retractable nozzle contacts in the interrupter heads, and the external isolators open immediately after current interruption. The retractable contacts are normally retained in the closed position by means of springs. Current making is carried out on the external isolating contacts. The main air-feed pipes and isolator supporting insulators, which are working under continuously applied voltage, are of porcelain. A continuous leak of dry air is passed up each interrupter column to maintain the optimum condition of the insulation.

Resistance switching is employed so that the circuit-breaker interrupting capacity is independent of the inherent rates of rise of the system.

This circuit-breaker is operated by means of a control unit, which is self-sealing and guarantees correct sequential operation of the interrupter and isolator contacts. The control unit is electrically-operated by means of two solenoid-controlled pilot valves, which initiate the opening and closing functions, respectively.

Much interest was taken in a compressed air vent for air-blast switchgear. It comprises two compressors each of $1\frac{1}{8}$ H.P., each designed to deliver sufficient air to give continuous operation of the breaker at three minute intervals. This unit is the firm's proposed standard application for 33 kV air-blast switchgear operation and can be modified to suit other voltages without difficulty.

Amongst the subsidiary exhibits were a house service unit, incorporating electricity meter, conveniently designed and placed fuse box and wheel-type on-off switch,

based on M.O.W. proposals for post-war permanent housing schemes, and improved types of electrical accessories—plugs, lighting switches, etc. The latter included a microgap swith with a luminous plastic "dolly."

At the Saxon works, where prefabrication work is carried out, demonstrations were given of resistance welding employing 500 MVA, 52 000 A technique, and electronic heating as an aid to the efficient production of plastics. Here there is a well-equipped high voltage test laboratory and X-ray equipment.

Visitors to the exhibition on Friday, were the guests of the firm at a social function in the evening. A party of about 100, which included the principals, chief executives and technicians of the firm, visited the Opera House, Manchester, to see Jack Hylton's show, "Irene." Afterwards, they returned to the Midland Hotel for a supper-dance. The exhibition closed yesterday, Thursday.

Fair Trading Council

Statement on Future Policy for the Home Market

THE Fair Trading Council, under the chairmanship of Mr. V. Watlington, entertained the trade and technical Press at luncheon last week, when a statement with respect to the future was issued. The past history of the Council since its formation in 1933, in succession to the old "Committee D," is generally well known, as also are the contents of the first edition of the Fair Trading Policy issued in 1936, and the second edition, published in 1939.

It is claimed that the work accomplished up to the outbreak of war had been of considerable benefit to the manufacturing and distributive sections of the industry and in the interests of the consumer, while particularly during the war years the work of the Council has enabled many problems such as control of distribution, etc., to be dealt with in an easier way than if the policy had not been formulated; for instance, discussions with the Board of Trade, the Central Price Regulation Committee and others.

During the past year, the Council has devoted its attention to the future and given consideration to what changes, if any, should be made in the policy in the light of over eight years practical experience of its working, and of the problems which are likely to arise when peace returns.

The arrangements originally proposed were based on a conception of agreements signed by adherents to the policy, such agreements having compulsory aspects and the Council mandatory powers to enforce adherence to its policy. In actual fact, the policy has never operated in this manner, as it was found in practice that the work of the Council could best be carried out by the establishment of a code arrived at by consultation and voluntary agreement between the various sections of the industry. This code has become the basis of agreements between certain associations of manufacturers, wholesalers, contractors and retailers.

The Council has not decided to abandon any idea of a policy having mandatory features. The basic conception for the future is that it is a body which, by consultation between all interested sections of the industry, establishes the principles of good trading practice and promotes the use thereof by all engaged in the electrical industry, whether any individual firm or company or person is a member of a trade association or not. The policy will be open for general acceptance; it will represent the general basis on which negotiations on trading between various sections of the industry can take place and as a result of which, agreements may be entered into between the various trade associations concerned.

The Council has formally adopted the following resolutions:—

(1) that the Electrical Fair Trading Council should not take steps to secure mandatory power for the operation of the Fair Trading Policy;

(2) that the future work of the Electrical Fair Trading Council be based on the conception that its purpose is to determine good trading practice in all sections of the Industry and to recommend the adoption of such trading practices;

(3) in order to give effect to the foregoing, that the Constitution of the Electrical Fair Trading Council and its published Fair Trading Policy for the Home Trade should be reviewed and any necessary changes brought into effect.

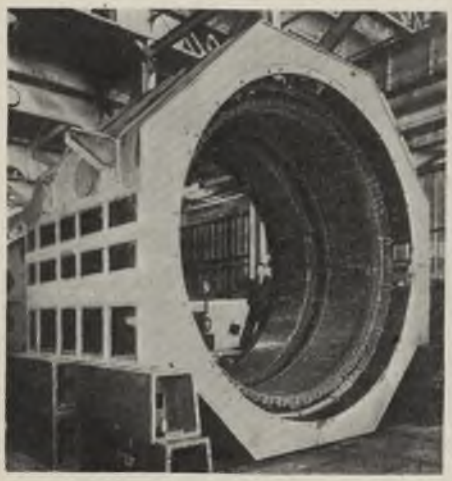
The work involved in the last of these resolutions has already been taken in hand by the Council and it is expected that the new constitution will be adopted and a new edition of the policy published within the next few months.

Kearsley Power Scheme.—Extensions costing £3¼ millions are to be carried out by the Lancashire Electric Power Co., at the Kearsley generating station by arrangement with the Central Electricity Board. The scheme, it is stated, will provide continuous work for 400 men for about three years.

What Manufacturers are Doing—VI

Powerful Marine Propulsion Unit—Equipment for Overseas

WHILE it is not permitted to mention any but a small number of developments carried out by the British Thomson-Houston Co., Ltd., in 1944, it may be stated that progress in standard products was well maintained.



Partly completed stator of a propulsion unit for a turbo-electric ship

During the year jet-propelled aircraft came into the news, and the easing of the censorship enabled the company to lift the veil on the part played by the team of B.T-H. men who collaborated with Air Commodore Frank Whittle in the design and manufacture of the first experimental jet-propulsion gas turbine, and subsequently the flight engine which was installed in the first successful jet-propelled aeroplane in the world—flown in England, May 15, 1941.

Turbo-alternators completed for electricity undertakings and industrial plants, both for home and overseas, included 30 000 kW and 20 000 kW sets, the latter having the alternator wound for 22 000 V. Many transportable geared turbo-generators, complete with condensers, were manufactured for service overseas, and a large number are in course of manufacture. The ratings range from 500 kW to 2 500 kW. Several small blowing units, and air compressors of various sizes, were made. Turbo-alternators for the turbo-electric drive of ships, as well as auxiliary turbo-generators for marine service, were completed.

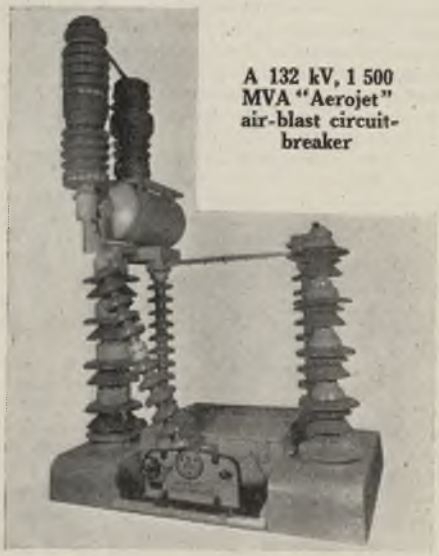
Geared turbine drives for the propulsion of naval vessels were supplied, and to facilitate the overhaul of large steam rotors a special sensitive portable balancing machine has been developed.

In the field of turbo-electric ship propulsion an outstanding equipment was delivered during the year, for what will be probably the highest powered tanker so far undertaken. The arrangement of the turbo-alternators and propulsion motors is also believed to be novel in that the advantages of a twin-screw turbo-electric equipment are retained, but on a single screw vessel.

Generating plant and electrical equipment for driving the cable laying machinery in a cable-laying vessel is on order.

The manufacture of a number of water-wheel alternators, including four of 15 000 kW, was completed, while among the orders received were those for complete hydro-electric power stations in which the power units, ranging from 1 150 kVA to 3 750 kVA, will be provided with automatic gear under push-button control.

The engineering effort so far available has been applied to various new developments in switchgear, the most important of which has been a production design of 132 kV, 1 500 MVA air-blast circuit-breaker to meet an order for six such breakers placed by the Central Board. These are of the B.T-H. " Aerojet " type, which has also been successfully worked out for 33 kV, 1 000 MVA.



A 132 kV, 1 500 MVA "Aerojet" air-blast circuit-breaker

Another development is in connection with a new line of flameproof mining switchgear to comply with the revised requirements of the Coal Mines Act.

Early in the year there was supplied to Russia a 120 000 kVA bank of single-phase transformers for operation on a 242 kVA three-phase, 50 cycles system. These transformers were the first to be built, it is believed, for such a high voltage system, and the bank rating was the largest for power supply so far made in this country. Other transformers completed for service overseas included three 20 000 kVA three-phase, three winding units, while among the very large transformers completed or ordered during the year mention may be made of two rated at 60 000 kVA for use on 132 kV systems and provided with " on load " tap changing gear, also one (a repeat order) rated at 37 500 kVA, 11/33 kV for direct-connection to a turbo-alternator.

The demand for heavy current furnace transformers continues, and the largest unit so far built at Rugby was completed during last year. It was rated at 9 220 kVA, 21 000 A.

A 4 000 H.P. rolling mill equipment employing grid-controlled pumpless rectifiers has recently gone into operation. A 3 000 kW, 1 500 V pumpless rectifier equipment for the Great Indian Peninsula Railway, the first application of pumpless rectifiers to 1 500 V duty, was also completed during 1944. Other orders received included pumpless rectifiers for industrial and light traction service in England, Australia and the West Indies.

A repeat order was received from the New South Wales Department of Railways for two 1 530 kW, 1 530 V rectifier equipments giving a compound characteristic by grid control. Unlike the earlier equipments supplied for this railway system, the grid control gear in the new sets will be entirely static.

A number of high voltage pumpless rectifiers, for 10 000 to 15 000 V d.c., are in hand for broadcasting service. A prototype rectifier has given faultless performance in trials in two different broadcasting stations.

Glass bulb rectifiers were supplied during 1944 for a variety of industrial purposes, at home and abroad. Among those recently commissioned have been a number for water electrolysis, for the production of hydrogen—an application which is likely to expand considerably after the war, and one for which the company had previously supplied rectifier equipments, both with and without grid control.

Leakage Protection

By " SUPERVISOR "

THE advent of single-pole fusing has raised an interesting point regarding leakage protection, whether this should be single or double pole ? That is, although the interruption of the phase line is adequate in connection with requirements for overcurrent protection, do the conditions applying to earth leakage protection become satisfied with this state of affairs, or should the neutral line be isolated in addition ? This is a point that appears to merit some consideration.

Efficient earth leakage protection is now a matter of isolation of leakage potentials rather than an interruption of earth leakage currents, and it is necessary to consider the possibilities of neutral potentials. Clearly, a potential of 30-40 V on a neutral line is equally lethal as a similar voltage on a phase line, and the extension of either on to a metal casing would give rise to equal risk. Should a leakage occur from a neutral line, the isolation of the phase line would obviously fail to make the circuit safe; with single-pole fusing there is no way to isolate the neutral.

In any consideration of leakage protection problems it seems necessary to differentiate between conditions as found in the town and those in the country, owing to their wide divergence on quite fundamental points. In the town, neutrals are often solidly inter-connected on the distribution side, so that the possibility of neutral potentials of any magnitude arising is remote. In addition, neutral earthing conditions are as good as they can be made, which is important; loads are usually fairly evenly connected over the three phases, which in turn makes for low neutral potentials—even at the ends of longish three-phase runs. Even so, potentials up to 15-20 V are not uncommon, although often transitory.

In rural areas, however, supply is often by means of long overhead lines, and very different conditions prevail. In the case of three-phase supplies, unsymmetrical loading of the phases may result in high neutral potentials above earth, so that in effect the neutral becomes a live line, though not, of course, to the same extent as the phase line. With any potential upon the neutral, above earth, leakage from the neutral to the metal casing of equipment becomes possible—even likely,

in view of the generally lower insulation of the neutral compared with the phase. With dairy equipment, a leakage from a neutral charged to some 15-20 V above earth might easily provide a risk for cattle.

Actual field measurements have shown that with a single-phase supply to a farm, a neutral potential existed continuously, as would be expected. According to loading, this potential varied from 7 to 24 V—it is true that the line was somewhat above average length, about one and one-third miles—but such conditions are not uncommon. It is extremely doubtful if neutral potentials of this magnitude are common in towns, but they must be considered normal for long rural supplies, and this factor must govern any appraisal of earth leakage under rural conditions.

In addition to the existence of neutral potentials under what might be called normal working, others may arise by reason of fault. Rural lines are subject to disturbances not likely in towns, and some of these should be briefly considered. A short-circuit between phase and neutral line may result in high neutral potential, and if this occurs at the end of a long line it is more than likely that line impedance will prevent operation of the transformer fuses. One or two cases of short-circuit have recently been investigated—in one case this occurred at the point of entry of the service, and in another by reason of leakage at a meter—resulting in maintenance of the supply in all cases, one accompanied by a slight fire.

It is clear that any disturbance to supply lines outside the installation cannot be cleared by internal fuses, and although the supply voltage may drop below a working level, yet the high neutral potential remains. The point is, that any leakage from this neutral is equally lethal as any other leakage, and a safe principle to assume would be that in the rural area a neutral line is as much a live line, from a protective angle, as a phase line. The problem is intensified when it is remembered that horses and cattle are extremely susceptible to low leakage voltages.

Less Common Fault

A less common cause of neutral potential is the complete or partial disconnection of a neutral line outside the installation. The introduction of even a small resistance into the neutral line by this means must considerably increase neutral potentials above earth in the installation. With every rise in voltage the possibility of leakage to earth from the neutral becomes more likely, even if intermittent.

Probably the most likely cause of high neutral potential is due to earth fault on the supply line, such as occurs with the falling of a phase line or failure of insulation at some point. High earthing resistances often prevent isolation of this line, with the result that heavy currents flow over the earth electrode, and in consequence the neutral line is raised to some considerable voltage above earth. Although separate earthing systems are often used for the line neutral and the transformer and/or switchgear ironwork, any insulation failure on the latter is likely to be reflected in the raising of the neutral potential, as the two systems are generally so close together that any potential gradient due to the one may easily affect the other.

Variations in Electrode Resistance

Variations in electrode resistance are usually greater than are suspected, unless periodical check is made. During the recent frost nine earth electrodes in Norfolk, normally of about 2 to 8 ohms resistance, showed resistances between 14 and 30 ohms; in one case as high as 83 ohms. These were formed by about 100 yards of 0.1 sq. in. stranded hard-drawn copper, buried at varying depths in sandy soil, and have usually been considered efficient and reliable electrodes. In wet weather their resistances rarely exceeds 1 to 3 ohms.

It is obviously unsafe to rely upon these electrodes for the isolation of any fallen overhead line, and these conditions are at the moment probably true for half the country. With the raising of the neutral potential and the disappearance of the phase of the supply at the installation, dangerous conditions are set up. The supply has apparently failed, but the neutral remains alive; any unsuspected leakage from the neutral should be capable of immediate clearance.

For these and other reasons a case would seem to be made out for double-pole earth leakage protection in all cases, and the normal earth leakage circuit breaker will respond to leakage from the neutral as promptly as for leakage from the phase. In view of its infinitesimal extra cost, double-pole protection would even seem desirable for the town installation in addition, now that we no longer enjoy the doubtful value of a fuse in the neutral line. Single-pole fusing for overcurrent protection is now officially approved and should be adequate for all purposes, short-circuit and overload, although its economic value is small and greater care in installation work becomes necessary.

In the old days of double-pole fusing in the installation, no great risk would arise with a reversal of phase and neutral at the supply intake; with single-pole fusing, however, considerable danger may be set up with reversal. Double-pole earth leakage protection will, however, take care of the major risks, and render reversals innocuous though undesirable. Leakage from an unfused neutral may cause fire.

Electricity Supply

Clitheroe.—The T.C. proposes to carry out extensions in order to afford a supply of electricity to certain farm properties.

Jarrow-on-Tyne.—Plans have been approved for the erection of a sub-station in Prince Consort Road for the North-Eastern Electric Supply Co., Ltd.

Croydon.—The Electricity Committee reports that the Electricity Commissioners have issued consent to the amended scheme for the establishment of a new power station.

Hull.—According to the estimates submitted to the Electricity Committee generation in 1945/46 will cost £567 013—nearly £100 000 more than the probable cost in the current year. This, it is stated, is due largely to the increased price of coal. The general manager, Mr. D. Bellamy, said that at this stage, it was not possible to submit any application for increase in tariff on the basis of depleted reserves, but at the same time it was evident that some price revision in the near future would be essential.

Stoke Newington (London).—The Electricity Committee's estimates for post-war requirements are £50 000 for sub-stations, £55 925 for mains, £47 972 for meters, £54 340 for consumers' apparatus and £12 000 for showrooms.

Tynemouth.—The T.C. has decided to exercise its right under the Electric Lighting Act of 1888 to acquire immediately the electricity undertaking in the New York area now owned by the North-Eastern Electric Supply Co., Ltd.

Cheltenham.—At a meeting of the Housing Committee the Town Clerk reported that the Electricity Committee had agreed to bear the cost of providing equipment for two experimental houses in Kipling Road, amounting approximately to £185 and to offer them to the Council and its tenants on a rent free basis for seven years. In addition, no charge would be made for maintenance or fair wear and tear. The cost to the Housing Committee for electric wiring would be £12 per house.

132 kV Switchgear at Littlebrook

WITH reference to the impulse circuit-breakers referred to in our last issue in the description of equipment at Littlebrook power station, these were, as stated, made by the Metropolitan-Vickers Electrical Co., Ltd., and are of medium oil type requiring approximately 20 per cent. volume of oil normally employed in a 132-kV design. Despite this reduction the bushing type current transformers are built into the circuit-breaker mounted on a conventional condenser bushing. That part of the circuit-breaker subjected to hydraulic oil pressure comprises a steel chamber with a strong bakelised paper pressure tube, and the whole is surrounded by spring-loaded porcelains which are shock resisting.

The circuit-breakers are of forced blast type in which the oil is driven across the arc at the cross jet pots incorporated by means of pistons, which are in turn driven from compressed air mechanisms. The power output of these mechanisms while driving the oil is of the order of 1 000 H.P. and this power is released by the trip mechanism with .03-sec. from receipt of trip impulse. Because the forced blast provided is independent of current, the arc interruption is brought about in the shortest time, notwithstanding the value of the current. The total time from receipt of trip impulse to interruption of all currents within the circuit-breaker's rating of 2 000-MVA at 132 kV is less than 3-cycles.

As many as 70 short-circuits, including many at maximum rating, have been carried out without contact maintenance on this class of circuit-breaker, a feature which reduces maintenance and is made possible by the extremely short arc duration and the use of Elkonite contacts.

Despite the relatively low quantity of oil, the internal electrical creepages in the impulse circuit-breaker are of the order of double those acceptable in the conventional tank type circuit-breaker and this has made it possible to test the complete circuit-breaker for flash-over at 50-cycles up to 380 kV.

The circuit-breakers are mounted on a low concrete plinth providing easy access, surrounded by cages to comply with section clearance requirements. Each three-phase circuit-breaker is controlled from a kiosk outside the cage containing the air supply stop valves, pressure gauges, remote mechanical trip and other accessories. The whole installation is fed from a duplicated compressed air service incorporating silica gel driers, which are provided to prevent condensation and freezing in the air lines. Extreme precautions are not necessary in this connection since the air is not used in contact with insulation at any time, but serves only to drive the mechanisms.

A number of the latest form of this circuit-breaker are now being supplied for export.

Electricity and Water Supply

Pros and Cons Discussed at I.E.E. Informal Meeting

"THE applications of electricity to water supply" were discussed at the informal meeting of the I.E.E. on January 22, the subject being introduced by Mr. J. F. Shipley. Monsieur P. M. J. Ailleret, local hon. secretary of the I.E.E. in France, was among those present.

Mr. Shipley said that there were more than 1 000 different authorities supplying water in England and Wales, of whom 25 supplied more than 50 per cent. of the needs of the country; 125 authorities more than 25 per cent., and 875 the remaining quarter.

After referring to the recent Government White Paper on water sources, the speaker said that would probably be an obligation on water suppliers, nor merely to supply domestic but also for agricultural and other needs.

Electrical Applications

Electricity would have to be used for pumping, and it might also be used for water purification. An ordinary pump would be used for pumping water from surface levels; but pumping from underground would need either a borehole pump, or a reciprocating pump driven by an electric motor, or a submersible pump. With respect to the use of electricity in water purification, Mr. Shipley mentioned purification by ozone; by electrolytic methods producing hypochlorite; an electrolytic process; and ultra-violet light, the last being generally used as a secondary and not a primary process.

In the discussion, attention was directed to the automatic pressure system, consisting of a tank and a small pump and a pressure switch whereby the pressure in the tank was maintained at about 60 lb. per sq. in. When water was used and the pressure in the tank was reduced to 40 lb. per sq. in., the motor operated automatically. Thus, large capacity overhead tanks were dispensed with.

One speaker said that submersible pumps had been manufactured in this country for 12 years, and that they had already achieved a high degree of reliability. Pumps of this type had been submerged for as long as six years and had then required practically no overhauling and servicing. In one case the insulation resistance of the winding, after the pump had been submerged for 26 000 hours, was still 15 megohms. A number of other speakers spoke in support of the submersible pump.

Tariffs were the subject of a good deal of comment; and it was held that, inasmuch as the peak load for water was in the summer and the peak load for electricity in the winter, water and electricity authorities could do much to afford each other mutual aid. Another point was that local supplies of underground water could be made economically available by electric pumping, provided the tariffs were suitable. There was a plea also for standardisation of conditions. It was said that there were 50 electricity authorities supplying in the area of the Metropolitan Water Board, giving ample opportunity for co-operation in order to make the best use of the diversity factor. The warning was made, however, that the C.E.B. tariffs were subject to review a year hence, and that any long term commitment must bear this point in mind.

A suggestion to apply the variable pitch propeller principle to the centrifugal pump to give a 15 per cent. variation of output at fixed speed in order to vary the head of water when required, was put to Mr. Shipley, who pointed out that that would be suitable only for small heads. He did not know of any means whereby the speed of a.c. motors could be increased except by the commutator principle, but here the question of cost must be considered.

Comparison of Costs

Another speaker, representing a supply company, contributed data concerning rural water supplies and said that during the war with incidents which interfered with electricity supply averaging six per day, a supply continuity of 98.7 per cent. was given. To counter comments concerning electricity tariffs it was pointed out that electric pumping enabled savings to be effected in capital costs. Particulars were given of costs of pumping with Diesel and electric plant respectively in connection with a drainage scheme, the sets being of 50 H.P. and running 500 hours per annum. The total capital costs were £970 for electrical plant and £1 540 for Diesel; and the operating costs per annum were £201 and £233 respectively, the Diesel plant having to bear the greater capital costs.

Colour in Display.—The British Display Association has arranged a series of addresses dealing with display after the war. Among these is one by Mr. Wilson, of the British Colour Council on "Colour in Display," to be given on March 8 at the E.L.M.A. Lighting Service Bureau, London, W.C.2, at 6 p.m. The chairman will be Mr. W. C. Houston of the British Thomson-Houston Co., Ltd.

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.

The I.E.E. Council have made the twenty-third award of the Faraday Medal to **Dr. C. C. Paterson**, F.R.S., a past-president, for services rendered in the advancement of electrical science, particularly in the field of electrical research. He was on the staff of the N.P.L. from 1903 to 1919, His contribution to investigations into new methods of artificial lighting and into electronic developments has been outstanding. Dr. Paterson was elected a Fellow of the Royal Society in 1942. He is a past-president of the E.R.A., the Illuminating Engineering Society, the International Commission on Illumination, the Institute of Physics and the Junior Institution of Engineers. He is chairman of the Engineering Divisional Council of the British Standards Institution.

Dr. C. C. Paterson

Mr. A. G. Hawkins has been appointed manager of the North Western Area of the G.E.C. He has been with the company for over thirty years and assisted the late Mr. J. H. Farthing in the management of N.W. area for the past eight years. After graduating with honours at Cambridge he joined the company in 1912 as secretary to the late Lord Hirst. Shortly afterwards he was transferred to the Cardiff branch where he was engaged when war broke out in 1914. In 1919 he was appointed assistant manager at Glasgow and left there in 1925 to become general manager of the G.E.C. (India) Ltd.

Mr. A. G. Hawkins

Hirst Hall, Wembley, the social centre of the group of factories in that district owned by the G.E.C. was recently the scene of an unveiling by the Hon. Mrs. Gamage of a bronze plaque of the late Lord Hirst. The plaque was a personal gift from Lord Hirst's daughter and son-in-law, the Hon. Mrs. Gamage and Mr. Leslie Gamage, and its unveiling coincided exactly with the date of the death of Lord Hirst two years ago. Supporting the Hon. Mrs. Gamage at the ceremony were Sir Harry Railing, Mr. Leslie Gamage, Mr. G. Chelioti, Dr. C. C. Paterson and Mr. F. Winstanley.

The Hon. Mrs. Gamage unveiling a plaque of the late Lord Hirst

The I.E.E. Council have elected **Mr. J. S. Highfield**, a past-president, to be an honorary member of the institution, in appreciation of his distinguished work in the development of the science of the supply and application of electricity. Mr. Highfield became chief engineer to Stafford and St. Helens, Lancs., after which he was appointed chief engineer and manager of the Metropolitan E. S. Co. As senior partner in the firm of Highfield and Roger Smith, he later acted as consulting engineer for the Central Electricity Board and several electricity undertakings and industries in this country and abroad. He also became a director of the London Power Co., the London Associated Undertakings, the Central London Electricity, Ltd., and other companies. He is a vice-president of the Royal Society of Arts, a member of the Societe des Ingenieures Civil de France, past-president of the Junior Institution of Engineers and of the

Association of Supervising Engineers and a past manager and vice-president of the Royal Institution.

Three retiring employees of the English Electric Co., Ltd., whose aggregate of service amounted to 150 years, have been presented with long service testimonials. They are **Messrs. Thomas W. Probert** (56 years), **E. G. Fuller** (52 years), and **T. Reynolds** (40 years). The presentations were made by Mr. J. W. C. Milligan, manager of the Stafford works. The recipients voiced their appreciation of the company's consideration for them, referring also to the pension arrangements which they would enjoy. Also present were Mr. J. Rogers, general manager of works, the chairman and vice-chairman of the staff committee and departmental chiefs of the retiring employees.

The Coventry Electric Club held a successful New Year's dance at the Masonic Hall on January 23. The screening of the film in colour taken by Messrs. G. S. Nott and R. A. Bill during the club's summer golf tournament, with a running commentary spoken by Mr. Leslie Thorne, was an attractive feature. The Mayor, Alderman G. E. Hodgkinson, and the Mayoress attended, and the spot prizes were distributed by his Worship. Mr. F. Godden, the chief electrical engineer and manager, presented a plated egg set to the Mayoress. The Deputy Mayor, Mr. Lee Gordon, was also present. The proceeds are to be given to the Electrical Industries Benevolent Association.

Obituary

Mr. Percival Alan Toomer, a director of the Durrington Electric Light Co., aged 67 years.

Lt.-Col. F. R. S. Balfour, a director of Cable and Wireless, Ltd., on February 2, aged 71 years.

Mr. Kenneth Lindsay Wood, late engineer in-chief, Cable and Wireless, Ltd., on February 4.

News in Brief

Wireless Statistics.—The number of wireless licences issued by the Post Office during the year ended March 31, 1944, is stated to be 9 555 000, as compared with 9 420 000 in 1943.

Textile Mill Electrification.—Mr. F. J. Stevenson who addressed the Lancashire section of the Textile Institute at Manchester recently, said that for too long textile mill electrification had been considered simply as a question of changing over to electric power. He urged British electrical manufacturers to establish the advantage of driving the actual machine rather than the mill.

Machine Tool Installation.—The Northumberland C.C. intends spending about £3 000 on the installation of electrical machine tools at the Benton engine sheds used by the roads and bridges department.

Electrical Smithies, — Lancashire electricity undertakings are stated to have recently installed electric power in 36 smithies.

Blackburn Donation. — The Electricity Committee has voted £139 to the British Electrical and Allied Industries Research Association.

TWENTY-FIVE YEARS AGO

FROM THE ELECTRICIAN *of February 6, 1920: While we do not suppose that this country is in danger of attack, it is agreed that the next war will be largely in the air. It is worth-while, therefore, to consider the protection of power stations from this point of view, and to determine some policy for their adequate defence.*

Birkenhead Wireless Scheme.—A police wireless scheme is to be put into operation shortly. It will cost approximately £2 400 in its initial stages, of which about £1 300 will rank for Exchequer grant. It is understood that a similar wireless scheme is contemplated in Liverpool.

London-Athens Wireless.—It is announced by Cable and Wireless Ltd. that the London-Athens wireless circuit has been reopened for limited Press traffic only. The circuit, which had been closed since the transmitting station was attacked and immobilised on December 30, has been opened with temporary apparatus.

I.E.E. N.W. Centre.—The North-Western I.E.E. Centre Committee announces that a local group of the Installations Section has been formed. It will be under the chairmanship of Mr. L. H. A. Carr.

Electric Kitchens. —Owing to the public interest displayed in the Electrical Development Association's four all-electric kitchens, designed for use in low cost post-war homes, the exhibition at the Building Centre, 23, Maddox Street, London, W.1, will remain open until March 5.

X-Rays In Engineering

War-time Development and Future Trend

A JOINT meeting of the Institution of Electrical Engineers with the Industrial Radiology Group of the Institute of Physics, took place at the institution on February 1, when a paper by Mr. V. E. Pullen on "A Survey of X-Rays in Engineering and Industry" was read and discussed.

The paper contained nothing original. It did, however, attempt to show the development of X-radiography in industry and engineering from the time of Röntgen's discovery in 1895.

The paper was divided into three sections. In the first, developments up to the beginning of the present war were recorded in broad outline, with regard both to uses and to equipment. In the second, the war-time development of engineering and industrial radiography, particularly with regard to Service requirements and inspection, was dealt with. Both the applicability and the limitations of radiography in the engineering sphere were remarked upon. The third section was devoted to an attempt to forecast radiographic developments in future with regard to modifications in engineering inspection and development. The author also attempted to foreshadow the trend of development in X-ray apparatus and equipment.

No attempt was made in the paper to describe the applications of X-ray crystal analysis in industry, and no cognizance was taken of the enormous progress made by radiology in the medical and surgical fields.

Discussion

Dr. L. Mullins (Kodak, Ltd., and hon. secretary, Industrial Radiology Group, Institute of Physics), said he was sure it was for reasons of length that the author had omitted to mention the important developments in high speed radiography, which demanded very high X-ray intensities for extremely short times. He therefore described these researches in some detail since they illustrated how the electrical engineer could contribute to the progress of industrial radiology. There were also three other techniques in industrial radiography which had become of importance recently. The first concerned the photographic recording of the fluorescent screen image on to films as small as 33 mm., and apparatus for the industrial application of this technique was now commercially available in America. In this way, permanent records were obtained with less expense than when full-size films were utilised. The second concerned the applications of cine-radiography in which serial photographs of the fluorescent screen image of changing phenomena could be made in much the same way as ordinary cinematograph exposures. This technique seemed to hold great possibilities for the future. An important application of cine-radiography was reported in 1935 by Sack, who produced cine-radiographs of the drop formation in electric welding. The third branch of industrial radiography which justified some mention was X-ray micrography in which enlargements were made from radiographs in ultra fine grain material. This technique was first reported in 1913.

Dr. S. F. Dorey (Lloyds Register of Shipping) said that whilst the use of radiology in welded pressure vessels in the early days was, perhaps, not of great practical utility, it had a remarkably good moral effect. Then, too, the question of expense was a serious matter and an initial cost of £1 500 for the equipment, together with the fact that the apparatus had to be in the hands of fully competent people rather confined the application of X-rays, but it had the effect of keeping the welding of high class pressure vessels out of the hands of Tom, Dick and Harry. The result had been the development of a very high standard of welding pressure vessels. The training of operators of the apparatus was an important matter and it involved not only the operator but also inspectors who must have knowledge of how the apparatus should be used to get the results aimed at. As to the interpretation of evidence, so far as porosity was concerned some standardisation was necessary, but there were difficulties. He looked forward to a great extension of the use of radiological methods in industry, and to the time when every large works was equipped with the necessary radiological equipment.

Mr. E. J. Tunnicliffe (Siemens-Schuckert (Great Britain), Ltd.) discussed h.v. generating equipment, and, after referring to the staggering voltages now made use of—there had been an increase from a few hundreds to as much as 20 millions in a relatively few years—said that something very interesting was occurring, and that was a return to the electrostatic type of generation. He showed a slide of a modern 1 250 kV electrostatic machine with continuous current, ½-mA, which was not much larger than the man attending it, and foreshadowed a complete revolution in apparatus design. The volumetric capacity of the

1 250 kV generator was the same as a 200 kV generator of the more conventional type. With regard to X-ray crystallographic methods, only that day he had seen the urgent need for a piece of apparatus which would enable diamonds to be examined for their correct orientation in tool holders. We should also soon see some interesting special equipments, and he had in mind a 220 kV apparatus so constructed that the individual components would pass through a 20 in. diameter manhole on board ship and could be handled by two men. Finally, he asked for information with regard to the correlation of radiological and physical tests.

Dr. T. Raine (Metropolitan-Vickers Electrical Co., Ltd.) said that X-ray crystallography was no longer to be regarded as applicable only in the laboratory. It was applied to a considerable extent to routine testing in the metallurgical and ceramic industries. A special application was in connection with cemented carbide tool tips. Moreover, the use of this method for the rapid analysis of crystalline compounds was supplementing chemical analysis for the reason that whereas chemical analysis only gave information as to the individual compounds, X-rays gave information with regard to the combination of elements.

Mr. C. Croxson (Royal Arsenal) spoke of the phenomenal expansion in radiographic inspection during the war, and said that apparatus for flash radiography had now been put into a completly self-contained unit which could be taken to any part of the country, as mobile apparatus, working up to 300 kV. As to gamma-ray examination, he did not share Dr. Pullen's pessimism because he believed there would be an increasing demand for it in industry. Referring to the examination of castings he suggested that the right place for the use of X-rays was in the foundry in order to assist in the development of sound methods of making castings, rather than for inspection purposes only.

Dr. S. Torrance (G. A. Harvey and Co., (London) Ltd.) referred to the Admiralty radiological section which consisted of a corps of radiographers who had spent some time in the laboratories of industrial works and travelled round the shipyards and inspected welding work. He understood that at least one shipyard, which prided itself on the excellence of its welding, had been sadly disillusioned when radiology was introduced and that a great improvement had taken place.

Mr. D. E. Thomas (vice-chairman, Industrial Radiology Group, Institute of Physics) emphasised the importance of X-ray crystallographic methods in detecting strains and so avoiding failures which would otherwise not be anticipated, or suspected as possible.

Dr. R. C. Evans also spoke of the growing importance of X-ray crystallography and thought the author had rather given the impression that it had not developed sufficiently far yet, and would not for a long time. That was not the case. It was applied in the academic field 20 years ago in the elucidation of crystal structures, and this work had laid the whole foundation of modern crystal chemistry.

Correspondence

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

[To the Editor]

Education for Engineers

Sir,—I regret to note that in your issue dated February 2, the report of my remarks at the I.E.E. discussion on Education for Engineers might give a completely wrong impression, possibly due to the confusion which exists, particularly in the London area, by calling colleges for further education "institutes."

As published, my remarks might appear to suggest that technical colleges should only concern themselves with professional courses, whilst the City and Guilds of London Institute would be responsible for craft and technician courses. This, of course, is entirely contrary to my view. What I did suggest at the institution was that there had been a tendency in recent years for various bodies to put forward training and examination schemes and that I considered that the *examining bodies* should be limited to two, namely the professional institutions, in conjunction with the technical colleges for all professional examinations, and the City and Guilds of London Institute for all craft and technician examinations. I also made the further suggestion that the City and Guilds of London Institute might reconsider its existing regulations and award craft and technician certificates under regulations similar to those governing the award of National Certificates, in cases where the number of candidates is not likely to justify the holding of their ordinary type of examination.

Yours faithfully,

C. W. Robson,
Acting Principal,
South East London Technical Institute.

Industrial Information

Limitation of Supplies (Miscellaneous).—The Limitation of Supplies (Miscellaneous) (No. 25) Order, 1945 (a) which came into operation on February 1, no longer restricts supplies of lighting fittings in class 9b; the only provision relating to these goods deals with audited returns.

Potato Poofers.—Among several appetising dishes recommended in this month's "Cheerful Rationing" card, issued by the E.A.W., to give variety to the war-time diet are stuffed tripe, jugged steak, rabbit pudding, and potato poofers.

"Loud Hailer."—The second edition of the booklet published by Ardente Acoustic Laboratories, Ltd., describes one of their products, the "Loud Hailer," which has been in constant "front-line" use, particularly at sea, since the war began. Nearly 20 000 of these loudspeaking equipments have been supplied to the Navy and other branches of the Services.

English Electric Journal.—The December number of this journal contains an article by Mr. G. H. Paulin, chief engineer of the English Electric internal combustion department, entitled "Some Interim Notes on the Turbo Pressure-Charging of Four-Stroke Diesel Engines." The view is expressed that the turbo-charging of four-stroke engines will extend greatly and that the majority of these engines in future will be so arranged. An innovation is the introduction of a section for the Napier organisation as a feature of the journal.

Infra-Red Lamp Heating.—A brochure has just been published by the General Electric Co., Ltd., on the subject of infra-red lamp heating. It not only describes the developments recently made in this form of heat-treatment for many industrial processes, but also illustrates and gives technical particulars of installations in which infra-red heating has been applied successfully. The company point out that their services are available to advise, without obligation, on the best procedure to suit the needs and purposes of any firm which may be interested in the adoption of methods of heat treatment in which speed in production and improved finish are paramount features.

Philco Group Plans.—The Philco group of companies held a two-day meeting in London last week with the pre-war wholesalers and distributors of the Philco Radio and Television Corporation, Ltd. Post-war production plans and marketing methods for the products of the company members of the group were discussed. Mr. L. D. Bennett, chairman and managing director of the group of companies, announced that there would be no change from pre-war methods of distribution of the domestic radio and television receivers. Car radio, however, is to be a complete unit of the group. In addition to manufacturing sets for the British market at Perivale, Philco will maintain their own car radio sales organisation.

Copper Cylinders.—The revised specification, B.S. 699, 1944, Copper Cylinders for Domestic Purposes, Grades 1, 2 and 3, was primarily undertaken to permit concentrated production in order to meet the anticipated demands of post-war building. The range of sizes, as compared with the 1936 edition, has been greatly reduced and covers cylinders having nominal capacities from 20-100 gallons. The table of dimensions now specifies standard external heights instead of a range of stock heights in 3 in. increments, and the actual capacity appropriate to each nominal capacity. Other changes include standard positions for connections for circulators and immersion heaters, and the requirement that all jointing in all cylinders should be effected by brazing. Previously soldering was permitted in the case of the top and bottom seams of grade 3 cylinders; the thickness of the copper sheets specified has been amended to meet the revised requirements. Copies of B.S.699 may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. each, post free.

Equipment for Post-war Development.—In a circular letter to all authorised electricity undertakers, the Electricity Commissioners state that while they are not in a position at present to give any indication as to what extent it may be possible for post-war five-year programmes to be approved in whole or in part, it is assumed that most undertakers are, in any event, likely to require certain quantities of equipment, such as meters, switchgear and transformers, within the first 12 or 18 months after the termination of the war. In this connection it has been represented to the Commissioners that it would be of great assistance in maintaining employment at the highest possible level on the conclusion of hostilities, or as and when war contracts are terminated, if undertakers could now proceed to place advance orders for such equipment.

The availability of production capacity will vary in different districts according to the nature of outstanding war production requirements, but the Commissioners are advised that firms located in the follow-

ing areas, viz. : (i) the main industrial belt of Scotland; (ii) Dundee; (iii) Tyneside, Teeside and County Durham; (iv) West Cumberland; (v) South Wales, including Monmouthshire, are more likely to be in a position to give deliveries within a reasonable time.

The Commissioners will be prepared to consider applications by public authority undertakers for consent either to the borrowing of money or the use of surplus revenue for the above-mentioned purposes, but such undertakers should not enter into any commitments for which they would require such consent until it has been obtained.

Standards for Radio Components.— Various specifications in the BS/RC series for radio components prepared by the Inter-Service Components Technical Committee have been issued from time to time by the British Standards Institution, who publish these on behalf of the I.S.C. Tech. C. We give below a full list of the specifications in this series which are now available:— BS/RC.G/1, General Guide on Radio Components; BS/RC.S/1, General Specification for all Radio Components in the BS/RC. Series; BS/RC.S/110, Group Test-Specification for Fixed Resistors; BS/RC.S/110.1, Test Schedule for Fixed Resistors; BS/RC.S/120, Group Test-Specification for Variable Resistors; BS/RC.S/120.1, Test Schedule for Variable Resistors; BS/RC.S/130, Group Test-Specification for Fixed Capacitors; BS/RC.S/130.1, Test-Schedule for Paper-Dielectric Fixed Capacitors; BS/RC.S/130.6m, Test-Schedule for Miniature Paper-Dielectric (Metallised Paper Type) Capacitors; BS/RC.S/130.2, Test Schedule for Mica Dielectric Fixed Capacitors; BS/RC.S/130.3, Test Schedule for Ceramic Dielectric Fixed Capacitors; BS/RC.S/130.4, Test Schedule for Electrolytic Capacitors; BS/RC.S/141.1m, Test and Performance Specification for Miniature Variable Capacitors (Air-spaced Ganged Type); BS/RC.S/165m, Group Test-Specification for Miniature Relays; BS/RC.S/165.1m, Test Schedule for Miniature Normal Type Relays; BS/RC.S/165.4m, Test Schedule for Miniature High-speed Type Relays; BS/RC.S/130.1m, Test Schedule for Miniature Paper-dielectric Fixed Capacitors (Excluding Metallised Paper types); BS/RC.S/130.2m, Test Schedule for Miniature Mica-dielectric Fixed Capacitors; BS/RC.S/130.7m, Test Schedule for Miniature (High K) Type Ceramic-dielectric Fixed Capacitors; BS/RC.G/110, Guide on Fixed Resistors. The index and the first sixteen of the above documents (i.e., up to and including BS/RC.S/165.4m) are published at 6d. each, and the remainder at 3d. each by the publications department of the British Standards Institution, 28, Victoria Street, London, S.W.1.

Contracts Open

Tottenham (London), February 9.— Supply of electric lamps. Particulars from Mr. E. Townson, Town Hall, Tottenham, N.15.

Birkenhead T.C., February 12.—Supply of electric lamps for 12 months commencing April 1, 1945. Particulars from the Borough Electrical Engineer, Craven Street, Birkenhead.

Brightlingsea U.D.C., February 13.— Supply of electrically-driven borehole pump (3 000 g.p.h.). Particulars from Mr. J. Fowler, Clerk to the Council, Town Hall, Brightlingsea.

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

Leeds Education Committee, February 20.— Electrical repairs and maintenance work in connection with school buildings for the three months ending June 30. Forms of tender from the Director of Education, Education Offices, Leeds.

Ashford (Kent) U.D.C. February 26.— Supply and installation of a 300 000 cu. ft. per day carburetted water gas plant with automatic operation, together with electric coke-skip hoist. Particulars from the Manager of the Gasworks, Ashford, Kent.

Belfast Electricity Department, March 6. —Supply of the following materials:— Spare parts for mechanical stokers and ash conveyors (4); refined bitumen (6); feeder and section pillars (9); armourclad compound filled 6 600 V switchgear (10); meters and instrument transformers (11); l.t. fuse units, house service cut-outs and house service connector boxes (14); static transformers (15); v.b. and p.i. cables and cast iron joint boxes (16); bare hard drawn high conductivity copper conductors and p.b.j. insulated cables (22); overhead line materials (25); v.i.r. electric cables, wires and flexibles (29); electric lamps (30); oilskin coats, tarpaulins, rubber jointing, etc. (31); switch tripping batteries and charging equipments (33). Particulars from the City Electrical Engineer, East Bridge Street, Belfast.

Company News

CLYDE CRANE AND BOOTH.—Fst. and fin. on ord. 15% (same).

CAPE ELECTRIC TRAMWAYS, LTD.—Nov. revenue £106 435, exs. £86 591.

SHEEPBRIDGE COAL AND IRON CO., LTD.—Intm. div. on ord. 3%, tax free (same).

WM. NEILL AND SONS (ST. HELENS), LTD.—Intm. on ord, 1¼d. per sh. payable Feb. 21 (same).

ISLE OF THANET ELECTRIC SUPPLY CO. LTD.—Rev. for 1943, £60 821 (£52 455), Exes., skg. fund "A" and "B" deb. int. and skg. fund int. £62 152 (£62 510), exes. res. for local rates written back nil (£10 564), deficit £1 331 (£10 055).

POWER SECURITIES CORPORATION LTD.—Gross pft. £113 375 (£113 632) for 1944. Div. 6%, less tax (same). To exes. £9 745 (£9 796), dirs.' fees £1 104 (£1 200), net pft. £102 526 (£102 636). Tax £51 973 (£49 802), pref. div. £17 500 (same), ord. div. 6% £24 000 (same), fwd. £58 791 (£49 738).

ANTI-ATTRITION METAL CO. LTD.—Mfg. pft. (after admin. exes.) to July 31 £83 090 (£72 708). Dirs.' fees £1 050 (same), exceptional depreen. provn. £10 500 (£10 000), war damage £758 (£596), leavg. £70 782 (£61 062). Tax £52 000 (£48 000), staff superannuatn. £500 (same), div. 15% £13 125 (same), fwd. £7 178 (£2 021).

Company Meetings

E. K. COLE, LTD.—An extra-ordinary general meeting was held at Aston Clinton, on January 31, to consider a resolution approving the extension of the objects of the company. In the course of his speech Mr. W. S. Verrells, the chairman and joint managing director, said that when Mr. Cole and himself began their association in 1925, they had no idea that, within the comparatively short space of 20 years the Ekco business would have grown to such dimensions and it was not surprising, therefore, that the technical definition of the company's objects, as set out in its original memorandum of association, was somewhat narrow and restricted. The special resolution was carried unanimously.

R. A. LISTER AND CO., LTD.—In the course of his address at the annual meeting held at Dursley, on January 30, Mr. Percy Lister, the chairman, said the problems which would confront the company with the coming of peace were, of necessity, frequently under consideration, but no planners for post-war trade could ignore those problems presented by the disposal of Government surplus stores and equipment. Mechanised warfare had created an enormous volume of products, the uncoordinated disposal of which could seriously imperil not only plans for full employment but also the stability of many of our industrial undertakings.

SCOPHONY, LTD.—The annual meeting was held in London on February 6. In the statement made by the chairman, Sir Maurice Bonham-Carter, he said that it would be the company's policy as soon as circumstances permitted to develop a television unit displaying a screen about 3 ft. by 2 ft. and introducing colour, with the further aim of producing, as before the war, a large unit suitable for public entertainment. The introduction of colour would, it was true, need an increased frequency band, but the transmission and reception of this should not present great difficulty. Television should benefit from the improvements which had taken place in h.f. and u.f. transmission and reception technique. The transmission and reception of a wider frequency band should not create undue difficulties. It was also anticipated that the country could be covered for the reception of television by a wireless relay system.

Metal Prices

		Monday, February 5 Price.	Inc.	Dec.
Copper—				
Best Selected (nom.)	per ton	£60 10 0	—	—
Electro Wirebars ...	„	£62 0 0	—	—
H.C. Wires, basis ...	per lb.	9 5/8d.	—	—
Sheet	„	10 7/8d.	—	—
Phosphor Bronze—				
Wire(Telephone)basis	per lb.	1s. 0 1/8d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	—	—	—
Sheet „	„	—	—	—
Wire „	„	10 7/8d.	—	—
Iron and Steel—				
Pig Iron (E. Coast Hematite No. 1)...	per ton	£6 18 6	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ...	„	£27 10 0	—	—
Mild Steel Tape (Cable Armouring) basis 0.04 in. ...	„	£20 0 0	—	—
Galvanised Steel Wire No. 8 S.W.G. ...	„	£26 0 0	—	—
Lead Pig—				
English	per ton	£26 10 0	—	—
Foreign or Colonial	„	£25 0 0	—	—
Tin—				
Ingot (minimum of 99.9% purity) ...	per ton	£303 10 0	—	—
Wire, basis... ...	per lb.	3s. 10d.	—	—
Aluminium Ingots ...	per ton	£110 0 0	—	—
Spelter...	„	£25 15 0	—	—
Mercury (spot) Warehouse ...	...per bottle	£69 15 0	—	—

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

Commercial Information

County Court Judgments

NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*

CAMBORNE RADIO CO.—35, Trelowanen Street, Camborne, electrical engineers. £21 1s. Dec. 4.

TUBINI, Anthony B., 30, Derbyshire Lane, Stretford, electrical engineer. £10 8s. 10d. Nov. 30.

RADIO AND ELECTRICAL SERVICES, 21, Newport Road, London, W.C.2, radio engineers. £48 10s. 3d. Dec 20.

ORAM, E. R., 1, Repton Road, Brislington, electrical engineers. £19 12s. Nov. 17.

ROGERS, Harry, S., 347, Birmingham Road, Walsall, electrical engineer. £31 4s. 6d. Dec. 19.

B. E. T. A. SERVICES (CROYDON), 221, Ross Road, London, S.E.25, electrical engineers. £25 8s. 3d. Dec. 19.

FINN, Wm., 7, Banstead Way, Wallington, electrical cable engineer. £21 10s. 8d. Nov. 28.

SULLIVAN AND CO., Empire Works, Helena Street Parade, Birmingham, electrical engineers. £15 1s. Dec. 13.

Satisfaction

GENERAL ACCESSORIES CO., LTD., London, E.C., mfg. electns.—Sat'ns. Jan. 20, £5 000, reg. Jan. 25, 1933, and £7 000, reg. Mar. 13, 1937.

Notice of Dividend

PENTY, Percy Walter, trading as "Sackville Electrical Co.", residing and carrying on business at 38, Mannville Terrace, Morley Street, Bradford, electrical contractor. Supplemental dividend 4 per cent. statutory interest, payable Feb. 14, 1945, Official Receiver's Office, Hallfield Chambers, 71, Manningham Lane, Bradford.

Notice of Intended Dividend

BRIMFIELD, Robert Thomas Henry, lately of Wellington Cottage, Wellington Square, London, S.W.1, lately carrying on business under the style of Richfield Electrical Components, at 73-78, High Holborn, London, W.C.1, electrical contractor. Claims to be sent by Feb. 10, 1945, to the trustee, Mr. Leslie Arthur West, Bankruptcy Buildings, Carey Street, London, W.C.2, Senior Official Receiver.

Coming Events

Saturday, February 10.

I.E.E., LONDON STUDENTS' SECTION.—Visit to Battersea Power Station. *2.30 p.m.*—I.E.E., N.W. STUDENTS' SECTION, College of Technology, Manchester. Dance. *6 p.m.—10 p.m.*

ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.—E.L.M.A. Lighting Service Bureau, London, W.C.2. Lecture, "Distribution of Electricity in London," E. H. Jesty. *2.15 p.m.*

Monday, February 12.

I.E.E., N.E. CENTRE.—Newcastle-on-Tyne. "A Survey of the Problems of Post-War Television," H. J. Edwards. *6.15 p.m.*

I.E.E., WESTERN CENTRE.—Bristol. "Organisation of Industrial Electrical Maintenance," J. C. B. Nicol. *5 p.m.*

Tuesday, February 13.

I.E.E., N.W. CENTRE.—Manchester. "Thermoplastic Cables," H. Barron, J. N. Dean and T. R. Scott. *6 p.m.*—I.E.E. SCOTTISH CENTRE. Glasgow. "Standardisation and Design of A.C. Turbo-Type Generators," G. A. Juhlin. *6.15 p.m.*—I.E.E. LONDON STUDENTS' SECTION, Savoy Place, W.C.2. The Students' Lecture. "The Cathode Ray Tube and its Applications," Dr. W. Wilson. *7 p.m.*

ILLUMINATING ENGINEERING SOCIETY.—Institution of Mechanical Engineers, Westminster, S.W.1. Discussion on "The Lighting of Buildings" (Post War Building Studies, No. 12), introduced by Dr. C. C. Paterson *6 p.m.*

Wednesday, February 14.

I.E.E., TRANSMISSION SECTION.—London, W.C.2. "The Operation, Maintenance and Testing of Overhead Lines and Associated Outdoor Equipment on A.C. Systems," R. C. Hatton and J. McCombe. *5.30 p.m.*

Thursday, February 15.

I.E.E., CARDIFF STUDENTS' SECTION.—"Control and Organisation for an Industrial Electrical Department, W. P. Lewis.

Friday, February 16.

I.E.E., MEASUREMENTS SECTION.—London, W.C.2. "The Economic Utilisation of Modern Permanent Magnets," D. J. Desmond. *5.30 p.m.*—I.E.E., N.E. STUDENTS' SECTION, Newcastle-on-Tyne. Senior chairman's address, J. A. Harle. *6.30 p.m.*

I.E.E., BRISTOL STUDENTS' SECTION.—Bath. "Paper Insulated and High Voltage Cables," J. W. Miles.

JUNIOR INSTITUTION OF ENGINEERS.—39, Victoria Street, S.W.1. "War-time Engineering in Agriculture," H. W. Arkell. *6.30 p.m.*—SHEFFIELD SECTION, West Street. Discussion, "Fabrication by Welding," R. W. T. Norton. *7 p.m.*

ELECTRICAL TRADES' COMMERCIAL TRAVELLERS' ASSOCIATION.—Connaught Rooms, London, W.C.2. Luncheon. *1 p.m.*

Saturday, February 17.

I.E.E., LONDON STUDENTS' SECTION.—Visit to Furzehill Laboratories, Boreham Wood. Herts. *2.45 p.m.*

I.E.E., W. WALES SUB-CENTRE.—Swansea. "Electrostatic Precipitation of Dust from Boiler-Plant Flue Gases," J. Bruce.

IF anyone could make a Blower, it must be Hoover Ltd. who had made the world's best vacuum cleaner in peace-time.

Apparently the Government thought so too, for from the early days of the war they gave Hoover Ltd. contracts for Blowers — tens of thousands of Blowers. Hot Air Blowers for drying, Blowers for cooling; Blowers for a multiplicity of jobs, from cooling Radar Valves to testing airmen's dinghies so that they could be carried in safety on R.A.F. planes.

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