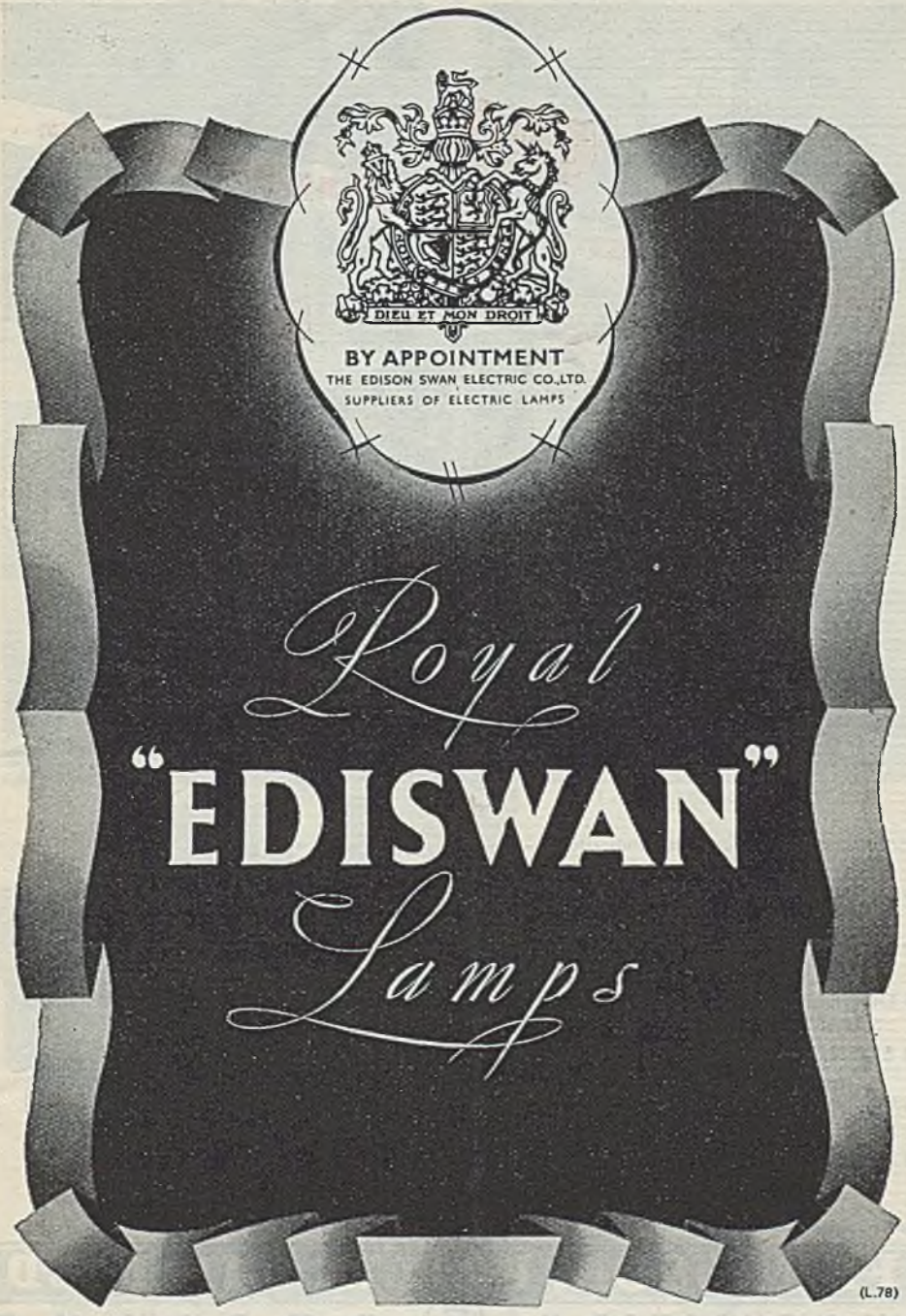
THE ELECTRICIAN

THE TECHNICAL NEWSPAPER OF THE ELECTRICAL INDUSTRY

29 NOVEMBER 1946



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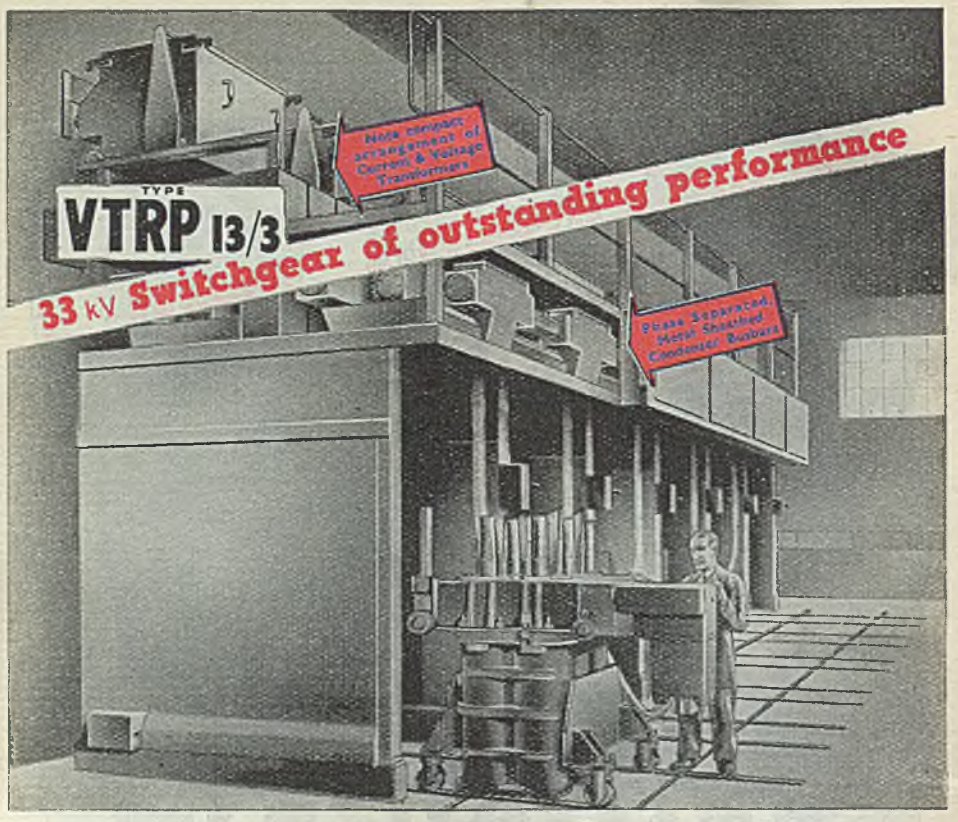

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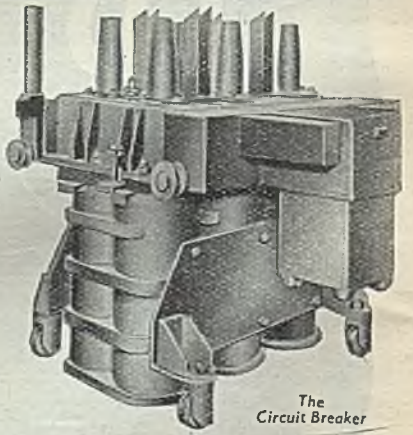

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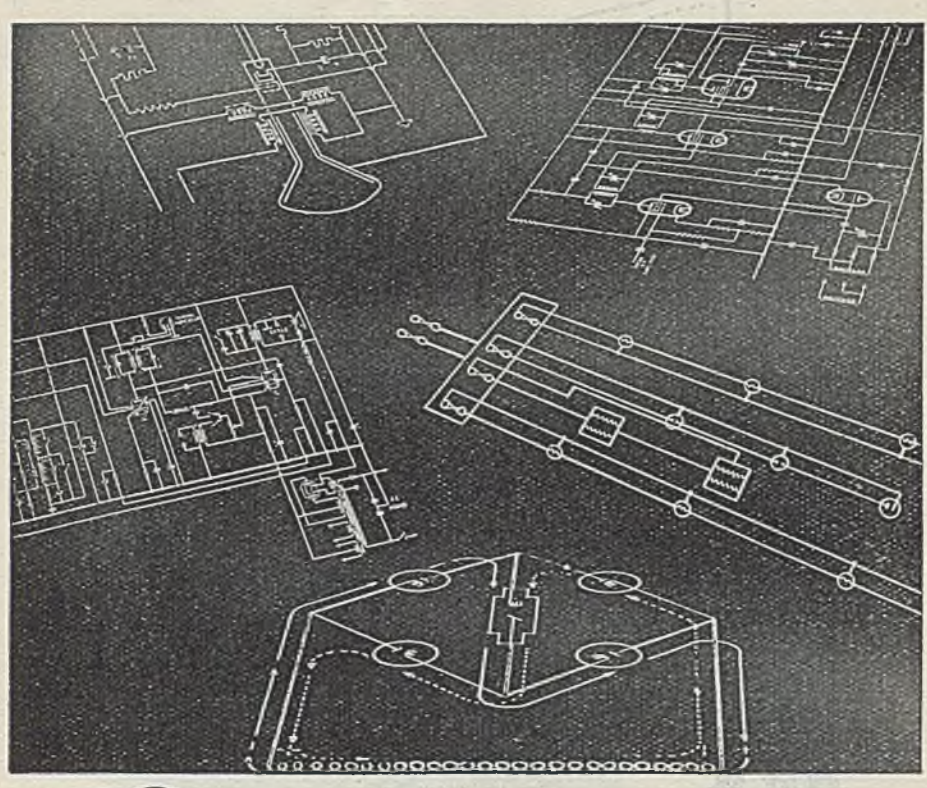

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SITUATIONS VACANT

CENTRAL ELECTRICITY BOARD.

A VACANCY exists for a Draughtsman with experience in Civil Engineering and Buildings Works drawings and preparation of Quantity Schedules.

The commencing basic salary will be from £300 to £350, depending on qualifications.

To the basic salary will be added war-time payments in accordance with arrangements in force from time to time. At present the additional payment amounts to £62 8s. per annum.

The selected applicant will be required to undergo a Medical Examination and, if approved, will be required to join the Board's Superannuation Scheme.

Applicants must state age and give full particulars (with dates) of education, technical training, experience, etc.

Applications must be submitted, in writing, to the Chief Engineer, Central Electricity Board, 1, Charing Cross, London, S.W.1, and be received by him not later than midday on Monday, December 16th, 1946.

ATHERTON URBAN DISTRICT COUNCIL.

ELECTRICITY DEPARTMENT.

APPLICATIONS are invited for the position of SYSTEM MAINTENANCE ENGINEER required in the Electricity Department.

Candidates must have a sound technical training and good practical experience in the distribution side of an Electricity Undertaking (mainly the overhaul and testing of High Tension and Low Tension Switchboards, Transformer maintenance and oil purification, and general mains works). Aknowledge of the testing and repair of house service meters is desirable, also mains and meter records.

Salary and conditions will be in accordance with the N.J.B. Class "B," Grade 8 (£354 per annum). The appoiutment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications, stating age, experience, and accompanied by copies of two recent testimonials, must be received by the undersigned not later than 19th December, 1946.

S. G. BLAKEBOROUGH,
Clerk of the Council.

Town Hall,
ATHERTON, Manchester.
16th November, 1946.

CITY OF BRADFORD ELECTRICITY DEPARTMENT.

CLERK OF WORKS (SUB-STATIONS).

APPLICATIONS are invited for the above appointment from persons who have a sound knowledge of drawing office work and have had experience in the preparation of drawings and specifications for sub-station plant and in the supervision of the erection of buildings and the installation of electrical plant. Corporate Membership of a Professional Institution or exempting qualifications will be an advantage.

The salary and conditions of employment will be in accordance with the N.J.B. Agreement, the salary being that attaching to Class H. Grade 9 (£402/410/417).

The selected candidate will be required to pass a medical examination and contribute to a Superannuation Scheme under the provisions of the Local Government Act, 1937.

Applications, stating age and giving details of education, technical training and experience, together with copies of two recent testimonials, must reach the undersigned not later than Tuesday, the 10th December, 1946.

T. H. CARR,
Electrical Engineer and Manager.

45-53, Sunbridge Road, BRADFORD.
November, 1946.

SITUATIONS VACANT

CIVIL SERVICE COMMISSION.

APPLICATIONS are invited for posts at the Military College of Science, Shrivenham, near Swindon, Wilts., of permanent and temporary Principal Lecturers, Senior Lecturers and Lecturers. Vacancies in one or more of these grades exist in the following subjects:—Electrical Engineering, Metallurgy, Heat Engines, Machines, Mathematics, Mechanics and Materials. Applicants must have a University degree in an appropriate scientific subject with first or second class honours or an equivalent qualification. Experience in research or design as applied to military needs would be an advantage. The inclusive scales of salary are (Principal Lecturer) £840—£1 125, (Senior Lecturer) £610—£800, (Lecturer) £333—£560. If, owing to the housing shortage, accommodation is unavailable, War Department quarters may be allotted at a fair rent until such time as other accommodation becomes available. Full particulars of the posts, together with a statement of the conditions of service and the intentions of the War Office regarding the Military College of Science, and a form of application, may be obtained from the Secretary, Civil Service Commission, Burlington Gardens, London, W.1, quoting No. 1 698. Application forms must be returned to him by 20th December, 1946. SUCCESSFUL APPLICANTS WILL BE REQUIRED TO JOIN FOR DUTY AS EARLY AS POSSIBLE IN 1947.

DRAUGHTSMEN.—Applications are invited from Senior and Junior Switchgear Draughtsmen with experience of general switchboard work, high and low voltage, control panels, diagrams, etc. Applicants should state age, experience and salary required to Employment Officer, Messrs. Johnson and Phillips Ltd., Victoria Way, Charlton, S.E.7.

DRAUGHTSMEN.—Senior and Junior required; experience on Electrical Control Gear an advantage. Also, Junior Draughtsmen required for preparing complete diagrams from schematics. Applications in writing to Managing Director, Igranic Electric Co. Ltd., Bedford.

SITUATIONS VACANT

LONDON COUNTY COUNCIL invites applications from qualified electricians and charge hands for positions of INSPECTORS FOR ELECTRICAL WORK in the Chief Engineer's Department. Applicants must have had practical experience in good class wiring in houses, blocks of flats and other buildings, and should be conversant with methods of carrying out this work by contract on a large scale, and capable of supervising, inspecting and testing work on site. Ability to write clear and concise reports is essential.

Rate of pay, according to qualifications and experience up to £7 17s. 6d. a week, including variable allowances.

Selected candidates will be subject to the provisions of the Local Government (Superannuation) Act, 1937.

All other things being equal, preference will be given to registered disabled persons.

Application forms obtainable by sending stamped addressed foolscap envelope to the Chief Engineer (quote 46/16), County Hall, Westminster Bridge, London, S.E.1.

Completed forms are to be returned by not later than 16th December, 1946.

Canvassing disqualifies.

EXPERIENCED Tracer for Drawing Office required. Apply to Personnel Manager, Carlisle Electrical Manufacturing Co., Ltd., Bentcliffe Works, Salters Lane, Eccles, Lancs.

ARMATURE Winders and Improvers required, A.C. and D.C., top rates, good working conditions.—Electrical Power Repairs (Gillingham) Ltd., Strover Street, Gillingham, Kent.

FOR SALE

"PIED PIPER" Electric MOUSE TRAPS, automatic, clean, safe. No "setting," just plug in! Type "O" (3 mouse capacity), with 6 ft. flex, 200/250 volts, 12s. 6d., post free.—The Robert Joliffe Trust (Manufacturers), Aston Clinton, Bucks.

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

LEATHER FINGER STALLS.—Made of Chrome Hide. Very strong and hard wearing. Length 3 in. Price 4s. per doz. Prompt delivery. Sample on application.—Willson Brothers, Industrial Clothing Manufacturers, Epsom, Surrey.

FOR REWINDING ELECTRIC MOTORS. Fractional, up to 100 h.p. Transformers, Chokes, etc., contact Electrical Construction Company, Ltd., Seymour Wharf, Totnes, Devon. 'Phone: 3282.

SACKS and Bags in excellent condition for all commodities, as low as 4d. each. Write: John Braydon, Ltd.,
230, Tottenham Court Road, W.1.
Tel. No.: Museum 6972.

SUPERIOR Type Builders' Ladders now in production; also Steps, Trestles and Extension Ladders.—Phone: Shaftesbury Ladders, Ltd., 453, Katherine Road, E.7. Grangewood 3363/4.

VACUUM CLEANER REWINDING SERVICE, commutators and Bearings. Prompt delivery and full guarantee.—Thomas Anderson, 117, Bowes Street, Blyth, Northumberland. 'Phone: Blyth 405.

SPECIAL OFFER.—Timber-framed, asbestos-clad huts; twenty only, size 8 ft. by 6 ft. by 6 ft. eaves by 8 ft. ridge. Also a few size 16 ft. by 8 ft. by 7 ft. eaves and 20 ft. by 12 ft. by 7 ft. eaves. Further particulars and prices on application.—D. McMaster and Co., 38, Mount Bures Works, near Colchester, Essex. Tel. No. Bures 351 and 352.

FOR SALE

DYNAMO & MOTOR REPAIRS LTD.,
Wembley Park, Middlesex.
Telephone: Wembley 3121 (4 lines).
Also at Phœnix Works, Belgrave Terrace, Soho Road, Handsworth, Birmingham.
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LAMPSHADE Wires, any design, from own drawings or samples. Enquiries invited.—Regent Wares, 57a, Queen's Road, Walthamstow, London, E.17.

ARMATURE Winding: Vacuum Cleaners, etc., single or quantities.—Vac, 80, Cranbrook Road, Ilford.

STAR Domestic Appliances Ltd. (Electrical Wholesalers), invite Electrical Contractors and Retailers to visit their showrooms at 28, Deansgate (adjoining Deansgate Garage), Manchester, 3. Good deliveries can be made on all electrical items. Worth a visit!

ELECTRIC Convector Heaters.—Home and Export market supplied. Prompt deliveries from Weatherhead and Company (Glasgow) Ltd., Electro-Engineering Manufacturers and Distributors, 153, Oxford Street, Glasgow, C.5.

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2 500 ELECTRIC METERS.—L. Stephenson offers for immediate despatch this large quantity of electric meters of the various types listed, all supplied "On Approval," all correct to very fine margin of error, all cases like new for 200/250 volts supply, A.C. 5 Amp. Meters, 425 No.; 10 Amp. Meters, 1 525 No.; 20 Amp. Meters, 70 No.; 40 Amp. Meters, 12 No.; 50 Amp. Meters, 300 No.; Prepayment Meters, 77 No. We also offer Maximum Demand Indicators, 7.5 Amp. Indicators, 50 No.; 10.0 Amp. Indicators, 25 No.; 50.0 Amp. Indicators, 25 No. These Meters and Maximum Demand Indicators are suitable for Service Use or Interdepartmental Use in Factories, Works, Stores, etc., send S.A. Foolscap Envelope for our list No. E.101, with specifications and prices.—L. STEPHENSON, Bay Hall Works, Birkby, HUDDERSFIELD. Tel. 2455. P.S.—Do you require Steel Windows-List W.D.3. Do you require Nissen Type Huts, List N.3 (very large ones). Do you require Reconditioned Timber Huts, List 590. Do you require Wood or Steel Benches, Racks, List M.2.

FOR SALE

FIRES, fires, fires.—The Sedway 1 kw tubular bar reflector fire at 45s. retail is the finest value on the market; liberal trade discounts; factors willingly supplied; send for sample.—Sedway Electric, Ltd., 131. High Street, Wolstanton, Stoke-on-Trent.

ELECTRIC MOTORS, A.C. and D.C. We supply all types and sizes of Electrical Machinery—Slow Speed Reduction Gears can be supplied to customers' requirements with short deliveries. Send your enquiries to Be-Be Engineering, 3, Retreat Close, Kenton, Middlesex. Tel.: WORdsworth 4928.

CHANNELLING OR SHEATHING.—Galvd. made in 6 sizes for electric wiring in houses. Buy direct from the manufacturers. Price List on application to Metal Commodity Company, Sutherland Avenue, Cuffley, Herts.

VACUUM Cleaner Spares and Accessories. Bags, bearings, belts, brushes, fans, switches, etc. Repairs, rewinding, rebristling. Sent for price list.—Reliance Vacuum Cleaner Service, 152-154, Broadway, Bexleyheath, Kent.

FOR SALE.—One Oval shaped Test Drying Equipment constructed of steel with glass fronts, circulating fan, and silica gell compartments 12 ft. by 4 ft. 6 in. by 1 ft., as new, £40.—Grosvenor Engineering Co. Ltd., Grecian Street, Salford 7, Lancs.

A BARGAIN in CABLE and BELL WIRE.—Cable 1/.052, V.R. 250 volt, Ref. 4101. Taped Cotton Braided and comp. Flameproof, Black (Craigpark), in 500 yd. coils or on non-returnable reels; 37s. 6d. per 500 yards. Waxed Bell Wire (1 red, 1 blue), 1/.036. Twin Twisted, Tinned Copper, pure insulated, Cotton Runners, Cotton Lapped and Paraffined, in 100-yard coils (W. T. Glover), 9s. per 100 yards, 37s. 6d. for 500 yards. Terms net cash with order. Carriage extra. Any quantity supplied.—Wm. Hurlock, Jnr., Ltd., High Street, Thames Ditton, Surrey. 'Phone: Emberbrook 4011.

LADDERS, Trestles and Handcarts, from Ramsay and Sons (Forfar), Ltd., Forfar.

EAST Devon Electrical, Radio and Cycle business. Double-fronted shop. Main street position. Turnover £3 000 per annum. Good living accommodation. 3 double beds., 2 box rooms, bath, 2 rec., kitchen, good storage accommodation, small walled garden, greenhouse. Price £5 500 includes goodwill, equipment and freehold property. Stock at valuation.—E. Hayne, 4, Johnson's Place, Exmouth.

NUTS. 700 gross surplus for disposal. ¾ in. Whit. Simmonds No. 2BA/T/MS. Self-Locking. Offers to H. Frost and Co., Ltd., Fieldgate, Walsall. Tel.: Walsall 2218.

ATLAS lamps from stock, delivery in London, Surrey, Sussex and Kent; other lines include clocks, toasters, fires, irons, kettles, fans, fittings, chargers, speakers, etc.—Drubel Radio Distributors, Ltd., 39a, Stafford Road, Croydon. Croydon 1107.

ELECTRIC Storage Battery, 54 cells, by D.P. Battery Co., Bakewell, Derbys., together with 7-h.p. Lister Engine. Owner now on mains supply.—Strutt and Parker, 2, High Street, Chelmsford.

SELF-PRIMING ELECTRIC PUMPS.—300 g.p.h. £14 5s.—John E. Steel, Clyde Mills, Bingley. 'Phone 1066.

METERS.—200/250 V 50 cycle, 2 wire Prepayment pattern comprising 150-10 amp. and 20-5 amp. Electrical Apparatus Company type ECP with shilling coin mechanism and 9d. price compounds. These compounds may be easily changed. Due to tariff changes the meters have recently been removed from circuit and are no longer required. Price as removed, £2 each; or if certified, £3 each.—Apply J. S. Pickles, Esq., B.Sc., M.I.E.E., County Electrical Engineer, Marchmount, Dumfries.

FOR SALE

SLIP RING MOTORS, 400 volts 3 phase 50 cycles: 3—Crompton Parkinson, 90 H.P., 580 r.p.m. 3—E.E.C. 100 H.P., 720 r.p.m. The above complete with E.A.C. Pillar type Stator Rotor Control Units, Automatic type, floor mounting. Alternators 400 volts 3 phase 50 cycles: 1—Brush Revolving Field Alternator, 275 KW 600 r.p.m. Three Bearing type, complete with Switchboard. 1—As above, but 30 KW. 1 500 r.p.m., complete with Switchboard.—Oldfield Engineering Company Limited, 96, East Ordsall Lane, Salford 5.

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TWO Westinghouse Static Phase CONVERTORS. Input: 400-440 volts, 50 cycles, single phase. Output: 400 volts, 4 kVA, 3 phase.—Home Counties Engineering Co., Ltd., 106a, Church Road, Upper Norwood, London, S.E.19.

DIESEL ALTERNATOR, 30 to 50 kW, 230 volt, single phase.—Greenhill, Kilowatt House, North Road, Bath.

WANTED, Electric Motors, 4 h.p. 400 volt 3-phase 50 cycle, also 4 h.p. 220 volt 3-phase 50 cycle, 1 500 r.p.m.—The Wadley Manufacturing Co., Ltd., Coventry House, South Place, London, E.C.2. 'Phone CLErkenwell 3692.

NO. 68 LAMINATIONS (Sankey or M.E.A.) required immediately. Advertisers will purchase or exchange for 26 s.w.g. wire.—Apply J. and G. Coughtrie Ltd., Montrose Avenue, Hillington, Glasgow, S.W.2. Telephone: Halfway 3262.

URGENTLY REQUIRED.—250 ft. of Hot Rolled low carbon seamless steel tubing in sizes which will machine to 4⅛ in. o/d by 3⅜ in. i/d. Material should be in good condition.—Box No. L.S.Y., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

7½-H.P. Squirrel Cage Motors, foot or flange mounted, 3-ph., 50 cycles, 960/1 440 r.p.m., 220/380 and/or 400/440 volts, in good condition.—T.M.A., Leatherhead Road, South Chessington, Surbiton, Surrey. (Tel.: Epsom 2634.)

VITREOUS base metal top push button switches required.—Runbaken Electrical Products, 71, Oxford Road, Manchester.

ENAMELLED wire wanted, 21, 21½, 23½, 24, 43 and 44 gauge. Good price paid, any quantity.—Runbaken Electrical Products, 71, Oxford Road, Manchester.

A.C. MOTORS, 1-100 h.p., 500-1,500 r.p.m. Any make fitted with ball and roller type bearings. Must be good machines, such as you yourselves would buy. Alternatively motors for rewinding will be considered.—Oldfield Engineering Co., Ltd., 96, East Ordsall Lane, Salford, 5.

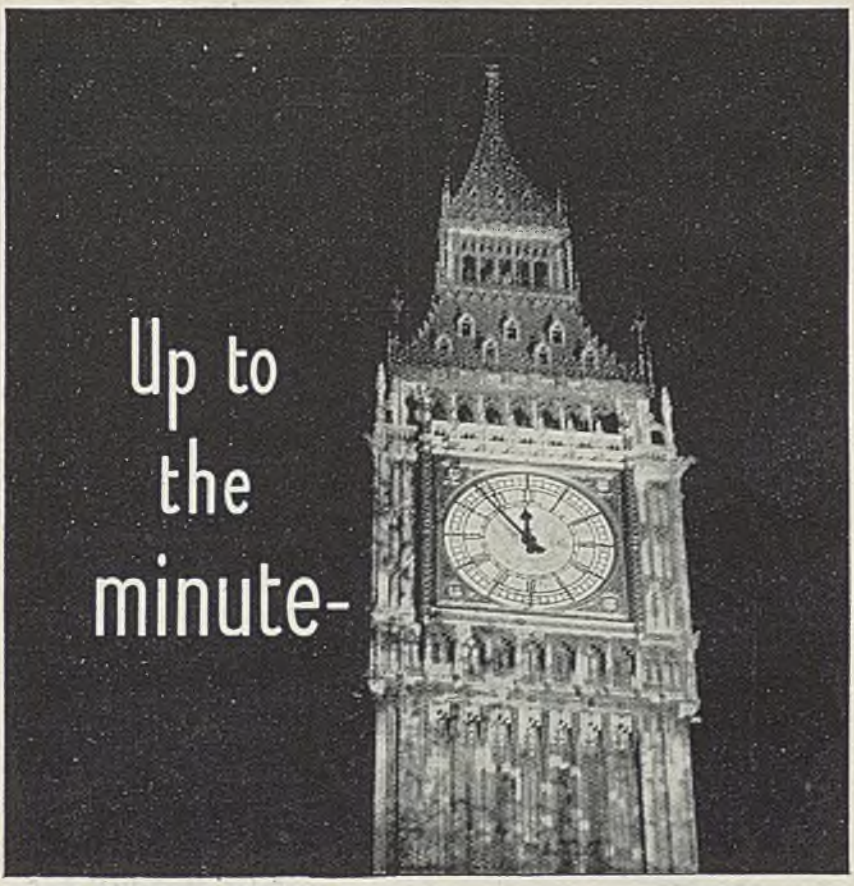
WANTED.—ROTARY CONVERTORS, any size.—Universal, 221, City Road, London, E.C.1.

WORK WANTED

MANUFACTURERS contemplating contracting out part of their production due to labour or capacity difficulties are invited to contact us; reasonable space available at the moment; ample female labour available.—Broxlea Products, High Road, Broxbourne, Herts. Hoddesdon 3091-2.

EXCHANGE

COPPER WIRE FOR EXCHANGE.—Advertisers are prepared to exchange the following amount of 26 s.w.g. wire, 271 lb. Pigenam insulated type 1, 3877 lb. Pigenam insulated type 2, for equal weight of 37 s.w.g. Bicolon or Lewmex. Price difference to be adjusted.—Apply J. and G. Coughtrie Ltd., Montrose Avenue, Hillington, Glasgow, S.W.2. Telephone No.: Halfway 3262.



"BIG BEN" is always up to the minute, never falling a step behind or getting one in front. Unlike Big Ben, we at SANDERS—WEDNESBURY, endeavour to be always a step in front, but the abnormal conditions of today unfortunately will not permit us to keep pace with the demand for our products. Shortage of supplies, restrictions, etc. are gradually being overcome—meantime, modifications to existing ranges and entirely new designs are being planned to keep Sanders switchgear, fusegear, sockets, plugs etc., 'up to the minute.'

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THE

ELECTRICIAN

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Looking Ahead

AN interim report by Mr. V. W. DALE, general manager and secretary of the British Electrical Development Association, to the Council of that organisation, serves as a reminder of the wide scope of the activities of the association and of the manifold ways in which service is given to the industry generally. Matters dealt with during the first half of the year fall under no fewer than 32 headings and there is clear indication that there is no waning of that practical enthusiasm for development which so characterised the electricity supply industry in the years before the war.

At the moment, the association finds itself in a delicate and difficult position in regard to propaganda, owing to the need for fuel economy, and it has had to readjust its policy and methods. As it would be against the public interest to urge people to use more electricity at a time when the nation is being enjoined to use "one bar instead of two," the association has had to formulate a long-term policy and at the same time to adopt a realistic attitude of a positive nature to bridge the period of restriction. This long-term programme, while not bringing immediate benefit to the industry, is calculated to produce results when the supply of electricity is commensurate with the demands made upon it, and a short-term poster and advertising campaign has been launched to link up satisfactorily with the long-term programme.

Instead of urging people to use less electricity, the association points out the wisdom at the present time of using electricity only at off-peak periods and offers information as to when those periods occur. By that simple device the association has thus perpetuated its traditional positive type of advertising. With respect to films a new approach is foreshadowed and this, together with an announcement to the effect that the association is collaborating with the E.R.A. in large-scale experiments on problems of domestic electrification, gives promise of interesting developments.

The E.D.A. and Education

A SURVEY carried out by the E.D.A. of fifteen domestic science colleges in Great Britain and Northern Ireland, reveals that for the last twenty years the gas industry has provided and maintained equipment free of charge and the training has been almost entirely by gas appliances. The association, having learnt a lesson from its competitors, is therefore spending under its long-term planning policy from £20 000 to £30 000 in equipping the main domestic science colleges with a complete range of electrical equipment so that teachers may be trained in the use of electrical methods and impart their knowledge to their charges. Installations in schools are another matter engaging the attention of the association and the early issue of a report on the subject is forecast. The panel of architects working on the matter have almost completed their labours and it is hoped that their report will be available about Easter. This, it is anticipated, will be before the Government commences its school-building programme—second in priority only to housing—and its appearance should therefore be of appreciable assistance not only to the industry, but also to the Ministry of Education, whose responsibility for the servicing of our schools would be gladly shared if the recommendations of the industry are adopted.

New Power Station Design

THE Bankside power station, a somewhat ugly building with a cluster of "tin" chimneys on the south side of the Thames, may be replaced by a new station that will be "a thing of beauty and a joy for ever," if the proposals of the City of London E.L. Co., Ltd., are allowed to materialise. This was revealed by Mr. H. J. RANDALL, managing director of the company, when he presided at an informal Press luncheon given by the E.D.A., of which he is chairman, on November 22. He mentioned that Sir GILES GILBERT SCOTT had produced a preliminary architectural design, which, in his opinion, is the finest yet created for any power station in the world. "If we can have a generating station with an end elevation as shown in this design," he said, "we are going to put generating stations into a totally different category, and they are going to be the things of beauty that they can be if properly designed." Sir LEONARD PEARCE has been asked to design the technical side. Whether the new station will be erected on the site of the present one is a matter yet to be decided by the powers-that-be. It is right in the heart of London and will cut into the town planning scheme of the London County Council. Opposition may also come from those who advocate the removal of generating stations from big cities. A public inquiry into the scheme is to be held in January.

Electrical Exports Mounting

FOLLOWING a falling-off during the holiday season, electrical exports in October showed an encouraging move forward and reached dimensions never previously recorded. For the first time, shipments of electrical goods and apparatus, as distinct from machinery, exceeded in value £4 million, and acceptances of electrical machinery by overseas buyers also increased, indicating that the rate of output by British manufacturers in the electrical industry is gathering momentum. Where comparative figures of volume are given in the Board of Trade accounts for the month, these show several instances where the quantities of goods exported exceeded by a substantial amount the monthly average for 1938, demonstrating that the industry is not lagging in the drive towards the export target set by the Government; given the necessary materials and labour and unfettered operation it can and will assume a leading position. The number of radio sets sent overseas was 54 492—the highest ever recorded and more than 750 per cent. above the 1938 volume for any month. Electric lamps exported reached

over 4½ millions, nearly three times the 1938 monthly volume, house service meters 24 600 against 13 700, vacuum cleaners more than doubled and, in weight, motors, generators and other electrical machinery showed appreciable increases.

Output of Cookers Accelerated

NO less spectacular has been the increase in the output of domestic electrical appliances and equipment for the housing drive. In announcing that the 10 000th aluminium house had come off the production line, Mr. J. WILMOT, Minister of Supply, has said that the production of housing fitments is steadily increasing, and, with one or two exceptions, sufficient fitments have been procured to meet the entire temporary housing programme. The monthly production of electric fires is now 206 000, compared with 113 000 in 1938; immersion heaters have jumped from 9 000 in 1938 to 39 000, and electric wash-boilers from 5 000-6 000 to 19 000. In October, 23 306 electric cookers, 127 151 meters and 7 013 electric refrigerators were produced, each group representing impressive increases on the September figures, which were, 13 321 electric cookers, 99 600 electric meters and 488 electric refrigerators.

Further "Southern" Example

THOUGH there is nothing particularly new in the adoption of multiple aspect colour light signalling, the announcement by the Southern Railway that approximately £1 200 000 is to be spent on modernising the London-Brighton main line in this way is of interest. We say this because, not only is any capital expenditure over £1 000 000 something worth noting, but because the new signalling will displace 32 manual stations by 11 worked by power. Most of the London-Brighton line is already equipped with colour light signalling, but on the suburban sections from Battersea Park and New Cross Gate, to Coulsdon North, the semaphore type of signalling is still used; replacing it with the new system will result in a saving of nearly £20 000 per annum. It is, on the face of things, odd that the manual form of signalling should have persisted so long on any part of the Southern, for on a railway so very much of an electrical example to the rest of the world, there will, even with the latest extensions completed, still be plenty of scope for electrical operation of the company's signalling system.

Colonial Telecommunications

THE two papers read before the I.E.E. last week on this subject promoted a discussion which had about it the distinction of a meeting of overseas contributors. Apart from the fact that the speakers in the discussion added much valuable information to that already given in the papers, their remarks, based on personal experiences abroad in many cases, are worthy of the attention of all whose business it is to manufacture communication equipment for overseas. In this connection it may be said that this country already has unique experience in overcoming the wear and tear imposed upon electrical equipment in tropical conditions, for in meeting the military demands in Burma during the war, much was discovered which, if applied to peace-time needs, should prolong even further the efficient life of the equipment operated east of Suez and south of the Equator. While it is not suggested that finality is in any way approaching, it must be realised that the time has come when to make further improvements is becoming increasingly difficult; a condition which is the reward of the high efficiency already established; a condition which at once proclaims the superiority of British design and finish.

Electric Vehicles and Motor Trade

ALL who have the future of the electric vehicle at heart will learn with interest that the Austin Motor Co. is to enter the field of battery-electric production. Agreement has been reached with Crompton Parkinson Ltd. for both companies to be equal partners in a new concern, to be called Austin-Crompton Parkinson Electric Vehicles, Ltd., which will take over the work previously performed by Crompton Parkinson through their associated companies. While the final details of the arrangement for distribution and service remain to be settled, responsibility for the manufacture of the vehicles will be taken over by the Austin Co. at the end of the year, and its effect upon the penetration of the electric vehicle into fields now enjoyed by petrol-driven vehicles will be watched with interest.

FROM THE CONTINENT

THE SUPPLY POSITION IN FRANCE—NEW GENERATING PLANTS

As from Wednesday all electricity-consuming industries in France except a few priority holders are working a four-day week during the winter. By the introduction of night shifts it will be possible, however, to maintain the present working hours, that is, 40 to 48 per week. This decision follows the sharp increase in electricity consumption over last year, amounting to some 30 per cent.

* *

Cuts in current from the British zone of Germany will deprive France of about 1 000 000 kWh a day, and this will further strain her coal resources, as her thermal plants will have to make up the deficiency.

* * *

Hydro-electric generation is still satisfactory, and at the moment reservoirs are 80 per cent. full. 1½ milliard kWh, enough for eight to ten weeks' consumption, is being held in reserve, and present hydro-electric generation amounts to 13 out of the 24 millard kWh produced annually. Coal may possibly be sent to Switzerland in exchange for current this winter, which would help industry over a difficult period.

* * *

The Girotte Lake in the Savoy Valley is now being used to feed the Bellville and five other less important plants. Girotte will be more important still when the work of increasing its capacity to 10 million cu. tons of water is completed. Water will ultimately be carried by subterranean channels 12 km. long to the generating plant, where it will be used in the production of an extra 165 million kWh. This, and other schemes, are expected to ease current problem this winter.

* * *

The supply position in the French Colonies and Protectorates is not so good and reports show that in Morroco generation is far below present needs. A new barrage is being considered for construction at El Ouidane to increase generation from an average of 200 million kWh to 500 million; this would not in any case be possible before 1955.

* * *

According to a ten-year plan prepared by the S.N.C.F., it is intended to carry out large-scale electrification of the French railways. An addition of 2 074 km. will be made to lines already electrified, of which 214 km. will be suburban lines. The superior possibilities of electric drive compared with steam are expected to enable the railways to compete on favourable terms with road and air transport. At the outbreak of war, 3 531 km. of track out of a total of 32 000 had been electrified. During the war the only work undertaken was the electrification of the Brive-Montauban line. Since the liberation, the Juvisy-Valenton line in the suburbs of Paris has been electrified and the Versailles-Juvisy line is in process of completion. The S.N.C.F. will then proceed with the Sete-Nimes, Paris-Lyons and Bordeaux-Montauban lines.

* * *

From the technical point of view, the S.N.C.F. experiments have led to the decision to retain the 15 kV d.c. system although experience with 5 000 V monophase and 3 000 V d.c. systems has shown advantages.

* * *

Complementary to its electrification programme, the S.N.C.F. is also working on hydro-electric installations for which it holds concessions. The programme includes various installations for the Tet, Ossau and Auro valleys and the Pyrenees, the construction of plant at Bort, installations in the Arve Valley in the Alps. This plan will raise the annual generating figures of the organisation from the present 1 100 million kWh to 1 900 million in an average year, which will be just slightly lower than the traction needs for 1945.

* * *

France is one of the countries benefiting from the first allocation of German materials and equipment following the confiscation of 15 German factories. France is to receive the modern electricity plant at Mannheim, and the move is welcomed as a step towards the restoration of French economy.

* * *

Sources of hydro-electric power in areas ceded to France will still be available to Italy, according to a special clause in the draft treaty prepared by the Council of Foreign Ministers. France will control the water supply in territory ceded, in such a way that Italy will suffer no loss in the supply of power, and a commission is to be established to ensure that Italy is receiving fair treatment. The French will be responsible for maintaining existing equipment, and meeting Italian power requirements. Under the terms of the draft treaty, the French will charge the Italians the same rates as those operating in France for power supplied. Certain Italian hydro-electric installations will be operated by the French, pending the reconstruction of wrecked plants at Breil and Fontan.

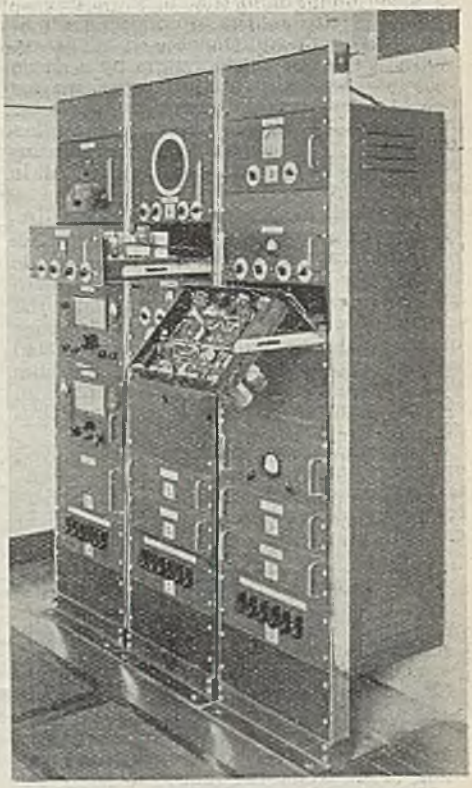
Carrier-Frequency Broadcasting

The first G.P.O. licence for the operation of carrier-frequency broadcasting was issued at Rugby last week, and will be used in connection with a system developed in the Research Laboratories of the B.T-H. Co., Ltd., for Multi-Broadcast (Engineering) Ltd. The inauguration of the system was attended by the Chairman of the I.E.E. Radio Section, and following the handing over of the licence an inspection of the equipment and installation was made.

DEVELOPED in the research laboratories of the British Thomson-Houston Ltd., at the request of Multi-Broadcast (Engineering) Ltd., the first carrier-frequency broadcasting system to be put into public service in this country was opened on November 22, at Rugby, when Prof. Willis Jackson, chairman, I.E.E. Radio Section, invited the midland regional director of the B.B.C., Mr. Percy Edgar, to speak over the system network from Birmingham.

Prior to this ceremony, those present were addressed by Mr. L. J. Davies, director of research, B.T-H. Co., Ltd., and Mr. A. R. Almond, managing director of Multi-Broadcast (Engineering) Ltd., who explained the method of operation and advantages of the system. The equipment seen at Rugby last week provides four programmes at the terminals of subscribers, but arrangements have been made for the reception early next year of six programmes, by the operation of a selector switch embodied in each subscriber's reproducer unit.

Before those present were invited to inspect the transmitter and aerial system, Prof. Willis Jackson addressed a large audience at an inaugural luncheon at which he said that though there might be an apparent element of contradiction in the Chairman of the Radio Section of the I.E.E. giving his blessing to a development which moved away from rather than towards the extended use of radio, at any rate in its broadcasting aspect, the contradiction concerned him far less than it had. Whatever the long-term indications of the carrier-frequency system of wire-broadcasting, so far as radio broadcasting and other systems of wire broadcasting were concerned, it should be remembered that the function of the engineer was to devise means of achieving certain desired practical results in new ways which overcame the limitations of existing techniques, and to do that economically. It would be surprising if, in performing this function, he did not from time to time produce problems, no doubt of some seriousness on occasions for others; but in so far as the future well-being of this country was governed by the extent



Part view of the multi-broadcast modulation equipment, showing accessibility of assemblies

to which engineers exercised their creative faculty, he thought we should have no reservation in applauding an achievement which promised such benefit as that they were inaugurating that day. The carrier-frequency system of telephony had been a practical reality in the telephone system of this country for many years, and its use for wire broadcasting was advocated by Mr. P. P. Eckersley when he was chief engineer of the B.B.C. Wire broadcasting was not a replacement altogether for wireless broadcasting. The two systems were supplementary; each had its advantages, dependent mainly on the listener; each had an end to satisfy and each had a public to serve.

Mr. A. J. Gill, vice-president of the I.E.E., deputy engineer-in-chief of the

G.P.O., then made history by handing to Mr. Almond the first carrier-frequency licence ever to be issued.

Following the luncheon an inspection was made of the transmission lines of 0.044 in. diameter, spaced 2 in. apart, insulated with polythene, and stretched between special insulators supported by light brackets strapped to the chimneys of subscribers' premises. The reproducer unit, as the subscriber's equipment is called, is connected to the overhead system by a single cable and located in the usual position for a radio receiver. It comprises a Westex rectifier and 2-stage amplifier, with a selector switch, volume control incorporating an on/off switch, and loud-speaker, all in one equipment.

A typical installation of a carrier-frequency wire broadcasting system consists of aerial arrays erected where man-made interference is small, which feed high-quality communication receivers under the control of a skilled staff. When facilities are available, programmes are transmitted to the receiving station over land-lines direct from the B.B.C., and the effects of disturbances in transmission are thus reduced.

The broadcast programmes to be relayed are transmitted over G.P.O. lines to a centrally situated station at which the carrier-frequency equipment is installed, where carriers at specially selected frequencies

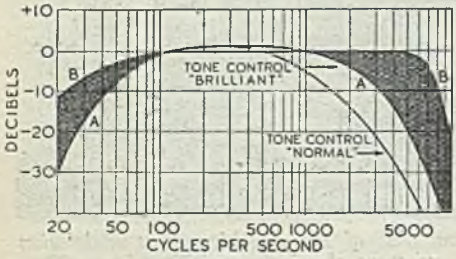


Fig. 1.—Frequency characteristics of a broadcast receiver (A) and a multi-broadcast reproducer unit (B). The shaded portion shows the improvement effected

below 200 k/cs. are modulated by the programmes, and after amplification, fed to the distributing network.

In particular instances it may be geographically more convenient to locate the modulators at the receiving point, or again a number of towns may be fed from one receiving station. Each installation requires, in fact, a careful technical review of the individual circumstances. In a large town, for instance, simple amplifiers might be sited at suitable points for local redistribution, the number depending on the layout of the town.

The curves reproduced in Fig. 1 were supplied by Multi-Broadcast (Engineering) Ltd., and are claimed to show the comparative frequency characteristics of a

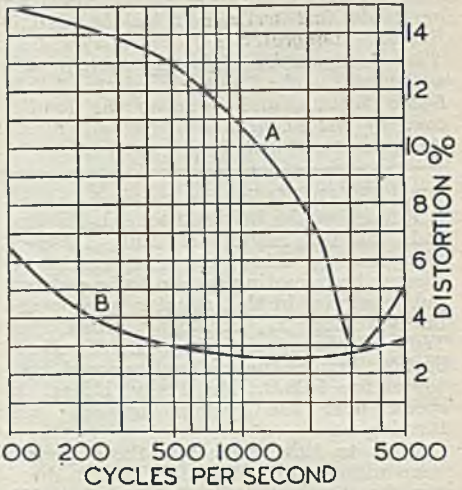


Fig. 2.—Audio-frequency distortion curves for a typical broadcast receiver (A) and for a multi-broadcast reproducer system (B)

typical broadcast receiver (A) with those of a multi-broadcast reproducer unit (B). The shaded portion shows the improvement effected. Fig. 2 illustrates audio-frequency total harmonic distortion curves for a typical broadcast receiver (A) and for a multi-broadcast reproducer system (B).

Bell System Technical Journal

THE current issue of this journal commences with an outline of the technical developments leading to the production of Buna S synthetic rubber during the recent war. In less than three years the production of this elastomer exceeded the pre-war production of natural rubber. Further papers describe the testing methods and equipment required for the maintenance of radar equipment, and also the properties of the valves used, especially one type adopted extensively, the 6AK5. The number concludes with a detailed examination of the various modifications of carrier-telegraph methods which have to be considered when a system is to be selected to meet practical requirements. References are given to the weathering of soft vulcanised rubber, the insulation of plastics under humid conditions, chemical piezo-electric crystals, permalloy tape, as well as to papers on propagation, crystal filters, and statistics.

S.E. Area E.D.A.

Sales Lecture on New Domestic Appliances

MEMBERS of the sales staffs of electricity undertakings in the S.E. and Eastern England area heard, on Monday afternoon, details of the manufacturers' hitherto unpublished plans for forthcoming developments in the field of electrical household appliances.

The occasion was the opening meeting of a series of lectures arranged by the E.D.A., to be held, at monthly intervals, with the object of "refreshing" sales staff personnel.

Introducing the afternoon's speaker, Mr. H. J. Randall, chairman of the E.D.A. Council, referred to the growth of the electrical industry in recent years and then introduced Mr. E. G. Batt, chairman of the B.E.A.M.A. domestic electrical appliances committee.

Mr. Batt began by saying that the most serious problem at present was one of materials. Difficulties existed with sheet steel, castings, ceramics, paint, resistance wire and labour. In addition, half of the manufacturers' output was compulsorily diverted into the export market.

The tendency to-day, he said, was to encourage, as far as possible, the idea of interchangeability of components, and he instanced electric fire elements as an example. A rod-type element had been developed by manufacturers which might soon, subject to tests now being carried out at the N.P.L., become a standard fitting for all fires of that type, and the next step was to develop an interchangeable panel element.

The trend was likely to be in favour of rod-type fires, and more chassis would be made of aluminium, although reinforced plastics and metallised finishes on wood had possibilities.

Future electric cookers would be equipped with thermostatic oven control, and would have two hot-plates, grill boilers and medium sized ovens. The best model for competition with other forms of fuel was the family size.

The public taste seemed to be in favour of the self-standing electric refrigerator. In this field, the adoption of the sealed unit was of major importance, since it permitted an easy system of replacement.

After brief reference to kitchen fans and thermostatic electric irons, Mr. Batt revealed details of the new Mycalex panel heaters. These were made, he said, of a mixture of powdered glass and mica, moulded under high-pressure around an embedded 500 W heating element.

Interim Report on Development

IN an interim report on the main activities of the British Electrical Development Association during the first half of this year, Mr. V. W. Dale, general manager and secretary, states that as a result of the co-operation of members, virtually all the pre-war functions of the association have been restored, while a ready acceptance has been accorded to new tasks related to changed or changing conditions.

An E.D.A. Domestic Installations and Appliances Committee has been established and three sub-committees have been set up to deal with cooking, water heating and refrigeration, respectively.

As a result of the association's report to the Ministry of Works on the design of the electric water heating installations in temporary houses, a conference of the departments concerned was addressed and remedies were suggested for the deficiencies in the water heating and wiring installations. The association's recommendations regarding modification of the plumbing unit were adopted by the Ministry of Works, and the association is pressing the Ministry of Health to accept retrospective responsibility for units installed in temporary houses already licensed. Advice was given to housing authorities, architects and builders in regard to the electrical installations in traditional and prefabricated houses.

The panel of consultant architects has made good progress in the study of the use of electricity in post-war schools; in particular, new methods of lighting, heating and cooking were investigated. By the time the Government is ready to proceed with the building of schools, a valuable and comprehensive report will be available.

Arrangements are being made for a general display at the Scottish Building Centre, Glasgow, of electrical appliances and a complete all-electric kitchen, which will be supplemented by window displays to attract visitors. The association has completed plans for an enlarged electrical section at the Building Centre, London, and the work will be undertaken at the earliest opportunity.

The association is collaborating with the British Electrical and Allied Industries Research Association in large-scale experiments on problems of domestic electrification.

Electrical Personalities

SIR ROBERT WATSON-WATT has been awarded the Valdemar-Poulsen gold medal by the Danish Academy of Technical Science in recognition of his radar inventions.

ALD. ALEXANDER CRITCHLEY has been re-elected chairman of the Liverpool Electric Power and Lighting Committee for the ensuing year.

SIR THOMAS HIGHAM has entered upon his 42nd year as chairman of Accrington Electricity Committee.

PROF. E. O. WILLOUGHBY, who has been engaged upon research work in Great Britain recently, has taken up duty as Professor of Electrical Engineering at the University of Adelaide. This is one of two new engineering chairs recently established. Prof. Willoughby is a graduate of the University of Melbourne in both civil and electrical engineering.

MR. CHARLES M. NESBITT, sales manager of Dorman and Smith, Ltd., and the associated company, D.S. Plugs Ltd., is leaving this country very shortly for an extended business tour of India and Ceylon. He expects to be away for about six months.

MR. C. M. NESBITT

MR. IVOR G. EVANS, electrical engineer to the Portland U.D.C., has been appointed electrical engineer to the Pontypridd U.D.C.

ALD. T. EVANS, who has completed almost 21 years as chairman of the Bury (Lancs.) Electricity Committee, has been re-elected to the office.

MR. L. E. A. PHILLIPS has been appointed manager of the drawing office at the head office of the General Electric Co., Ltd., which is responsible for the design of all the company's decorative lighting fittings. Mr. Phillips, who has been with the company for 24 years, succeeds Mr. E. H. Penwarden, who retired recently. Mr. Penwarden joined the company in 1915, and was in charge of the drawing office for the greater part of his service. Although he was concerned primarily with lighting schemes, he collaborated latterly in the design of certain domestic appliances for the post-war market, and several examples of his work are shown at the "Britain Can Make It" Exhibition. He was a member of the G.E.C. Dramatic Society from its formation in 1930, and played leading rôles in twelve of their productions.

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

MR. CHARLES KING, who was chief electrical engineer and manager of the electrical department of G. N. Haden and Sons, Ltd., whose staff he joined in 1928, and was responsible for the electrical installations at the Cambridge University Library, the Bodleian Library new building at Oxford, and Liverpool Cathedral, is now a director of the Alliance Electrical Co., Ltd. He is a member of the I.E.E. Codes of Practice Committee and of the B.S.I. Engineering Committee, and has served on the I.E.E. Installation Section Committee.

MR. C. KING

MR. F. D. WILLIAMS has resigned from the board of the Radio and Television Trust.

MR. H. B. McKINTY has been appointed a director of the Scottish Power Co., Ltd.

MR. P. B. HEALEY and Mr. J. G. Flint have been elected to the board of the Telephone Manufacturing Co., Ltd.

MR. G. WANSBROUGH, chairman of A. Reyrolle and Co., Ltd., has been appointed a member of the Colonial Economic and Development Council.

MISS JANE THOMPSON, of Kirby Muxloe, Leicester, has been appointed by the Fulham Borough Council as temporary assistant technical engineer at the power station; Mr. J. S. Anderson, of Ironbridge, Shropshire, has been appointed assistant operating engineer.

MR. F. H. DICKENSON has been appointed deputy electrical engineer to Croydon Corporation in succession to Mr. H. C. Spence, now borough electrical engineer at Wimbledon. Mr. Dickenson is at the London Transport Board's power station at Neasden, and was formerly with the Liverpool Corporation as assistant

electrical engineer. He is 35 years of age and 6 ft. 7 in. tall.

MR. H. M. MATHIESON has retired from the service of Submarine Cables, Ltd. Previously he was in the cable department of Siemens Brothers and Co., Ltd., for 36 years.

Obituary

MR. WILLIAM JOSEPH BAILEY, a former staff engineer of the General Post Office, on November 26, aged 76 years. He was a member of the I.E.E.

MR. GEORGE HULBERT WILSON, on November 17, aged 44 years. He joined the research laboratories of the General Electric Co., Ltd., at Wembley in 1922 as a member of the newly-formed illumination section, and took over the leadership of that section in 1929. He left the laboratories during the late war, and became physics master at the Lawrence Sherriff School, Rugby. He served on a number of committees of the I.E.S., and was an active member of the Council. He was an associate member of the I.E.E. and was also well known on B.S.I. committees and, from 1928 onwards, at the meetings of the International Illumination Commission, particularly for his interest in aviation lighting. He was the author of several papers on lighting read before the I.E.S. and A.P.L.E.

MR. CHARLES W. BRIDGEN, a director of Ferranti, Ltd., on November 18, aged 51 years. He joined the company's staff in 1913, after previous experience with Messrs. Everett Edgcumbe and the Electrical Apparatus Co., Ltd., being engaged on general experimental work until he joined the Army in 1914. After serving throughout the war, he took up duties in the transformer department. Transferring to the selling staff, he became manager of Ferranti interests, successively in Cardiff and Birmingham, where he remained until his promotion to general sales manager in 1934. His elevation to a seat on the board came in 1943. Business activities carried him to all parts of the world. Prominent in B.E.A.M.A. affairs, Mr. Bridgen was for more than 10 years a member of the I.M.E.A.—B.E.A.M.A. Joint Committee. He was a member of the I.E.E. and served on the Council from 1942 to 1945.

Queen Mary Visits Cable Works

AN informal tour of the cable works of Johnson and Phillips, Ltd., at Charlton, was made by Queen Mary on Monday. Accompanying her were Lady Cynthia Colville, Miss Caroline Haslett and Major the Hon. John Coke.

The party was received by Mr. G. Leslie Wates, chairman and managing director, Mr. W. Glass, director and general manager, and Mr. S. J. Passmore, director.

Her Majesty showed a keen interest in the processes of manufacture, and many questions were asked of Mr. J. Wooldridge, cable works manager, who conducted the party through the rubber cable works.

The Royal party spoke for some minutes to Mrs. Seymour, an operative employed on rubber strip winding machines, who had been a patient at the Roffey Park Rehabilitation Centre which Queen Mary had recently visited.

After the inspection of the rubber cable works, Queen Mary drove to the directors' office where she admired the mural decorations and models, and signed the visitors' book. Mr. Wates related the origin and early history of the firm.

Mr. G. T. W. Whitehead, asistant general manager, then conducted the party over the paper cable works and explained the process of cable-making from the initial stranding of the conductors, the processes of paper slitting, lapping, impregnating, lead sheathing and steel armouring, to the final voltage testing and winding on to drums.

An inspection of one of the switchgear erection shops was also included.

At the paper cable works, Mr. Kennett Boorn, who has been with the company for 59 years without a day's sick leave, was presented to Queen Mary, and at the conclusion of the tour Mr. Russell, night shift superintendent throughout the war, was presented to Her Majesty and joined the party for tea in the reception room.

Left to right, (*seated*) MR. S. J. PASSMORE, MR. W. GLASS, HER MAJESTY QUEEN MARY, MR. G. LESLIE WATES. (*Standing*) MR. G. T. W. WHITEHEAD, *and* MISS HASLETT

On leaving, an inspection was made of the underground control room.

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

Broadcasting and Peak Load

[To the Editor]

Sir,—The use of electricity in recording public opinion is the latest suggestion put forward by a Paris newspaper. The article points out that distribution companies register automatically the consumption figures in their sectors, a heavy demand for current showing as a steep rise in a graph. When, at a given hour, a million wireless sets are being used at the same time, the curve rises steeply. This, it is suggested, could be used to classify the importance of programmes in given sectors. Examples are given for the German occupation period, when consumption of current rose every evening at 9.15—the time of the B.B.C. broadcasts. Other graphical records show consumption during General de Gaulle's speeches in London, then later in France.

This experience is by no means new and has often been referred to in The Electrician. Its interest at the moment is in connection with the building up of load during peak periods, due to the broadcasting of popular sports news, commentatories, etc., as, for instance, short-wave broadcasts of cricket results. These occur more often than not during the 8.0 a.m. onwards peak, and it would be interesting to know what effect upon the power load the switching on of radio receivers for their reception has upon the total demand.

It is appreciated that such a load would be difficult to assess from the total demand, but the difference in figures during and immediately after the broadcast might give some indication. With modern radio receivers in the hands of over 10 000 000 licensed listeners, the load they represent must be considerable.—Yours faithfully,

N. J. Telpher.

Wallington, Surrey.

A Good Suggestion?

[To the Editor]

Sir,—The "Britain Can Make It" Exhibition as covered in the issue of The Electrician of September 27, is interesting and it is to be hoped most stimulating to British exports.

Taking the title of this exhibition as a text I wonder if another type of exhibition in England might not also be suggested?

I have in mind a permanent display of tools and utensils, and electrical and mechanical devices and garments and materials of all kinds, now used in lands foreign to Great Britain, and not produced by the British as yet.

As an extreme case, consider the "half pint" British automobiles now available in America. They sell at the moment because anything that rolls now sells. But they are not designed to meet American car-buying habits in scarcely any way whatever. And America has excess dollars, the expenditure of which for foreign goods is becoming very much of a necessity for the Americans themselves.

Local habits and customs whenever goods are sold are of paramount importance in selling, and it seems to me that for the British producers' inspection in connection with the design of his own output, an exhibition of things he does not make but which are constantly being sold overseas might prove to be of inestimable benefit.—Yours faithfully,

William A. Rhodes.

New York, N.Y.

I.E.E. London Students

The annual lecture was given to the London Students' Section of the I.E.E. on November 18, by Mr. A. H. Mumford, who took as his subject "The Trend of Modern Telecommunication."

It was found, he stated, that line communication had shown a trend towards higher operating frequencies. It was interesting to see how important the ultra short wave link was in the trunk telephone network, the quality of which was such that it was impossible to distinguish between that type of link and the cable link. The evolution from single-channel to multi-channel operation on telephone cables resulting from the introduction of the co-axial cable had inevitably effected the development of radio links as a permanent feature in the land network.

The part played by radio in long distance links for both telephony and telegraphy was discussed in some detail, and some interesting recorded examples of morse transmission were given. Methods of improving such links, with particular reference to the type of transmission and betterment of quality, were mentioned, and an interesting film illustrating the angle of arrival of radio waves under simple and complex transmission conditions was shown.

INSIDE OF ELECTRICAL MACHINES

by R. H. ROBINSON, B.Eng., A.M.I.E.E.

IN this, Part XVI, of the series, is described the application of insulation to commutators and sliprings.

Commutators. — All commutators, whether it be the tiny ones used in domestic apparatus or those many feet in diameter, and illustrated in Fig. 1, have one thing in common. Unless they are well designed and built they will give endless trouble. Some of the troubles are of mechanical origin and outside the scope of this article, others may be brought about by faulty insulation or its application, and it is this aspect we propose to examine.

In Fig. 2 is shown a section of a commutator which may be taken as representative of most so far as general principles are concerned. The copper segments A are separated by micanite segments, the whole assembly being held together by the two vee-shaped clamp rings B and C. These are insulated from the copper segments by the micanite vee rings D. At the appropriate stage in manufacture, the completely assembled commutator is put into a hydraulic press so that the clamping vees are pressed tightly into the copper, and while under compression the nut E is tightened. In small commutators the outer end of the hub is riveted over to hold the clamp ring B. Large commutators are held together by bolts which go through the vee rings and the space between the inner circumference of the segments and the hub on which the structure is built.

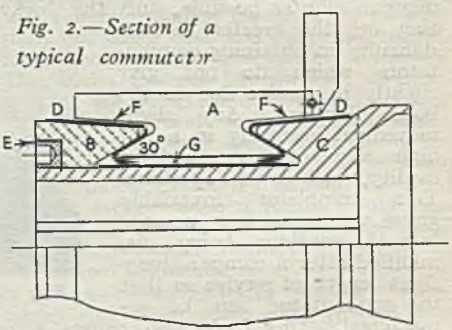


Fig. 2.—Section of a typical commutator

The pressure of the clamp rings on the slopes of the segments causes them to move radially inward until the whole becomes locked as a solid mass. The angle of the slope is usually 30°. This type of construction is known as an arch-bound commutator. An important requirement in these commutators is that no mechanical pressure shall exist between the outer slopes F of the micanite vee rings and the adjacent faces in the segments. To ensure this it is usual to design the commutator with a definite slight clearance as shown at F. Alternatively, the slope in the copper may be made 1° greater than that of the vee rings.

There is another construction, known as the wedge-bound commutator, in which the outer slopes make contact just before the 30° slopes come together. This causes the segments to move outward a little and the commutator is finally helped by the vee rings wedging themselves into the double slope. This type of commutator requires much more careful machining and building and is not used very frequently.

The requirements for the manufacture

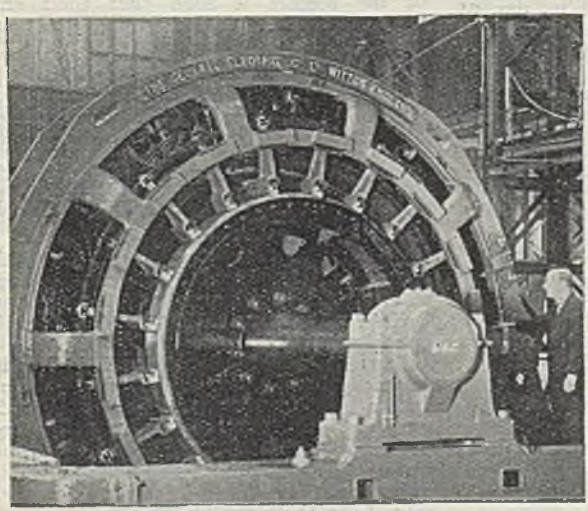


Fig. 1.—Commutator and brushgear of a 2 140 H.P. (r.m.s.) 650V, 57 r.p.m. winder motor

* Parts I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XII, XIII, XIV, XV, appeared in THE ELECTRICIAN of April 26, May 10, May 24, June 7, June 21, July 5, July 19, August 2, 16, 30, September 20, October 4, 18, November 1 and November 15, respectively.

of good segment and moulding micanite were discussed in Part X of this series, and we now have to examine the methods of applying these products from the starting point, the manufacture of the vee rings. It may be stated in passing that small commutators, up to a few inches in diameter, may have a moulded plastics insulation instead of micanite.

In general, micanite vee rings should be made as thin as possible, since the thicker they are the greater is the difficulty in obtaining commutators which do not give slightly in service due to the bond flowing. Any slight movement resulting in a few high segments, or perhaps ovality, will cause sparking. This complaint invariably grows worse and may necessitate the machine being dismantled after a comparatively short length of service so that the commutator can be re-machined. This fault also causes radio interference.

For most purposes .030 in. to .040 in. is thick enough for vee rings which are moulded in one piece; the very small ones, up to about 1 in. diameter at the apex, being as thin as .020 in.

Moulding Vee Rings up to 2¼ in. Diameter.—Vee rings up to 2¼ in. dia. at the apex are frequently moulded from discs of micanite. Those of 1 in. dia. and under are produced from micanite washers of suitable diameter. These are heated on a hot-plate until the shellac bond is very fluid and transferred quickly to a press. This is closed before the bond has time to set. This method produces rings in which

Fig. 3.—Micanite discs for small vee rings

the micanite forming the outer slope is somewhat creased.

To reduce the creasing as much as possible, those above 1 in. dia. are moulded from discs of the shape shown in Fig. 3. The bottoms of the vee notches coincide with the apex of the finished ring, and the notches are of such an angle that their edges butt. Four discs, each .010 in. thick, are used for making a ring of .030 in. thick. They are placed on the top of each other on a hot-plate and are staggered so that in the finished ring the joints in one layer do not coincide with those in any other layer. The pressure applied during moulding consolidates the four discs and results in the production of solid, homogeneous rings $\frac{1}{32}$ in. thick.

Moulding Vee Rings from 2¼ in. to 10 in. Diameter.—Larger rings, up to 10 in. apex

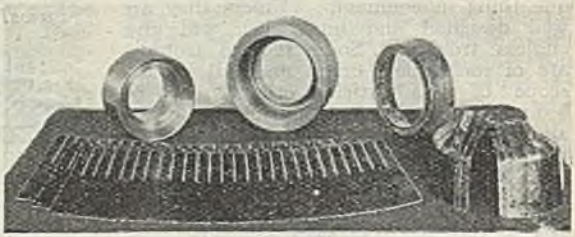


Fig. 4.—Stages in the manufacture of micanite vee rings

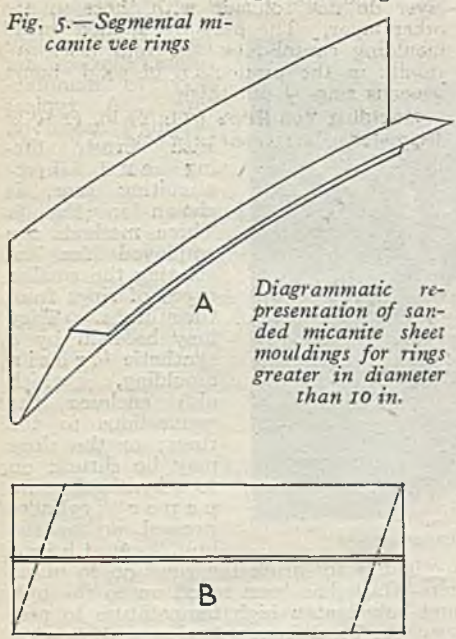
dia., are frequently made in the manner illustrated in Fig. 4. Micanite .013 in. thick is cut into sectors and slit into fingers as shown. The slits may be vee-shaped if it is found that overlapping results from the use of parallel slits. This depends upon the width of the slits and the diameter of the ring. The length of the sectors is such that their ends just butt when folded round the plug part of the mould-background, left of the figure. They are placed on top of each other so that the slits are staggered as shown, and their curved edges coincide. (They were placed non-coincident in the illustration, so that the staggering was more apparent). After heating so that the bond is fluid, the three are placed together around the unheated plug and the fingers bent down the 30° slope. A roughly pre-formed ring, as shown to the right, is thus obtained. The mould (shown next to the plug) and the plug are then heated up to about 150° C, after this the pre-formed ring is placed in the mould, followed by the plug, which is bedded down by hand. The assembly is then put into a suitable press and left to cool under pressure. To prevent the micanite from sticking, the mould and plug are wiped with a greasy rag, and also lined with mica splittings. A finished ring is shown in Fig. 4, to the right of the mould.

Attention is here drawn to the importance of designing all moulds with a slope to the outer circumference. A slope of 4° to 5° is a great help, both when putting the parts together and when separating them after moulding.

Moulding of Rings Above 10 in. Diameter.—When rings exceed 10 in. in dia. at the

apex it is not convenient to handle the sector type of micanite blanks shown in Fig. 4. It is better to use sanded (or milled) sheets of micanite .040 in. thick and mould them in segmental lengths as

Fig. 5.—Segmental micanite vee rings



Diagrammatic representation of sanded micanite sheet mouldings for rings greater in diameter than 10 in.

shown at A in Fig. 5. Such mouldings may be from 6 in. to 18 in. in length, depending upon the diameter of the commutator. These mouldings are inserted in the machined vees in the copper so that their edges butt.

Two precautions are necessary in applying segmental mouldings. If their ends were cut square, as shown by the front view at B in Fig. 5, the butt joint would run parallel with the micanite separators between the copper segments, and any slight difference between one moulding and the next might result in the uneven seating of the adjacent copper segments in that region. To eliminate this possibility the ends are cut off at an angle shown by the dotted lines, so that the joint is spread over three or four segments.

The second precaution is for electrical reasons. Armatures having commutators of this size would be subjected to several tests between windings and earth at upwards of 2 000 V during their manufacture, and in all probability such a voltage would cause breakdown at the butted joints. To obviate this, a second layer of mouldings is placed inside the original one, with their joints midway between those in the first layer. These are produced in a mould having slightly different dimensions, so that one set can be accommodated closely inside the other.

There are other methods of applying the micanite, but space will not allow of further descriptions. The final result is the same, namely, to interpose a solid insulating barrier between the clamp rings and the copper.

Inspection of Micanite Vee Rings.—It is important that every ring should be thoroughly inspected. A visual inspection will generally suffice for rings up to 3 in. dia., but larger ones and segmental mouldings should also be checked for thickness. The faults to look for are bad distribution of the bond, almost clear or transparent areas, and white opaque areas. Almost transparent areas are due to an excess of mica in that part, the pressure during moulding having caused the bond to flow away. Such a region would take most of the pressure in an assembled commutator, resulting in uneven bedding of the copper segments.

Opaque spots indicate crushed mica, which may disintegrate when rubbed with a finger. Such spots are probably due to an excess of mica taking the sliding pressure exerted during moulding. All these faults probably originate from badly built micanite.

Sometimes rings appear almost clear nearly all the way round, especially near the apex. This is due to the space between the plug and mould not being parallel. Suitable correction should be made to the incorrect part.

Rings struck with a steel rod should emit a hard sound, not a dull one. Experience is necessary to enable one to tell whether a hard sound is due to the ring being well made, or due to an excess of bond. The percentage of bond in a good ring should be 10 to 12 per cent. by weight. Whilst this can only be verified by analysis, experienced examiners are able to recognise good rings with a reasonable amount of certainty.

Several measurements of thickness should be made of the 30° slope. A tolerance of plus or minus .005 in. from the nominal thickness is usually permissible. Great importance is not paid to variations in the thickness of the outer slope of rings for arch-bound commutators, since the clearance in the commutator should be ample. For wedge-bound commutators, however, the outer slope should comply with the figures given for the 30° slope.

Assembling the Segments.—The copper segments and micanite separators for large commutators are each sorted out into three groups—nominal thickness, over size and under size. They are then assembled by taking one from each group in turn.

This operation is carried out on a flat steel plate, the pieces being stood on end. They are then clamped up, heated, and forced into a retaining ring. For the largest sizes the same rings are used for the original and final clamping. All machining is done while the assembly is in these rings.

Commutator hubs and clamping rings should be designed completely to prevent the ingress of dust. The line G in Fig. 2 is the section of a micanite cylinder used to prevent a flash-over from the copper to the hub. It is generally made of a sheet of micanite rolled into a cylinder with an overlapped joint. Its thickness is 30 to 40 mils., and as it is not called upon to take any mechanical stress, except that due to centrifugal force, its make up is not of great importance. In the large bolted type commutators the cylinder is not necessary, but the bolts are insulated by having micanite tubes slipped over them.

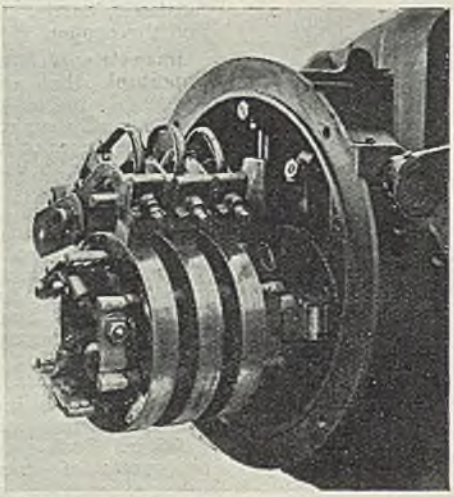


Fig. 6.—Slipring assembly

Seasoning Commutators.—In high speed commutators there is a possibility of the segments moving outward a little if the micanite softens. To avoid this it is usual to carry out what is known as a seasoning process on these commutators. Sometimes this is done before the commutator is mounted on its shaft, but the best result is obtained by seasoning after the windings are connected. The process consists in running the armature slowly in a special fixture and heating up the commutator to a temperature in excess of the normal working temperature. It is then run for a short period at a speed in excess of normal, after which it is stopped and the hub clamping nut or bolts are immediately tightened. This cycle may be repeated several times, the idea being to squeeze out as much bond as possible so that the compression is taken by the mica, and also to raise the softening temperature of the bond.

Protection of the Vee Ring Extension.—The extensions of micanite vee rings beyond the outer faces of the copper are protected against mechanical damage, and perhaps disintegration by windage. For this purpose a string band may be used on commutators up to, say, 6 in. in dia. Larger commutators are protected by cotton, webbing, or glass tape. To ensure adhesion the micanite and the tape are well brushed with shellac varnish and the tape is ironed down with a hot iron. The end of the tape is held by stitching.

Sliprings. — Compared with commutators, sliprings are easy to manufacture. A typical slipring assembly, with brush lifting and short-circuiting gear, is shown in Fig. 6. Three methods are employed for insulating the smaller types of rings from their hubs. They may be held by a synthetic resin moulding, which also encloses the connections to the rings; or the rings may be shrunk on to a synthetic resin paper cylinder pressed on to the hub. A third method is to shrink the rings on to micanite which has been rolled on to the hub and baked at a high temperature to prevent the bond from softening and allowing the rings to become loose.

The use of synthetic resin paper cylinders necessitates working to closer limits than is the case with micanite. This is because the maximum temperature at which the rings can be put on the paper cylinders is not much in excess of 150° C. if the paper insulation is not to be spoilt. With micanite the rings may be heated to well above 200° C., which gives a greater expansion. The insulation on the hub should be as thin as conditions will permit. Generally, a thickness of 0.025 in. for the smaller sizes, up to 0.040 in. for large ones, is found satisfactory.

Micanite is invariably used for the hubs of large rings, and special treatment is given to ensure that it is hard. The micanite, which is in the form of a long sheet a little wider than the length of the hub, and about .010 in. thick, is softened on a hot plate. The hub is heated and placed on the micanite, which is wrapped on by rolling the hub along the sheet. Five or six thicknesses are applied, and while the bond is still fluid a layer of steel wire is applied under great tension so as completely to cover the surface. It is then baked for several hours at a high temperature. After cooling, the wire is removed and the micanite is turned in a lathe to

the correct diameter for the rings to be shrunk on.

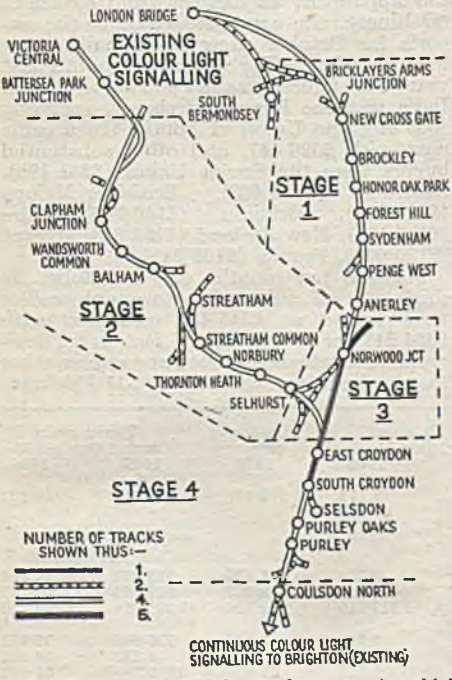
When the rings have been fitted and turned, the exposed micanite is protected against damage and disintegration due to windage by a covering of cotton or glass tape. The ends of the tape are held by stitching and the surface rendered as smooth as possible by several coats of an anti-tracking varnish.

In the illustration connectors may be seen passing through the rings. These are insulated with synthetic resin or micanite tubes, the latter being employed for Class B insulated machines.

(To be continued)

Colour Light Signalling on S.R.

THE Southern Railway Company has announced plans involving the expenditure of approximately £1 200 000 on multiple-aspect colour light signalling for the London and Brighton main line. Continuous electrification and colour light signals all the way will make this much used track the most modern of any.



The diagram above shows the stages in which the colour light signalling system is to be extended on the Brighton line. It is already used in those sections outside the dotted lines

The scheme, which provides the latest method of signalling trains over densely occupied lines and also the most effective means of reducing delays due to fog, will be carried out in four stages, taking five years to complete and including the displacement of 32 manually-operated signal boxes by 11 which will be power-worked. An annual saving of nearly £20 000 in expenditure will result. The greater part of the route from London to Brighton is already equipped with colour light signalling, but on the suburban sections from Battersea Park and New Cross Gate to Couldsdon North the earlier type of semaphore signalling is still used. It is on these inner London sections that the new signalling is to be installed to improve punctuality.

A greater number of signal sections will be introduced, increasing track capacity. Intervals between trains on certain sections will be reduced from three minutes as now, to two minutes, and a greater frequency will be possible. During fog, 70 per cent. or more of the normal train service will be guaranteed, instead of about 40 per cent. as to-day.

The Southern Railway Company have already the largest mileage of track controlled by electric colour light signals in the country, 405 track miles being so equipped. The latest additions provide for a further 98 track miles, including many complicated junctions, to be similarly treated.

Avoiding Current Cuts

The saving of electricity by maximum use of off-peak periods is the theme of a nation-wide poster campaign sponsored by the British Electrical Development Association. Hoardings throughout the country are carrying 16-sheet posters exhorting the housewife to "use electricity at off-peak periods and help to avoid cuts." Normal peak periods (8 a.m. to noon, and 4 p.m. to 6) are given on the posters; stickers are available for use where local peak periods occur at different times. Each poster illustrates one of the five main current-users—the cooker, water-heater, fire, kettle, or iron. Running concurrently with the poster campaign is a series of national Press advertisements on the same theme. Double-crown posters are being used in local areas to supplement the national campaign, which will be further supported by local Press advertising. It is planned to augment local campaigns later with leaflets and lantern slides. Member supply undertakings of the association are being provided with material to enable them to give area support.

ELECTRICAL OVERSEAS TRADE

VALUE OF EXPORTS FOR OCTOBER EXCEEDED £5½ MILLION

SHIPMENTS of electrical goods, apparatus and machinery during October reached a record, the total value being £5 624 099 compared with £2 142 870 for the same month last year, and £3 966 503 in September. The monthly average for 1938 was £1 814 114. Imports for the month also showed an increase, the value being £1 429 775, as against £339 469 for September and £759 221 for October last year. The monthly average for 1938 was £324 016. The increase in imports is accounted for by purchases of wireless apparatus from Canada. For the ten months of this year the value of electrical exports was £41 619 843, contrasted with £21 037 135 for the corresponding period last year and £18 141 163 for five-sixths of 1938. The imports for the same period of this year were valued at £4 853 244, showing a credit balance of £36 766 599. For the comparative five-sixths of last year the value of imports was £21 834 630.

There were substantial increases last month in the sales to the Dominions and foreign countries of insulated wires and cables and particularly of those with insulation other than rubber. The number of radio sets sent overseas was 54 492—the highest ever recorded and more than 750 per cent. above the 1938 volume for any month. For October, 1945, the number was 2 379. House service meters numbered 24 605, compared with 7 774 in October last year and a monthly average of 13 778 in 1938, while the number of portable accumulators was 57 192, as against 17 525 last year. Primary batteries and/or cells, numbered 2 086 158. Electric light bulbs shipped aggregated 4 567 132, compared with 2 055 856 in September, 2 658 795 in October, 1945, and a monthly average of 1 638 099 in 1938.

In the group comprising electrical goods and apparatus, as distinct from electrical machinery, the aggregate value of the exports for October exceeded £4 million for the first time. For the same month last year the figure was £1 488 309. British India was the largest purchaser, spending £636 845, the Union of South Africa came next with £598 447, and other substantial buyers were the Soviet Union (£331 196), Australia (£210 403), British Malaya (£202 291), Belgium (£140 745), Eire (£125 179), New Zealand (£122 814), Egypt (£130 038), France (£104 346).

For the ten months ended October 31 shipments of submarine telegraph cables were valued at £545 456 compared with £324 217 for five-sixths of last year; telegraph and telephone wires and cables other than submarine, reached £2 317 186 com-

Imports	Monthly average 1938	Month ended October 31 1945	1946	Five-sixths of year 1938	Ten months ended October 31 1945	1946
	£	£	£	£	£	£
Electric wires and cables, insulated	31 246	18 021	3 113	312 457	1 112 151	19 371
Wireless apparatus—						
Receiving sets and receiver chassis, complete, other than radio-gramophones, excluding valves	10 148	8 981	8 234	101 476	315 472	91 364
Valves, complete	10 893	35 737	15 563	108 927	819 553	91 757
All other descriptions	54 119	461 358	1 317 516	541 186	11 293 959	3 963 390
Telegraph and telephone apparatus other than wireless	9 243	23 619	1 346	92 434	726 597	32 372
Electric furnace carbons	4 054	84	—	40 540	4 232	14 022
Other electric carbons	2 301	3 924	5 517	23 010	101 768	64 662
Electric lighting appliances, accessories and fittings, and parts thereof, not elsewhere specified—						
Bulbs, complete, ready for use	10 265	1 779	1 445	102 646	188 935	6 916
All other descriptions	38 662	5 837	2 444	386 624	253 056	11 759
Batteries, primary (complete, and parts other than carbons) ...	3 549	1 594	853	35 493	265 415	4 727
Electrical instruments (other than telegraphic and telephonic) ...	32 057	5 923	2 782	320 573	227 124	66 375
X-ray apparatus and vacuum tubes	9 734	3 387	22 239	97 343	320 841	144 309
All other articles	42 630	147 290	12 944	426 297	3 170 929	120 018
Electric motors	26 033	14 950	1 399	260 333	103 257	53 868
Other electrical machinery ...	14 455	17 706	4 576	144 550	2 530 236	40 615
Vacuum cleaners, complete ...	7 519	43	123	75 187	169	968
Other portable mechanical appliances, electrically operated, not elsewhere specified, including parts	17 108	1 560	2 488	171 076	81 539	21 572
Welding machinery (including welding electrodes), other than tube making	—	7 428	27 193	—	337 387	105 179
Total	324 016	759 221	1 429 725	3 240 150	21 834 630	4 853 244

pared with £859 365 over the comparative period of 1945, rubber insulated wires and cables £2 323 622 against £1 320 384, and electric wires and cables with insulation other than rubber £3 766 841 compared with £1 175 951. The value of wireless apparatus accepted by overseas buyers increased from £1 561 162 for five-sixths of last year to £5 473 323 this year; telegraph and telephone apparatus other than wireless from £2 039 314 to £4 133 741; generators from £1 230 232 to £2 960 998; electric motors from £1 343 282 to £2 233 914; vacuum cleaners from £34 749 to £714 576; other portable appliances, electrically operated, from £45 481 to £367 408; and welding machinery from £448 219 to £714 642.

The tabulated figures given herewith, show the relative values of the imports and exports for October and for the ten months of the year contrasted with those for the comparative periods last year and in 1938.

Exports	Monthly average 1938	Month ended October 31 1945	1946	Five-sixths of year 1938	Ten months ended October 31 1945	1946
	£	£	£	£		£
Submarine telegraph and telephone wires and cables	17 289	68 460	21 854	172 894	324 217	545 456
Other than submarine	71 803	192, 543	163 909	718 034	859 365	2 317 186
Rubber insulated wire and cables	117 533	90 876	307 655	1 175 337	1 320 384	2 323 622
Electric wires and cables with insulation other than rubber	153 256	145 799	401 412	1 532 564	1 175 951	3 766 841
Wireless apparatus	149 593	195 792	855 419	1 495 932	1 561 162	5 473 323
Receiving sets, and receiver chassis, complete, other than radio-gramophones, excluding valves	36 755	19 112	531 241	367 554	114 907	2 470 220
Transmitting apparatus, excluding valves	28 296	30 200	115 948	282 966	330 931	795 533
Valves, complete	41 272	104 683	121 421	412 726	697 531	1 141 167
Telegraph and telephone apparatus, other than wireless	242 716	220 353	532 683	2 427 164	2 039 314	4 133 741
Electric lighting appliances, accessories and fittings, and parts thereof, not elsewhere specified—						
Bulbs, complete, ready for use	49 440	96 088	138 549	494 403	684 724	1 093 267
Other descriptions	48 565	59 090	250 593	485 653	399 082	1 647 861
Batteries, and/or cells, primary, complete	13 572	14 347	38 379	135 719	129 279	443 036
Accumulators—						
Complete*—						
Portable (including accumulators for motor vehicles)	28 874	28 824	126 367	288 737	319 360	1 109 029
Stationary	19 773	3 502	16 600	197 727	28 698	137 350
Parts and accessories	—	24 110	55 197	—	149 056	461 187
Electrical cooking and heating apparatus (including industrial)	30 664	30 156	151 689	306 637	200 782	975 483
Electrical instruments (other than telegraphic and telephonic)—						
Commercial (including ammeters, volt-meters, &c., and parts thereof)	15 878	28 398	78 219	158 780	266 404	469 483
House service meters, complete	15 791	18 258	66 360	157 913	97 366	412 639
All other descriptions	9 612	10 661	57 079	96 126	98 034	382 508
X-ray apparatus and vacuum tubes and parts thereof	4 881	15 554	206 845	48 810	130 771	575 720
Insulating materials, not elsewhere specified	19 343	51 621	136 742	193 436	272 816	992 372
Other electrical articles	110 615	193 877	416 409	1 106 146	1 218 210	2 681 619
Electric generators	157 150	46 875	378 132	1 571 504	1 230 232	2 960 998
Electric motors	145 045	132 153	301 340	1 450 453	1 343 282	2 233 914
Electrical converting machinery	101 304	76	96 195	1 013 046	11 226	118 803
Transformers for lighting, heating and power, including coils		58 413	164 252		1 074 218	1 646 284
Rectifiers for power-house use	3 463	9 285	17 203	34 633	50 025	90 272
Starting and controlling gear for electric motors	50 866	49 306	78 641	508 660	315 895	665867
Switchgear and switchboards (other than telegraph and telephone)	184 533	88 415	304 734	1 845 336	1 860 906	1 974 150
Electrical machinery, not elsewhere specified	15 497	9 905	20 590	154 967	3 347 927	191 206
Vacuum cleaners and parts	26 662	17 503	101 352	266 617	34 749	714 576
Other portable mechanical appliances, electrically operated, not elsewhere specified, including parts thereof	10 394	13 748	56 029	103 943	45 481	367 408
Welding machinery, other than tube making machinery and welding electrodes*	—	128 882	83 671	—	448 219	714 642
Total	1 814 114	2 142 810	5 624 099	18 141 163	21 037 135	41 619 843

* Including parts and accessories in 1938.

Inquiries from Overseas Buyers

OVERSEAS readers of THE ELECTRICIAN *who wish to import goods manufactured by British firms in the electrical and allied industries are invited to write to* THE ELECTRICIAN, *Bouverie House, 154, Fleet Street, London, E.C.4, giving details of the equipment in which they are interested and quoting bankers' references, and, where possible, the names of their British purchasing agents. Details of their requirements will then be inserted for a period in this section under a reference number, free of charge. The section appears in the last issue of each month.*

Replies to these inquiries should be enclosed in separate envelopes, bearing the appropriate reference on the top left-hand corner, the remainder of the envelope being left blank for insertion of the buyer's name and address, and should be enclosed in a covering envelope addressed to THE ELECTRICIAN at the above address. Stamps to cover Foreign or Dominion and Colonial postage must be affixed to replies.

On request, regular advertisers will be furnished with the names, addresses and, where known, the references and purchasing agents of any of those readers to whom they wish to forward catalogues or letters. Stamped addressed envelopes should accompany applications for this information.

Refrigerators.—Refrigerators and electrical goods, for Lahore, India.—Ref. X. 2038.

Hoisting Plant.—Electric hoisting crab winches of up to one ton in capacity, for Malta.—Ref. B.X. 12/2598.

Electrical Appliances.—Electrical appliances; electric drills, for Johannesburg, South Africa.—Ref. X. 1944.

Electrical Accessories.—Lamps, porcelain fixtures, cables, wires, conduit pipes, for India.—Ref. B.X. 12/2581.

Electrical Plant.—Electrical plant and supplies; radio components, for Wellington, New Zealand.—Ref. X. 1992.

Electric Kitchens.—Electric kitchens, electric fittings, washing machines and fans, for Bombay, India.—Ref. X. 1916.

Radio Sets, Flashlamps.—Radio receiving sets, electric products, flashlamps and batteries, for Zanzibar.—Ref. B.X. 12/2591.

Lamps and Household Appliances.—Electric lamps; electric household appliances, for Singapore, Straits Settlements.—Ref. X. 1947.

Electric Clocks and Tools.—Electric clocks, electric soldering irons and electric hand tools, for Wellington, New Zealand.—Ref. X. 1936.

Electrical Goods.—Electric table fans, irons, domestic electrical appliances, and other electrical goods, for India.—Ref. X. 2035.

Domestic Appliances.—Electric cookers, refrigerators, washing machines, all types of electric domestic goods; automotive tools, electric drills, for Sydney, Australia.—Ref. X. 1900.

Electrical and Radio Accessories.—Flashlamps, batteries, bulbs, Bakelite fittings, incandescent bulbs, motor-car bulbs, cycle dynamos, radio spare parts, for Bombay.—Ref. B.X. 12/2600.

Electrical Equipment.—F.H.P. and electric motors up to 10 H.P.; generators and complete sets, radio sets and components, lamps, cables and accessories, for London account.—Ref. B.X. 12/2585.

Switches, Fans, Meters.—Electrical wiring accessories, switches, plugs and sockets, adaptors; ceiling and table fans; house service meters, a.c. and d.c., for Lahore, India.—Ref. E.X. 20.

Electric Cables and Appliances.—Electric cables and appliances, mining machinery, tools, belting, etc., required by mines, railways and industries, for Southern Rhodesia.—Ref. E.X. 21.

Electric Motors, Switchgear, Cables.—Electric motors, 3-phase, 50 cycles; low tension circuit-breakers, 100-1 200 A, and ironclad unit type industrial switchgear, 15-200 A; cables and wires; conduit and fittings, wiring accessories; time switches (electrically-wound), domestic appliances; nurses' call and inter-communication systems, for Palestine. Ref. E.X. 19.

Refrigerators, Plugs, Switches, Appliances.—Refrigerators, commercial freezing plants, brass lamp-holders, circuit-breakers, 5 A 2-pin plugs (20 000), Bakelite switches (20 000 5 A), desk fans, ceiling fans, auto-control irons, convertograms, electric kettles, electric roasters, electric toasters, electric hair dryers, other electrical appliances and accessories, for Bombay.—Ref. E.X. 17.

Cables and Meters. — Underground cables: 25 miles three-core, cambric insulated, 500 000 cm., 5 000 V; 20 miles four-core cambric insulated, 250 000 cm., 5 000 V; 10 miles three-core, cambric insulated, 1 000 V. Poles, clamps and other accessories. Electric energy meters: 1 750, single-phase, two-wire, 220 V, 50 cycles, 5 A; 150 of 10 A capacity, 50 of 25 A and 50 of 50 A capacity; 450 three-phase, four-wire, 440 V, 50 cycles, with three single-phase elements for 10 A; 75 for 25 A; 20 for 100 A and 5 for 200 A, for South India.—Ref. E.X. 18.

High-Voltage Measurement

AN ELLIPSOID VOLTMETER — CALIBRATION OF SPARK-GAPS

TWO papers by Dr. F. M. Bruce were read before the I.E.E. Measurements Section on November 22, the subjects being "The Design of an Ellipsoid Voltmeter for the Precision Measurement of High Alternating Voltages," and "Calibration of Uniform-Field Spark-Gaps for High-Voltage Measurement at Power Frequencies."

The first paper discussed the various factors that influence the design dimensions for an ellipsoid voltmeter to be used for the precision measurement of a specified range of high alternating voltages. Having selected the overall dimensions of the ellipsoid itself, methods for evaluating the constants of the instrument were discussed, and a method was given for determining the necessary constants for a given ellipsoid from a series of weighted measurements. The theory leading to the simple equation giving the field strength as a function of the period of the ellipsoid made certain simplifying assumptions, and the magnitudes of the errors arising from those were considered. Where they were of the order of 0.01 per cent. or more, correction curves were given by means of which the necessary allowances could be made in any given case. The theoretical treatment was illustrated throughout by reference to a particular instrument, and it was concluded that, after its performance had been analysed on the above lines, it would give results having an estimated error of less than ± 0.03 per cent.

In the second paper a calibration was given for spark-gap electrodes designed to ensure that the spark path lay in a uniform field, and it was shown that for all three sizes of electrodes investigated, covering a range of 9 to 315 kV (peak), the sparkover voltages were within 0.2 per cent. of the values given by the empirical law

$$V = 24.22S + 6.08_2\sqrt{S}$$

peak kilovolts at 20° C. and atmospheric pressure of 760 mm Hg, where S is the electrode spacing in centimetres.

All observations were made with vertical gaps having the lower electrode connected to earth, and comparative data were obtained for a sphere-gap with electrodes of 25 cm. diameter. The effects of surrounding objects and of faulty alignment of the electrodes were determined experimentally, and on the basis of those results a number of recommendations were made, giving the limits within which the spark-over voltage was defined by the above equation.

MR. S. F. EDWARDS (Metropolitan-Vickers Electrical Co., Ltd.) said that both in America and Germany attracted disc electrometers had been constructed for the measurement of voltages up to 600 kV with an accuracy of 1 part in 200 or better, and the Germans early in the war made a development of that instrument involving the use of compressed gas, which increased the field strength and very greatly increased the pull on the disc. The same thing had been achieved by means of vacuum instead of compressed gas, and also within the last three or four years a 300 kV d.c. voltmeter of the resistance type had been developed, for which an accuracy of 1 part in 300 was claimed. Although the mathematics of the problem had been carefully studied in the author's paper on his ellipsoid voltmeter, he felt some doubt as to the overall accuracy of the method. With so many detected sources of error, there might be some that were not detected. The only really convincing test did not appear in the paper, viz., a comparison with an accurate voltmeter working on an entirely different principle, and he thought this omission was rather surprising. Referring to the second paper, he asked what was the value of the resistance in the high voltage circuit. The author had encountered a trouble which was common to people who tried to measure high voltage, viz., the unsteadiness of the mains voltages. The author had given reasons for the very high accuracy of 1 in 3 000 for his instrument, but some amplification of that part of the paper dealing with the accuracy of the test voltmeter would be interesting.

MR. R. DAVIS (N.P.L.) said he believed with the last speaker that it would have been very desirable to have had some comparisons with another R.M.S. method, even if it were not as accurate within the limits claimed for the ellipsoid voltmeter of the author. He felt the author had made one important omission in measuring the peak voltage in that he had not said anything about the wave shape of the voltage he used because if there were any subsidiary peaks they must be taken into consideration in computing the accuracy. With regard to the parallel plate spark-gap, he suggested that the setting-up of that was a much more complicated matter than the simple process of setting up a sphere-gap. Another objection he had was

to the overall width of the parallel plate condenser as compared with the sphere-gap, and the difference was a serious matter in laboratories of the finite dimensions in which one had to work to-day. He thought the time had come for what the institution called an integrating paper dealing with the properties of gases over all ranges of spacing, and with frequencies up to the highest values—thousands of megacycles. If the parallel plates of the author were dealt with in such a way that the field was not altered, some valuable information would be obtained on flash-over in air across dielectric surfaces, which was of very great importance in the design of all sorts of electrical equipment.

DR. S. WHITEHEAD (E.R.A.), referring to the ellipsoid voltmeter, said there was nothing really good enough to compare it with, if the author's estimate of its accuracy was to be believed, and whilst he kept an open mind about two parts in 10 000, he was not disposed to quarrel with the statement that this form of voltmeter either was, or should be, more accurate than any of the others that had been devised. There were a number of advantages of the parallel plate spark-gap over the sphere-gap, which were inherent in the type of electrode and whatever he might have done in putting the sphere-gap forward as a standard of calibration, he was well aware that whilst it was very good when working well, one could never tell when it was not going to work well. Therefore, it was very desirable to have some other method of measurement to make sure it was in good order. He strongly recommended the parallel plate spark-gap as one solution and one which deserved the most careful consideration in regard to the problem of industrial h.v. measurement.

MR. ARVON GLYNN (Manchester College of Technology) expressed some doubt as to whether the author had eliminated all possible sources of inaccuracy of the ellipsoid voltmeter. For example, he had calculated the moment of inertia of the ellipsoid on the assumption that it was a perfectly homogeneous material, but there was the possibility that the homogeneity of the material might vary. Another conceivable source of inaccuracy was the possibility of some degree of ferromagnetism in the ellipsoid. He briefly referred to some work being done at his college on an instrument which he thought might conceivably be a rival to the ellipsoid voltmeter.

DR. W. G. THOMPSON (G.E.C.) remarked that the ellipsoid voltmeter was really a remarkable instrument and was largely due to the faith and persistence of the late Prof. Thornton. He agreed it was not a voltmeter and preferred to regard it as a field strength measurer. He felt very strongly in favour of the author's claim to an accuracy of .03 per cent. As to the plate spark-gap, he said there was no comparison between this and the ellipsoid voltmeter as regards accurate reading, but that did not detract from the spark-gap as a practical device.

MR. J. M. FERGUSON (English Electric Co., Ltd.) said the principal criticism of the ellipsoid voltmeter appeared to be one of size, because as the voltage was increased so the size of the voltmeter had to be increased. Consideration had been given to making a vacuum ellipsoid voltmeter and it might be possible, in that way, to reduce very considerably the maximum stress allowable at the surface of the ellipsoid, and therefore reduce the size of the instrument, and, in addition, the rather dubious factor of damping due to air and dust from eddy currents would be eliminated. With regard to uniform-field spark-gaps he suggested that the cathode-ray oscillograph might be developed as the most accurate method of measuring impulse voltages of any type and duration.

DR. E. BRADSHAW (Manchester College of Technology) suggested that the figure of .03 per cent. might be regarded as the degree of reproducibility rather than as the absolute accuracy of the ellipsoid voltmeter. He said that work was being done at the Manchester College of Technology somewhat on the lines of the original work of the late Prof. Thornton.

MR. F. W. WATERTON (Manchester), as an exponent of the vacuum type instrument, said he thought that the advantages of the ellipsoid over the electrometer in vacuum were not very obvious.

MR. F. E. J. OCKENDEN (Everett, Edgcumb, Ltd.) said the measurement of high voltage was a practical matter and the provision of a high voltage voltmeter was a field not adequately served at present. The ellipsoid voltmeter would have important advantages if mounted in vacuum. An accuracy within .1 per cent. for commercial work would be very useful and he thought that by a little consideration it could be turned into a commercial voltmeter.

MR. ERIC HARTILL discussed the problem of putting the ellipsoid voltmeter in vacuum and pointed out that whilst it was a good idea, there were certain difficulties if the same results were to be obtained in vacuum as in air.

DR. A. BLOCH (G.E.C. Research Laboratories) referred to the measurements of damping given in the paper, and inquired the possible effect of ionisation on accuracy.

Colonial Telecommunications

I.E.E. Discussion on System, Plant and Organisation

AT the ordinary meeting of the I.E.E., on November 21, two papers on colonial telecommunication systems were delivered by Messrs. C. Lawton and V. H. Winson.

One, " The Development and Design of Colonial Telecommunication Systems and Plant," gave a review of the improvements and growth of colonial telecomunication services during the last 30 years or so, combined with a study of the measures that have been found necessary to overcome the special problems in telecommunication engineering that result from tropical conditions. The paper is based on experience in colonial, protected and mandated territories, which lie mainly within the tropical zone. There had been previous mention of these problems in a paper by the late Mr. Llewellyn Preece and by the late Mr. R. W. Weightman. Mr. Weightman was for many years associated with colonial telecommunication services, and in the present paper tribute was paid to the large share he had in solving many of the problems discussed. He described in his paper the services in Canada, Australia, South Africa and New Zealand. Since then there have been, the authors pointed out, much progress, and the telecommunication engineers of the Dominions must now be left to speak for themselves. The present paper was, therefore, concerned only with the colonial, protected and mandated territories under the direct control of the Mother Country. The paper was divided into four main sections: (1) General requirements for telecommunications in colonial territories; (2) characteristics of tropical climates; (3) general design of external plant; (4) design of apparatus and components for tropical conditions.

The other paper, " The General Planning and Organisation of Colonial Telecommunication Systems," was prepared in association with a paper on the development and design of colonial telecommunication services, and discussed the planning and organisation of the necessary systems. As in the associated paper, the countries considered were the colonial, protected and mandated territories under the control of the British Government, which lie mostly in the tropics. The subjects discussed included the factors governing the general planning of a telecommunication system so that it shall meet requirements and operate efficiently at minimum costs. The organisation needed for such systems was outlined, with observations on the performance of work for other Government Services, staff selection and training requirements, arrangements for purchase of materials, the control of expenditure by the costing of works and the desirability of keeping cost accounts.

MR. W. K. BRASHER (secretary of the I.E.E.) said he regarded the invitation to open the discussion as a compliment to his work abroad, as a chief engineer who was in charge of one of the telecommunication systems under discussion up to the outbreak of the war. With that experience he regarded the papers as being extremely badly needed, in that they enabled records to be brought up-to-date and, at the same time, were of assistance to others. As regards radio communication, that was not an alternative to line communication but only complementary to it. Having served in three Colonies and visited five others, he had been impressed with the dissimilar methods of construction and the lack of planning as between adjoining territories. There should be much greater standardisation of equipment and greater co-ordination between the respective chief engineers. He emphasised the need for a major reconstruction in many Colonies, in order that there might be a more efficient linking up with the international network. There was also a need for more adequate maintenance records and, moreover, a proper system of scrutiny of those records. An important point was the analysis of fault frequency. Referring to equipment, he had yet to be convinced that any form of impregnation of transformer coils was worth using.

DR. W. G. RADLEY (Post Office) said the papers were opportune because many members of the institution must have had experience of trying to maintain communication circuits in tropical countries during the war. As the result of experience in this country with equipment under damp conditions, especially in unattended automatic exchanges, he could support the view that corrosion was not troublesome so long as the humidity did not exceed something like 65 per cent. But corrosion increased very rapidly when the humidity became very high. Some years ago he had been very interested in cable corrosion, but his experience was limited almost entirely to bare lead-sheathed cables pulled into ducts, whereas he gathered that it was the more common practice in the Colonies to use armoured cable buried directly in the ground. He did not think

it was generally appreciated that a great deal of corrosion trouble was due to self-generated currents which might extend sometimes for several miles. These were caused by differing electrochemical potentials as between the cable sheath and the earth or salt water immediately surrounding, and perhaps such effects might be more serious in countries where the temperature of the ground was higher than here. A higher standard of technical knowledge on the part of those engaged on these installations in the Colonies was called for to ensure the efficient maintenence of the equipment.

MR. J. E. COLLYER (General Electric Co. Ltd.) said that manufacturers of colonial telecommunication equipment welcomed information such as was provided in the papers, because it aided considerably in design development. Reputable manufacturers had research laboratories where equipment was tested under conditions approximating as far as possible to tropical conditions, but even so such tests could not be absolutely conclusive. The chief difficulties to be overcome were associated with climatic conditions and the class of labour available for maintenance and service, as well as problems of packing and shipment. Local labour in many cases was poor, which resulted in a low standard of maintenance until the staff had become trained, and this latter point should be borne in mind by designers.

MR. F. SUMMERS (Post Office) spoke of serious corrosion experienced in this country on overhead wires, particularly in industrial areas, and expressed the view that there had been insufficient research anywhere in the world as to the use of a covered wire which would prevent this type of corrosion

MR. S. FLEMONS (China) said that whilst air conditioning was essential in the tropics, it constituted a heavy charge against the plant, not only as regards first costs but also running expenses. In the system with which he was concerned, they had installed equipment with the standard non-tropical finish, and there had been no special trouble as regards maintenance.

MR. A. BROOKES (Ericsson Telephones, Ltd.) spoke of the necessity for further investigations with the object of improving the standards of materials used in colonial equipment, and suggested that the extra cost of new and improved materials of construction would be more than off-set by the reduced maintenance. He spoke of improvements already made by way of the use of special varnishes and also oils which would stand up to the most strenuous conditions, but thought a great deal more should be done.

COL. J. READING (Post Office) spoke of his experiences in tropical countries, and said that nobody concerned with Army equipment had a good word to say for the oil insulator. He added that within his knowledge one of the best lines was from Jerusalem to Haifa which had been installed during Mr. Brasher's time.

MR. D. J. ROBINSON (Posts and Telegraphs, Gold Coast) said the people in West Africa had much more than a village outlook, and were becoming very telephone minded. There was a demand there which fully justified large-scale planning. He asked designers of equipment to bear in mind that African maintenance men were not as good as they might be; at the same time, he expressed the view that given an adequate long-term system of training, first class African maintenance operators could be produced.

MR. J. C. EMERSON (Telephone Services, Ltd.) expressed regret that the authors had not given more facts and figures in support of some of their general observations. He gave details of the working of telecommunication systems in Trinidad, Barbados and Kingston (Jamaica), and emphasised the need for engineers in charge of colonial telecommunication systems to pay periodical visits home, and to keep in touch with manufacturers and suppliers of equipment and engineers here generally. On the other hand, engineers and manufacturers' representatives from home should also pay periodical visits to the colonies.

MR. L. A. WILLIAMS said he believed there was a larger proportion of labour involved in every £ worth of telecommunication equipment than in almost any other branch of engineering. At the present time, labour was scarce, and therefore if those concerned with colonial telecommunication equipment insisted on departures from the standards used in this country, the cost must be correspondingly higher.

MR. J. McGAVIN (Automatic Telephone and Electric Co., Ltd.) said that a great deal of experience had been gained in various parts of the world, and the absence of details of that experience was regrettable because it led others, in some cases, to be unjustifiably optimistic with regard to tropical conditions. An immense amount of work had been done on insulating varnishes and materials and special impregnating materials for use under tropical conditions, but there was no precise information as to how these things met colonial conditions. It was, of course, possible to achieve success for the major part under tropical conditions, but he did not think we had yet reached the point where we could use the adjectives used in the paper.

Industrial Information

Electron Jubilee Exhibition

The fiftieth anniversary of the discovery of the electron by the British physicist, Sir Joseph Thomson, will occur next year. To mark this jubilee and to demonstrate the tremendous influence such an advance in pure physics may have on the life of the

A new display designed by the Metropolitan-Vickers Electrical Co., Ltd., for large windows. It opens to an overall width of about 9 ft. and stands 4 ft. high.

community, the Institute of Physics and the Physical Society, jointly, are arranging a series of meetings and other functions to take place on September 25 and 26, 1947, in London. A special exhibition, which will remain open to the public for several weeks, will be held at the Science Museum, South Kensington, and will show the development of the vast range of modern industrial equipment from its earliest experimental origins.

Radiolympia in 1947

The Radio Industry Council announces that Radiolympia, the national radio exhibition, will be resumed next year. Present plans provide for a pre-view on September 30, and the show to be open to the public from October 1 to 11.

Disposal of Surplus Stores

The Ministry of Supply announce that manufacturers' and electrical plant, including hair dryers, irons, batteries and lamps, together with electric fires, will be offered between December 3 and 5 at a sale at Aber Tinplate Works, Llansamlet, Glamorgan. Emergency battery lighting sets will be among the stores for sale between December 16 and 18 at the Ministry of Supply 98 Depôt, Tower Bridge Road, London, S.E.1.

A.E.H.A. Annual Meeting

The first annual meeting of the newly-formed Association of Electrical Housecraft Advisers took place at Kingsway Hall, London, on November 2. Miss M. Gosse presided and explained the purpose of the association and the need for its registration as a trade union. She also discussed the work of the demonstrator and electrical housecraft adviser, and suggested that refresher courses might be arranged. In a discussion on salaries reference was made to the varying N.A.L.G.O. grades in which demonstrators had been placed, and the general feeling of the meeting was that fully qualified housecraft advisers should be regarded as technical and graded accordingly. The following officers were appointed for the year: Miss Gosse, chairman; Miss Boyd, vice-chairman; Mrs. Windsor, secretary; and Mrs. Pavitt, treasurer.

Welsh Industries Fair

The first Welsh Industries Fair to be held in London will open at the Royal Horticultural Hall, Westminster, on New Year's Day, 1947, and continuing until the following Tuesday (January 7). Organised by the National Industrial Development Council of Wales and Monmouthshire, the scope of the exhibits will be very wide and will include a large proportion of consumer goods from the light industries now established in the Principality, such as electrical fittings, hot-water systems, tools, domestic and office equipment. Among non-consumer goods will be switchgear.

New Factories and Offices

When the Germans raided Birmingham on the night of October 26, 1940, they dropped a bomb which broke up a 60-years-old association between Bulpitt and Sons, Ltd., the makers of " Swan Brand "

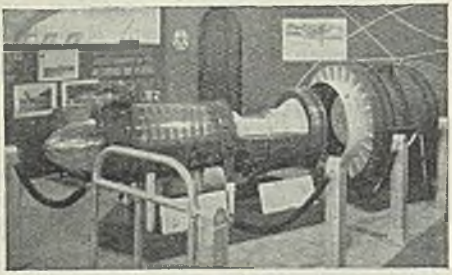
New factory and offices of Bulpitt and Sons, Ltd., at Birmingham

products, and their offices in Camden Street. The bomb started a fire which destroyed all the offices and all the production. Part of the factory space, urgently required for essential war pro-

duction, was rebuilt, but the office staff were forced to find a temporary address. The move this month to new premises, known as St. George's Works, Icknield Street, Birmingham 18, involves an extension of " Swan Brand " productive capacity besides the resettlement of the office staff.

Metro-Vick and the Paris Exhibition

The display of the Metropolitan-Vickers Electrical Co., Ltd., at the Paris Exhibition, though only three years old, is of historic interest; it is the first ducted fan engine ever built. The exhibit is divided into two separate parts, the simple jet engine and the ducted fan thrust-augmentor; the jet engine, a Metrovick type F2 (Series 3), which forms the gas generator for the augmentor is shown with part cut away so that the internal arrangement may be seen. The company started development work on jet propulsion in 1938, the engines then envisaged being power turbines to drive propellers and also to produce some thrust from the exhaust velocity. The losses inseparable from this construction led to its early abandonment, since when the company has concentrated on axial flow engines deriving their thrust from the exhaust jet. A more recent development is the thrust augmentor which is also purely axial. On November 13, 1943, a modified Gloster F9/40 powered by two Metropolitan-Vickers engines made the first British axial-flow jet-propelled flight, previous flights having been made in a flying test bed powered by reciprocating engines. The axial flow jet engine installed in this 'plane completed a test programme of 210 hours, 90 hours being spent in the air.



Metropolitan-Vickers' type F2 thrust augmented jet propulsion engine at the Paris Exhibition

Large Factory Opened

The Marshall Richards Machine Co., Ltd. (wire drawing division of Marshall Sons and Co., Ltd., Gainsborough), have taken over a two-acre factory in Crook, Co. Durham, which was opened recently. Mr. J. D. Murray, M.P., declared the factory open, and in the afternoon, members of the Crook and Willington U.D. Development Board, the directors of Marshall Richards Machine Co., Ltd., and the workpeople, gathered in the works canteen, where the meeting was addressed by Mr. Murray, Mr. George Wood (chairman of the company), Mr. George Bryden (managing director, Mr. S. H. Richards (technical director), and Coun. W. Bourne (chairman of the Crook Development Board). The factory is a modern one and was built by the Admiralty only three years ago.

H.F. Heating Explained

An outline of the progress made in h.f. heating is given in a brochure, " High Frequency Heating by Valve Generators," just published by the General Electric Co., Ltd. The advantages of the process in the heat treatment of metals and non-metals are outlined, and a few examples are given of the way in which a generator —in this case a 25 kW model—speeds up the work. Under average conditions it will heat 40 lb. of ferrous, or 18 lb. of non-ferrous metal through 100° C. per minute; harden 10 sq. in. of steel surface to a depth of 30-thousandths of an inch in 5-10 secs., or dry off 50 lb. of water from a charge per hour. The brochure, a copy of which can be obtained on application to Magnet House, Kingsway, W.C.2, is well illustrated throughout its 28 pages, and has complete sections devoted to eddy current and dielectric heating. Details are given of the range of available G.E.C. generators and prospective users are given a fair estimate of what can be expected of each.

Fish-Finding Equipment Markets

What was described as a typical instance of B.E.T.R.O.'s work was demonstrated at a Press conference in the library of the British Export Trade Research Organisation at 48, Dover Street, London, W.1, on November 21. Mr. Leslie Gamage, vice-chairman and joint managing director, who is chairman of B.E.T.R.O., said the organisation was doing the job for which it was formed, and was gathering momentum as was indicated by the number of inquiries recently received for market research, but it could undertake more work and wanted more. Mr. Francis Hughes, director and overseas manager of Marine Instruments, Ltd., and president of the British Nautical Instrument Trade Association, said that his firm decided to contract with B.E.T.R.O. for investigation of world fisheries, and the reports they received from the organisation had demonstrated that fish-finding, i.e., the actual recording of the presence of shoals of fish, could be a commercial success by the development of the right equipment

through market research. The echo-sounding equipment, which was used for hydrographic surveys and for the location of mines during the war, could be employed now not only for the location of fishing grounds but also for indicating the presence of fish where fish-finding was an important commercial asset. The essential feature which distinguished the recording echo-sounder developed by Marine Instruments, Ltd., from French, American and German patterns, was the installation inside a ship's hull of the oscillators for the transmission and reception of sound vibrations. The sensitivity of the recording system, in which "wet" paper instead of dry facsimile paper was used, permitted the actual recording of fish. Some charts showing various types of fish recorded were exhibited, and the equipment was demonstrated.

Reports from Germany

Further reports containing scientific and technical intelligence from German industry, now available at the Stationery Office, include the following: B.I.O.S. 629, Electronic Principles as Applied in Germany to the Testing of Materials (16s. 6d.); F.I.A.T. 609, High Power Radar Jagdhaus (1s. 6d.).

Industry Aids Training Scheme

Ex-servicemen whose education for a business career was interrupted by service in the Forces are being helped to continue their training through the co-operation of large industrial organisations with Ministry of Labour schemes. Hoover, Ltd., have started a two-years' training course in both factory and sales-service management for young men who have reached matriculation standard in education.

New Products

We have received two booklets descriptive of two new products of the metals division of Imperial Chemical Industries, Ltd. The first, "Kutern," is a material possessing the properties of copper, but capable of much quicker and easier machining to a fine surface finish. The second, "Kumium," is a copper chromium alloy which, it is claimed, is able to retain its tensile strength, hardness and conductivity at extremely high temperatures.

Test Underground Car Lighting

Daylight lighting and a continuous band of route diagrams around the ceiling of the compartment are features in two test Underground cars being put into service by London Transport early in December. They will run on the Metropolitan line between Uxbridge, Baker Street and the City. There are 22 fluorescent tubes in each car, ranged in two rows over the seats. Six lights of the ordinary bulb type are also provided for emergency use. The object of the cars is to test out features which are likely to be incorporated in the 143 new District and Metropolitan cars now under construction. An improved current pick-up gear and a dual-purpose generator, of Metropolitan-Vickers design, are also being tested. The latter supplies 110 V a.c. for the fluorescent circuit and 50 V d.c. for the emergency lights.

Trade Publications Received

The abridged specifications of the products of the Cambridge Instrument Co., Ltd., 13, Grosvenor Place, London, S.W.1. Details of construction and working ranges of many instruments are given, including galvanometers, valve and electrostatic voltmeters, oscillographs and other kinds of laboratory measuring equipment and bench accessories.

"Builders' Bulletin," published by Electrolux, Ltd., Luton, Beds., giving particulars of their silent refrigerators displayed at the "Britain Can Make It" Exhibition, and of models being installed on a number of housing estates.

S. African Royal Train

FOUR of the most important coaches of one of the two special trains built for the Royal tour of South Africa were displayed at the works of the Metropolitan-Cammell Carriage and Wagon Co., Ltd., at Birmingham, on November 22. They are for the use of the King and Queen, the Princesses, and the Royal staff. The exterior colouring is ivory with gold lining. The cars are steel built, insulated against heat and cold, with sealed double armour-plate windows and have complete air conditioning.

In every compartment there is a telephone worked on an automatic dial exchange, installed by the Automatic Telephone and Electric Co., Ltd., and a loudspeaker, relaying radio programmes picked up by a special receiver in the baggage van. The Marconi Wireless Telegraph Co., Ltd., are supplying the special radio installation, including a high-speed short-wave telegraph/telephone transmitter with specially designed aerial systems, a high-frequency receiver, broadcast receiving equipment, loudspeakers, and so on.

The Royal train is air-conditioned throughout by the Stone carrier system, which provides fresh and filtered air, evenly distributed throughout each coach, automatically warmed or cooled as the conditions may require to a predetermined temperature. Axle-driven generators supply the power for air, lighting, water

pumping, refrigeration, a luminous indicator installation, thermostatically-controlled irons, kettles, vacuum cleaners, radio gramophones, and public address system, all supplied by J. Stone and Co.

Nearly 300 lighting fittings incorporating 2 ft. 20 W fluorescent tubes and control gear, designed and manufactured by the G.E.C., have been supplied. The ceiling fittings are made of chromium with ribbed glass of frosted appearance concealing the tubes.

Philips Industrial (Philips Lamps), Ltd., are providing the two generator sets which will supply all the current needed to operate the radio transmitters and receivers. They are required to be interference free on all frequencies. The sets will operate on a 65 V d.c. supply with a tolerance of 55 V to 86 V. They will have an output of 150 W at 220 V, single-phase, and will run at 1 500 r.p.m. Automatic speed governors capable of maintaining constant speed within ± 3 per cent. of pre-set value will be fitted.

The batteries which are being supplied by the Chloride Electrical Storage Co., Ltd., comprise 14 sets each of 56 Exide ironclad cells, type DCLA.13, having a rated capacity of 390 Ah. at the 10-hour rate to 1.80 V per cell. The weight of each cell, complete with acid, is approximately 105 lb., so that the total weight per 56-cell battery is about 2 tons 12 cwt. The battery on each coach is assembled within two steel compartments, each containing 28 cells and measuring internally 8 ft. 10¾ in. long by 1 ft. 11¾ in. wide by 2 ft. high.

Circuit Breakers

With reference to the report of the discussion on the paper read at the I.E.E. meeting on November 7, which appeared in our issue of November 15, Mr. H. Trenchman (B.T-H.) points out that his contribution should read not as published but to the following effect:

Messrs. Allan and Amer called the rate of rise of restriking voltage the severity and, whilst this was a convenient term with which to replace a rather cumbersome expression, he thought that that was all there was to commend it. He registered a strong plea that its use should for the present be abandoned in dealing with circuits and circuit breaking.

It was already accepted that different circuit breakers would respond differently to changes in the rate of rise of restriking voltage so that what was easy work for one circuit breaker might produce violent disturbance in another. It was also contended in the Cox-Wilcox paper, that the oil circuit breaker at least, would respond differently to different restriking transients over different portions of its breaking characteristics. Any acceptable criterion of severity should have equal incidence to all circuit breakers.

Next, the time factor was neglected when talking only of rate of rise; any positive rate of rise maintained long enough would arrive at any desired magnitude, and so amplitude, or time of application, must be taken into account.

Examination of rate of rise to express severity could go further. The restriking voltage characteristic was settled by the parameters of the circuit in the neighbourhood of the breaker and was a natural frequency or a combination of natural frequencies. If severity must be referred to a circuit breaker for verification, then it must be a standard circuit breaker, and the question then arose, what was a standard circuit breaker? It must be one wherein, through the whole range of current interruption, there was no change in response to a change in rate of rise of restriking voltage, and it was one which itself would not modify the restriking transient. As neither the air-blast nor the oil circuit-breaker had these characteristics there was at present no such thing as a standard circuit breaker in the sense required.

Section 3.7.1 of the paper commented to the effect that resistance switching did not make the breaking capacity of the circuit breaker completely independent of circuit severity.

The statement was based on tests at 11.5 kV (Table 4), carried out on a breaker designed for 33 kV, and this at once suggested considerably less than critical damping, a circumstance which might well explain what was observed.

Continuing, Mr. Trencham said that he questioned the conclusion drawn from the curves in Fig. 7 of the paper, viz., that an apparent reduction in dielectric strength was due to the presence of ionised gases. Experience based on another design led him to expect no reduction, and he suggested the authors examine the speed of contact separation and also the build-up of blast pressure.

On the subject of testing, Messrs. Cox and Wilcox indicated methods of unit testing applied to oil circuit breakers, more or less analogous with those covered in an earlier paper on air-blast circuit breakers. They also mentioned the method which was permitted in B.S. 116, part 2, but he had always felt that the only justification for the special provisions in B.S. 116, part 2, was the fact that the oil circuit breaker interrupting characteristic had two critical regions, as pointed out in the paper, viz., one for voltage and one for current. Once a design was produced in which this condition did not hold, both stresses might increase as the short circuit value was raised, and there was no practical alternative to full scale proof. This left a choice between building testing stations capable of maximum required output, or else designing breakers in sections which could be tested to the limit of their rating at existing stations—in other words, design for unit testing.

The application of resistance switching to oil circuit breakers, as described by the authors, placed them in the category requiring full proof, as the lower curve in Fig. 5 in the paper indicated that voltage and current stressing were no longer separately distinguishable. It was perhaps a happy coincidence that the present maximum voltage which could be interrupted in one arc control device, whether air-blast or of oil type, seemed to define a unit of approximately the same rating, and one which was convenient from the point of view of both the designer and the tester.

In Parliament

Some Electrical Questions Asked and Answered

Electrical Accessories.—The Minister of Supply was asked by Mr. Bossom what efforts he was making to overcome the dificiences prevailing in the smaller porcelain accessories indispensable to electrical installations. Mr. Wilmot replied that every encouragement was being given to new firms to enter the industry and to existing firms to expand their present capacity. In addition, four royal ordnance factories had undertaken production.

Bicycle Lamp Batteries.—Mr. Renton asked the Minister of Supply whether he was aware that there was a shortage of electric batteries for bicycle lamps; and what steps he was taking to overcome this shortage. Mr. Wilmot replied that his information was that the present production of these batteries was sufficient to satisfy the demand. There might, however, be local shortages, due to distribution or transport difficulties.

Wood Poles.—Several questions were asked about the supply of transmission poles. Mr. Belcher, speaking for the Board of Trade, said that of the 140 000 poles at present held by his Department about 30 000, which were kept in stock by the Post Office, were suitable for either h.t. or l.t. transmission purposes. All practicable steps were being taken to obtain as many poles as possible from home sources and from overseas for all essential requirements, including the electricity supply industry. Mr. Shinwell stated that the average length of time which elapsed between the application to the Electricity Commissioners for a licence to purchase poles and the time when the licence was refused or granted varied considerably according to the supplies available, the number of applications outstanding and the priority accorded to the supply of electricity for which the poles were required.

Reserve Electrical Plant.—The Minister of Fuel and Power was asked by Mr. P. Freeman what amount of the electrical equipment and duplicate machinery now standing in docks in South Wales, which was stored for use in emergencies in case of bombing or fire, had been sold abroad; and how it was proposed to dispose of the remainder. In reply, Mr. Shinwell said that this plant was part of a reserve pool which was built up for war emergencies. Much of it was unsuitable for regular use as plant of normal design. It was now being sold. Some of it had been bought by undertakings in this country, some by foreign countries and some by U.N.R.R.A. The plant which was now lying in docks in South Wales had been sold to U.N.R.R.A. No plant was being sold abroad which could be used to relieve the shortage in this country.

Electric Motors.—Replying to Lieut.-Col. Sharp, the Minister of Supply said that every encouragement had been given to the electric motor industry to increase production by the allocation of resources for expanding capacity, including factories in development areas, by securing a high preference for labour requirements, by arrangements for the protection of skilled workers from call-up, and by assistance in the provision of raw materials. Manufacturing capacity was increasing and would continue to increase during 1947, but unfortunately the shortage of materials, particularly electrical metal, was at present preventing its full exploitation. They were doing all they could to increase supplies, but it was not possible to say when these measures would be fully effective. Continuing, Mr. Wilmot said that shortage of electric motors was unfortunately affecting a number of other important industries as well as the machine tool industry. There was no system of Government allocation of motors of less than 1 000 H.P., and he did not consider that any such system was practicable. The solution lay in increasing the total production of electric motors.

Telephone Services.—Asked by Col. Hutchison when he proposed to make Ipsophone attachments to telephones available to subscribers in this country, and on what terms, the Assistant P.M-G. (Mr. Burke) said that the possibility of introducing facilities on the lines of the Ipsophone was being borne in mind, but for the present the resources of the Post Office had to be concentrated on meeting the heavy demands for the provision of basic services. Major Beamish asked whether the Assistant P.M-G. had studied the radio-telephone system now being operated by the New York Telephone Company as part of the Bell system; and whether he had any similar plans to announce for this country. Mr. Burke said that he was aware of interesting radio-telephone developments in the U.S.A., including one for telephone calls from moving vehicles. These developments were being closely watched by the Post Office engineers and the possibility of their introduction in this country would be examined when the position in regard to providing basic telephone services was easier.

Answers to Technical Questions

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

What is the "inversion" process as applied to electric circuit theory?

The term "inversion" is applied to a graphical method of finding the admittance

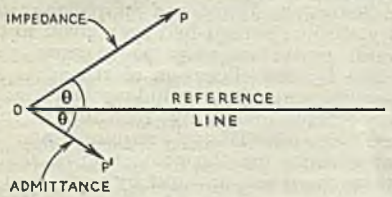


Fig. 1.—Inversion

of a circuit when its impedance is known or the impedance when the admittance is known.

The impedance of an inductively reactive circuit is given by $\mathbf{Z} = \mathbf{R} + j\mathbf{X} = Z\angle\theta$ and is a vector operator, i.e. if a current vector is operated on by the impedance operator it gives the vector voltage required to pass the current through the impedance in accordance with the equation $\mathbf{V} = \mathbf{I}\,\mathbf{Z}$.

Similarly if the admittance of the circuit is

$$\mathbf{Y} = \frac{1}{\mathbf{Z}} = \frac{1}{Z\angle\theta} = \frac{1}{Z}\angle -\theta$$

the current in the circuit is given by $\mathbf{I} = \mathbf{V}\,\mathbf{Y}$.

Thus if the impedance of a particular circuit is represented by O P in Fig. 1,

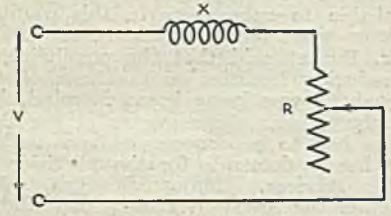


Fig. 2.—Simple series circuit

the admittance is represented by the reciprocal of OP, i.e. OP' drawn at an angle of —θ to the reference line.

The process of inversion is thus to draw the vector representing the impedance (or admittance) at its proper angle to the reference line and then to draw a line whose length is equal to the reciprocal of the length of the impedance (or admittance) and at an equal angle on the opposite side of the reference line.

The process is useful where a circuit to be investigated contains a variable impedance and it is desired to see how the current will vary as the impedance is varied; it is usually illustrated by considering a simple circuit comprising a reactance and a variable resistance in series supplied with a constant voltage V, as indicated in Fig. 2.

The first step is to draw the impedance vector for the various values of resistance as shown by the lines OP_1, OP_2, OP_3, &c., in Fig. 3. Inverting each of these lines as described above gives the lines OQ_1, OQ_2, OQ_3, &c. The lengths of the lines OP will be set off in ohms so that the lengths of OQ will be in mhos. The current taken

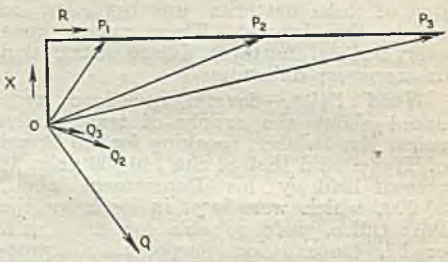


Fig. 3.—Inversion process on series circuit

by the circuit will be proportional to the admittance ($I = V\,Y$) so that each of the admittance lines also represents, to an appropriate scale of current, the current taken by the circuit as the resistance is varied. The locus of the end of the admittance vector in this case lies on the arc of a circle.

This method of treatment is of greater value when the circuit to be investigated contains a number of series and parallel elements as shown in Fig. 4 (which may be recognised as an equivalent circuit giving an approximate representation of a double-

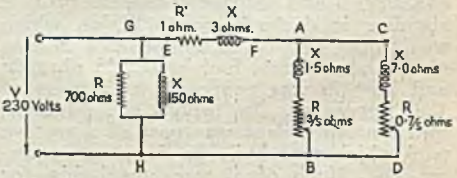


Fig. 4.—Circuit for solution by inversion process

squirrel-cage | induction motor). In this case it is desired to find how the current,

i.e. the total admittance of the circuit, varies as "s" is varied from 0 to 1.

The procedure is as follows: First draw the impedance loci for each of the circuits A B and C D and for various values of "s." Invert each of these giving the admittance loci which, as in Fig. 3, are arcs of circles. The total admittance of the two in parallel can then be found by adding the corresponding admittance vectors from each of these loci. Invert each of these total admittance vectors to give the corresponding impedance vector. The series impedance vector for E F can then be added to each of these. The resulting impedance vectors can then again be inverted to give the admittance of the circuit from E to B. The admittance vector for the circuit G H can then finally be added to each of these giving the total admittance of the whole circuit. Multipling each of these admittance vectors by the voltage V, i.e. altering the scale of the vectors, gives the current taken by the circuit for each value of "s" over the given rango. Actual values corresponding to a 400 V 10 H.P. star-connected motor are given in Fig. 4 so that a reader can try the process for himself.

The same result could, of course, be obtained analytically by using vector algebra and the choice of method depends on the desire of the engineer concerned. The analytical method involves a considerable amount of laborious calculation with the possibilities of arithmetical error but is normally employed in design offices for routine calculations where the necessary work is done in a pre-arranged tabular form. The graphical method has the advantage of presenting, throughout the determination, a picture of the conditions in the circuit and may lead to a better understanding of the problem. E. O. T.

Electricity Supply

Scarborough.—The Electrical Engineer has been asked to report on the re-introduction of assisted wiring schemes.

Mansfield.—The Electricity Committee has obtained sanction to borrow £20 400 for the provision of supply to the Mansfield colliery.

Grimsby.—The C.E.B. have issued a direction to the electricity undertaking to extend the generating station, at an estimated cost of £284 700.

Blackpool.—Proposals for the extension of the 33 kV transmission system having been approved, the Electricity Committee is seeking sanction to borrow £143 767 for the cost.

Bury.—As a move against hooliganism, the Town Council has decided to order the removal of lantern heads from street lamps, which are repeatedly broken, and to fix a notice to the standard stating the reason for the removal.

Scunthorpe.—An 11 kV ring main transmission system is to be superimposed upon the existing distribution system. The initial portion of the scheme will cost £52 560 and a further £90 000 will have to be spent later to complete the ring.

Hadley.—The Metropolitan Water Board is to remodel the Hadley Road pumping station and instal electric plant at a cost of £26 700. It is anticipated that this will save £1 000 a year in running costs, and that there will be a saving of 350 tons of coal per annum.

Newcastle-on-Tyne.—Representations by the City Council, previously reported on this page, that the city should be exempt from any cuts in electricity, have been unsuccessful, and the Council has been informed that cuts must be shared by industrial, transport and general consumers.

Hull.—The Minister of Fuel and Power has been asked to perform the opening ceremony of the Sculcoates power station extensions. Sanction to borrow £30 000 for new sub-stations has been obtained. The installation at the Anlaby Road institution is to be improved at a cost of £3 272.

Liverpool.—Subject to the approval of the Commissioners, the City Electrical Engineer is to proceed with the extension of the distribution system by laying six additional 33 kV main transmission lines from Clarence Dock station, in the general direction of Speke, at an estimated cost of £795 790.

Southwark.—Proposed extensions to the Bankside station of the City of London Electric Lighting Co., Ltd., comprise two 50 000 kW turbo-alternators, with the necessary auxiliary plant, boilers and buildings. Application for consent has been made to the Electricity Commissioners.

Preston.—Thirteen years after first rejecting the proposal, Wrea Green has again confirmed an objection to electric street lighting. It would have meant a 4.104d. rate increase. One objector described concrete standards as "too modern" and "hideous," saying that they would ruin beauty spots.

Maidenhead.—A distribution project for new housing sites, estimated to cost £40 000, has been approved by the Town Council, and a scheme for improved street

lighting between Maidenhead Bridge and Maidenhead Thicket, at an estimated cost of £7 961, has been submitted. Fluorescent lighting is to be installed in High Street, King Street and Queen Street.

London.—Twenty schools are included in an estimate of £38 000, the first instalment in a plan to provide all L.C.C. schools with electric lighting. The L.C.C. Housing Committee has agreed to the installation of electricity in 120 houses on the Becontree estate, at a cost of £1 800. The tenants will pay an additional rent of 6d. per week.

Wallasey.—The electricity undertaking is arranging to celebrate its jubilee on January 29. The Electricity Committee has decided to divert cables on the Leasowe estate at a cost of £2 083, provide a sub-station and cables on the Pasture Road estate, at £2 560, and change over the supply in the New Brighton area at £33 588.

Farnworth.—After hearing estimates that the electricity undertaking would lose £6 500 in the present financial year, the Electricity Committee has decided to discontinue the scheme of letting electrical apparatus out on simple hire, to make application to the Electricity Commissioners for approval to an increase of 10 per cent. in tariffs, to be put into operation as from April 1, 1947, and to withdraw the invested reserve fund of £8 033. The reasons given for the present position are the increases in the cost of coal, wages and materials, and a loss on the maintenance of hired apparatus.

Yorkshire.—Electrical Distribution of Yorkshire, Ltd., and the North Lincolnshire and Howdenshire Electricity Co., Ltd., have made a decision similar to that taken recently by the Yorkshire Electric Power Co., with which they are associated. The result is a reduction in charges for electricity supplied under agreements which provide for prices to vary with the cost of coal. Consumers will be notified shortly of the extent of this change, which will affect about 280 firms in the areas of Ossett, Gargrave, Beverley, Goole and Thorne, and Lincolnshire north of Market Rasen.

Electricity Undertaking Loan Sanctions

A financial statement, showing amounts of loans sanctioned by the Commissioners, is now published for the period ending September 30, 1946. The loans for similar purposes, made in the two preceding years, are given for comparison.

(A) Public Authorities (excluding Central Electricity Board)

Item	1944-45	1945-46	Six months ended Sept. 30, 1946
	£	£	£
Purchase of property	13 907	124 165	45 970
Buildings (generation purposes)	6 711 285	10 710 085	4 855 043
Buildings (distribution purposes)	42 734	789 258	1 178 183
Plant (generation purposes)	20 323 383	19 077 935	13 759 477
Plant (distribution purposes)	593 327	2 381 948	2 490 946
Mains and services	491 422	3 667 759	3 977 165
Meters and instruments	31 249	246 418	274 987
Wiring installations	1 107	16 009	63 942
Apparatus	24 034	245 500	255 485
Other purposes	105 370	393 298	329 829
Total	28 337 818	37 652 375	27 231 027

(B) Central Electricity Board

Purchase of property	—	—	—
Buildings (distribution purposes)	200 000	—	—
Plant (distribution purposes)	230 000	—	—
Mains	400 000	—	—
Civil Defence	100 000	100 000	—
Generating stations	1 075 000	—	—
Other purposes	20 000	—	—
Total	2 025 000	100 000	—

(C) Total Amounts Sanctioned during each Quarter

April 1-June 30	1 067 578	16 792 980	8 816 821
July 1-September 30	5 801 894	4 035 003	18 414 206
October 1-December 31	8 070 946	10 337 392	—
January 1-March 31	15 422 400	6 587 000	—
Grand total	30 362 818	37 752 375	—

Contracts Open

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

Litherland, November 30. — Electric wiring in 24 bungalows in Field Lane. Particulars from Borough Surveyor, Town Hall, Litherland.

Warwick, December 2.—Firms desirous of having their names placed on the County Council's approved list of contractors, for heating, hot and cold water supplies, steam services, laundry and kitchen equipment and electric light and power installations, should apply to the County Architect, Shire Hall, Warwick, giving details of recent contracts and names, etc., of persons to whom reference can be made.

Manchester, December 2.—Supply of plumbing and jointing metal prepared in accordance with, and supplied under, the terms of B.S. 219/1942. Particulars from Chief Engineer and Manager, Electricity Department, Town Hall, Manchester, 2.

Bonnyrigg and Lasswade, December 2.—Electrical work in 182 houses at Lothian Street. Particulars from Burgh Surveyor, 14, Lothian Street, Bonnyrigg.

Dublin, December 4. — Supply of 2 100 yds. single-core and 1 100 yds. three-core l.c. 660 V cable, for Port and Docks Board. Particulars from Secretary, Dublin Port and Docks Board, Dublin.

Manchester, December 6. — Supply, delivery and erection at Stuart Street power station of air-cooling pipework for Nos. 67 and 68 boilers. Particulars from Chief Engineer and Manager, Electricity Department, Town Hall, Manchester, 2. Deposit, £1 1s.

Plympton-St. Mary, December 6.—Supply of 6 600/415/240 V three-phase transformers. Specifications and other details from Clerk of the Council, Council Offices, Plympton.

Upper Stour Valley Sewerage Board, December 6.—Supply and delivery of three pumps with electric motors, switchgear, etc., at Quarry Bank. Particulars from Mr. G. P. Deeley, 13, Church Street, Stourport. Deposit, £5 5s.

Portsmouth, December 9.—Electrical work in conversion of Annesley House and Kent Cottage, Queen's Crescent, Southsea. Particulars from City Architect, Municipal Offices, 1, Western Parade, Southsea. Deposit, £2 2s.

Bury, December 9.—Supply and delivery of: (1) 1 250 kVA, 6 500/400/230 V, three-phase transformer, and (2) 625 kVA, 6 500/400/230 V, three-phase transformers. Specifications from Engineer and Manager, Electricity Department, Market Street, Bury.

Kingston-upon-Thames, December 9.—Supply and delivery of p.i. cables. Particulars from Borough Electrical Engineer, 17, High Street, Kingston-upon-Thames, Surrey.

Cardiff, December 10.—Supply and delivery of (a) 11 kV switchgear; (b) 500 kVA transformers; (c) 11 kV and l.v. underground cables, for work at Whitchurch. Particulars from Electrical Engineer and Manager, 2, Park Place, Cardiff. Deposit, £1 1s. each.

Manchester, December 13.—Supply, delivery and erection at Stuart Street power station of soot blowers for Nos. 65 and 66 boilers. Particulars from Chief Engineer and Manager, Electricity Department, Town Hall, Manchester, 2. Deposit, £1 1s.

Heston and Isleworth, December 13.—Supply, delivery, erection and setting to work of one 10 000 kVA transformer, 21/11 kV, with on-load tap change equipment suitable for remote control. Particulars from Borough Electrical Engineer and Manager, 11, Staines Road, Hounslow, Middlesex.

Epsom and Ewell, December 16.—Supply, delivery and erection of (a) one 500 kVA three-phase transformer, and (b) one ten-panel 11 kV, 150 MVA truck type switchboard. Specifications from Town Clerk, Town Hall, The Parade, Epsom, Surrey. Deposit, £1.

Cleethorpes, December 20.—Supply of four 500 kVA transformers. Specification from Borough Electrical Engineer and Manager, Showrooms and Offices, Grimsby Road, Cleethorpes, Lincs.

Leeds, December 30.—Supply and delivery of electrically operated pumping plant, with motors, switchgear, etc. Particulars from Sewerage Engineer's Office, Civic Hall, Leeds.

Camberwell, January 20.—Supply of electric lamps for 12 months. Particulars from Engineer and Surveyor, Town Hall, Camberwell, S.E.15.

Victoria, Australia, January 22.—Two 50 000 kW turbo-generators, with condensing plant, etc. Specification from State Electricity Commission of Victoria, 22, William Street, Melbourne. Deposit, £4 4s.

Dangers of Divided Control

POWER COMPANIES' CRITICISM OF SUPPLY PROPOSALS

ALARM at the proposal that general and main transmission should be separated from the distribution of electricity is expressed in a report of a Committee appointed by the Incorporated Association of Electric Power Companies to investigate the probable effects of divided control, and now made public. In a foreword, Mr. H. Richardson, president of the association, recommends its consideration by those interested in the future of the industry.

It appears necessary, the report begins, to direct attention to the inherent faults of a structure which would separate the ownership and control of generating stations from the distribution of energy to the consumers, and to the dis-service that would be rendered both to industry and consumers if this were carried out. It was perfectly clear that at the time the Electricity (Supply) Act, 1926, was passed, the opinion of Parliament was that only as a last resort should the Central Electricity Board themselves own or operate a generating station.

The importance of an undivided control would, it is admitted, be more apparent to those who had experience of supply over wide and diverse areas than to those undertakers who were only concerned with supply in urban areas. There was, in fact, no real break in the process between the delivery of fuel to the boilers in the generating station and the delivery of electricity to the consumer, and no particular stage at which responsibility could, with advantage, be transferred from one party to another.

EFFECT OF PRICE STANDARDISATION

Since 65 per cent. of the electricity sold in this country was used for industrial purposes, it was important to the supply industry that the price to industrial consumers be kept in proper relationship with alternative sources of available power. If the object of segregating generation from distribution was to standardise prices, then those areas with low costs and prices under present conditions would have to increase their charges so as to subsidise the others, with the result that they would lose much of their own industrial business and be no longer able to give any substantial assistance to other areas.

The report goes on to say that with recent technical advances, no permanent differentiation should be made between main transmission lines and distribution lines. What was a main transmission line to-day might at any time be utilised by the undertaker, in the interests of his consumers, for distribution. If all main transmission lines were to be owned by a separate generating authority, then the distribution side of the industry could no longer utilise a line in this way, and would have to incur further capital expenditure in providing additional lines.

Factors which condemned the proposal from an economic standpoint are summarised as: (a) the greater number of personnel required by two organisations as against that required by a combined organisation; (b) the duplication of spares for apparatus and equipment common to both generation and distribution, such as transformers and switchgear, and of spares for transmission and distribution, such as those for extra high voltage lines and cables and their associated sub-stations; (c) increased maintenance costs and (d) the duplication of many ancillary services.

COMPLICATED SAFETY PRECAUTIONS

In day-to-day working, prompt co-operation between generating and distributing operations would become more difficult, and to ensure the safety of employees and security of supplies, a complicated procedure of safety precautions would be essential. The training and best placing of staff would suffer because the existing facilities for interchange of duties under one management would be lost.

The report reiterates that when the 1926 Act confined the duties of the Board to co-ordination and direction, the dangers described were avoided, and that policy had been amply justified by experience. The advantages to be derived from its continuation would become still more marked with a general increase in the size of distribution areas. The dovetailing of generating and distributing activities attained by the large undertakings must provide the best structure for general adoption.

If any further argument were needed, the report ends, to refute the proposal for separating generation and transmission from distribution, it could be pointed out that such a course was never advocated by any of the Parliamentary Committees appointed to make recommendations with regard to the electricity supply industry.

The chairman of the Committee responsible for drawing up the report was Mr. E. H. E. Woodward, general manager and a director of the North-Eastern Electric Supply Co., Ltd.

Company News

LINCOLNSHIRE AND CENTRAL ELECTRIC SUPPLY LTD.—Rev. to March 31 incldg. inc-tax recoverable £267 (£2 500), £83 358 (£83 633). To mangmt. exes. £988 (£1 006), charges £428 (£409), deb. int. £14 933 (£15 164), dirs.' fees £600 (same), tax £8 119 (£9 111), off commsn. of pref. shs. issue, etc., £2 500 (same), lvg. pft. £55 790 (£54 842). Pref. div. absorbs £11 250 (same), ord. div. 9% (same) £34 875, gen. res. £2 500 (same); fwd £49 933 (£42 768).

CRABTREE ELECTRICAL INDUSTRIES, LTD.—Trading pft. of wholly-owned operatg. sub., J. A. Crabtree, after all exes. and incldg. sundry inc. for the yr. ended July 31, £249 605 (£226 986); less dep. £2 203 (£2 286), ex. on plant, etc., £20 054 (£3 059), inc.-tax and E.P.T. £119 069 (£142 351), and fees leavg. £107 178 (£77 982); to defd. repairs £3 000 (£13 000); div. £70 000 (£65 000) tax free, res. £30 000 (nil), fwd. £81 035 (£76 856). Holding co. has declared fin. of 5% less tax, plus bonus of 7½% mkg. 17½% less tax, (same) for yr. ended October 31.

ISLE OF THANET ELECTRIC SUPPLY CO., LTD.—Holders of the ordinary and 6 per cent. cumulative participating preference stock have been informed that the Margate, Broadstairs and District Electricity Special Order, 1946, has been approved by Parliament, and the local authorities of Margate and Broadstairs and St. Peter's are now in a position to constitute a joint board for the purchase (and subsequent operation) of its electricity supply undertaking. It is anticipated that the transfer will be made at the close of December next against a substantial payment on account of the purchase price, the exact amount of which cannot be ascertained until the financial result of the current year's operations is known. A further communication will be sent to the stockholders as soon as possible. Under the terms of the Trust Deed the debenture stock of the company will not remain as a charge against the electricity supply undertaking when it is transferred, but will attach as a first charge on the proceeds of the sale. The company must apply so much of the proceeds as is required in the redemption of the stock at par. It is anticipated that this will be done on December 31 next.

Coming Events

Friday, November 29 (To-day)

I.E.E., N.E. CENTRE. STUDENTS' SECTION.—Newcastle-on-Tyne. "Insulation Technology," B. A. L. Ellings. *6.30 p.m.*

INSTITUTION OF ENGINEERING INSPECTION.—Glasgow. "The Electron Microscope as an Aid to Inspection," R. R. Davy. *7.30 p.m.*

JUNIOR INSTITUTION OF ENGINEERS.—London. "The Trend of Patent Law," G. W. Tookey. *6.30 p.m.*

I.E.E., S. MID. STUDENTS' SECTION.—Loughborough. "Electric Resistance Furnaces," F. Crook (repetition). *7 p.m.*

Saturday, November 30

I.E.E., N. WESTERN STUDENTS' SECTION.—Manchester. Dance. *7 p.m.*

I.E.E., LONDON STUDENTS' SECTION.—Visit to Mount Pleasant Post Office Railway. *2 p.m. and 4 p.m.*

I.E.E., E. MIDLANDS STUDENTS' SECTION.—Leicester. Visit to Works of Taylor, Taylor and Hobson. *9.30 a.m.*

Monday, December 2

I.E.E., S. MID. CENTRE.—Birmingham. "The Extinction of Arcs in Air-Blast Circuit Breakers," A. Allan and D. F. Amer. "The Influence of Resistance Switching on the Design of High Voltage Oil Circuit Breakers," H. E. Cox and T. W. Wilcox.

I.E.E., MERSEY AND N. WALES CENTRE.—Liverpool. "The Chesters," talk by E. Leete. "The Development of the Gas-Cushion Cable System for the Highest Voltages," T. R. P. Harrison. *6 p.m.*

Tuesday, December 3

BRITISH KINEMATOGRAPH SOCIETY.—Manchester. "Fluorescent Lighting," A. G. Penny. *10.30 a.m.*

I.E.E., N. MIDLAND CENTRE.—Leeds. "The Chesters," talk by E. Leete. "Power Supply for Generating Station Auxiliary Services," W. Szwander. *6 p.m.*

Wednesday, December 4

I.E.E.—London. Radio Section. "The Elements of Wave Propagation Using the Impedance Concept," H. G. Booker. *5.30 p.m.*

I.E.E., N.E. CENTRE.—Newcastle-on-Tyne. Discussion on "Electrical Measurements in Research," opened by J. A. Harle.

I.E.E., MERSEY AND N. WALES CENTRE.—Liverpool. "Some Considerations on the Source of Power Supply," J. E. Beliss. *6 p.m.*

I.E.E., LONDON STUDENTS' SECTION.—Visit to Ford Motor Works, Dagenham. *2 p.m.*

Thursday, December 5

I.E.E.—London. "Power Supply for Generating Station Auxiliary Services," W. Szwander. *5.30 p.m.*

ILLUMINATING ENGINEERING SOCIETY.—Cardiff. "Improvements in Mine Lighting," C. S. Chubb.

Friday, December 6

I.E.E.—London. Measurements and Transmission Sections. Discussion on "Desirable Features of Protective Relays," opened by C. Ryder and F. H. Birch. *5.30 p.m.*

ILLUMINATING ENGINEERING SOCIETY, BIRMINGHAM.—Debate: "Can the I.E.S. Code be Profitably Applied to Industry?" *6 p.m.*

INSTITUTE OF PHYSICS.—London. "The X-ray Examination of Radio Valves," C. Croxson, followed by "Magnified Images" (Industrial Radiology Group).

Commercial Information

Mortgages and Charges

NOTE.—*The Companies Act of* 1908 *provides that every mortgage or charge shall be registered within* 21 *days after its creation, and that every company shall, in its annual summary, specify the total amount of debt due from it in respect of mortgages or charges. The following mortgages and charges have been registered. The total debt prior to the present creation, as shown in the annual summary, is given—marked with an *—followed by the date of the summary, but such total may have been reduced.*

SIMMONS ELECTRICAL AND WINDING CO., LTD., London W.C.—November 4, series of £1 000 (not excluding) debentures, present issue £500; general charge. *Nil. April 9, 1946.

ANGLIAN RADIO, LTD., Ipswich.—November 4, £1 000 debenture, to H. Tibbenham, Ipswich, general charge.

Satisfactions

ELECTRICAL ENGINEERING CONSTRUCTION CO., LTD. (formerly FRANK CURTIS (ELECTRICAL ENGINEERS), LTD.), London, W.—Satisfaction November 4, of debenture registered June 9, 1943.

MAY-VALE ELECTRICAL MANUFACTURING CO., LTD., Leigh-on-Sea.—Satisfaction November 5, £1 000, registered October 9, 1946.

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.*

ELM RADIO (a firm), 1102, London Road, Leigh-on-Sea, Essex, radio dealers. £17 16s. 1d. October 1.

HILLIER, M., 486, Kingsland Road, London, E.8, radio dealer. £13 3s. 6d. September 19.

HUNT, A. S. AND CO. (a firm), 587, London Road, Isleworth, Mddx., electrical contractors. £16 9s. 5d. October 1.

Orders for Discharge

SANDS, Chaloner Wilkinson, of and carrying on business at High Street, Kings Langley, Herts. Electrical and wireless contractor. Court—St. Albans. Date of Order—October 22, 1946. Discharged as from November 22, 1946.

EISNER, Joseph, Sunshine Joseph, Rome Barnett, and Otaki, Tokuichi (known as Joseph Tokuichi Otaki) trading together in partnership as The Lloyd Electric Lamp Company (a firm), 8, Rangoon Street, London, E.C.3, and lately of 4, Lloyds Avenue, London, E.C., wholesale electrical accessories dealers. (Separate application of Joseph Eisner.) Court—High Court of Justice. Date of Order—October 15, 1946. Discharged subject to consenting to judgment for £50 being entered against him by the Official Receiver and pay £1 10s. Costs of Judgment. Note.—£50 paid to Official Receiver in lieu of entering up judgment.

Intended Dividends

BARKER, John Richard, residing and carrying on business at Tanshelf House, Front Street, Pontefract, also carrying on business at 183, Kirkgate, Wakefield, formerly residing and carrying on business at Gillygate, Pontefract. Wireless dealer. Court—Wakefield. Last day for receiving proofs—December 2, 1946. Trustee: Sanders, Edwin Thomas, 29, East Parade, Leeds, Official Receiver.

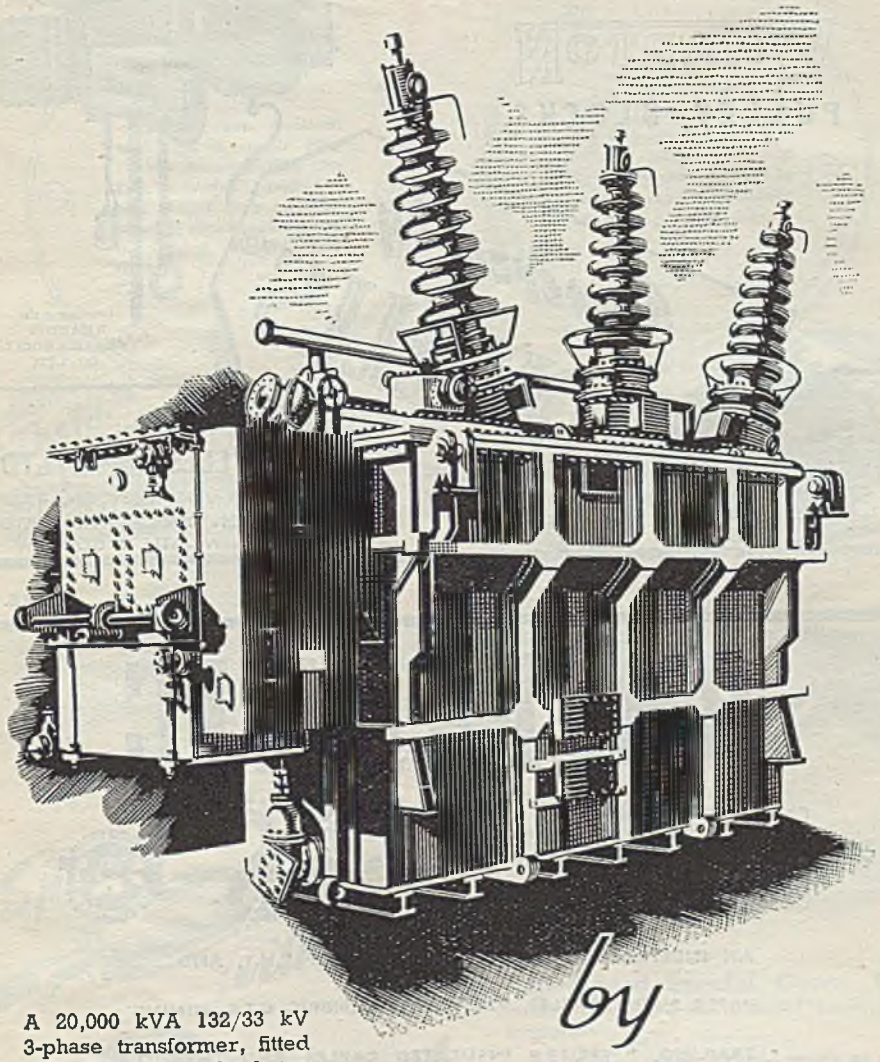
GRIFFIN, James Stanley, residing at 50, Havelock Road, Luton, Beds, electrical engineer, and carrying on business at 108, High Town Road, Luton. Court—Luton. Last day for receiving proofs—November 29, 1946. Trustee: Pollitt, Tom, 6, The Parade, Northampton, Official Receiver.

Metal Prices

	Monday, Price	November 25 Inc.	Dec.
Copper—			
Best Selected (nom.)...per ton	£96 10 0	—	—
Electro Wire bars ... „	£98 0 0	—	—
H.C. Wires, basis ... „	£112 5 0	—	—
Sheet ... ... „	£138 10 0	—	—
Bronze Electrical quality 1% *Tin*—			
Wire (Telephone) basis per ton	£134 0 0	—	—
Brass (60/40)—			
Rod basis ... ... „	10¾d.	—	—
Wire ... ... „	1. 3⅛d.	—	—
Iron and Steel—			
Pig Iron (E. Coast Hematite No. 1) ...per ton	£8 19 0	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ... „	£33 0 0	10s.	—
Mild Steel Tape (Cable Armouring) basis 0.04 in.) ... ... „	£21 15 0	—	—
Lead Pig—			
English ... ... „	£56 10 0	—	—
Foreign and Colonial... „	£55 0 0	—	—
Tin—			
Ingot (minimum of 99.9% purity) ... „	£384 0 0		—
Wire, basis ... ...per lb.	4s. 10¼d.		—
Aluminium Ingots ...per ton	£72 15 0	—	—
Spelter ... ... „	£55 0 0	—	—
Mercury (spot) ... per bott.	£25 0 0	—	—

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

TRANSFORMERS



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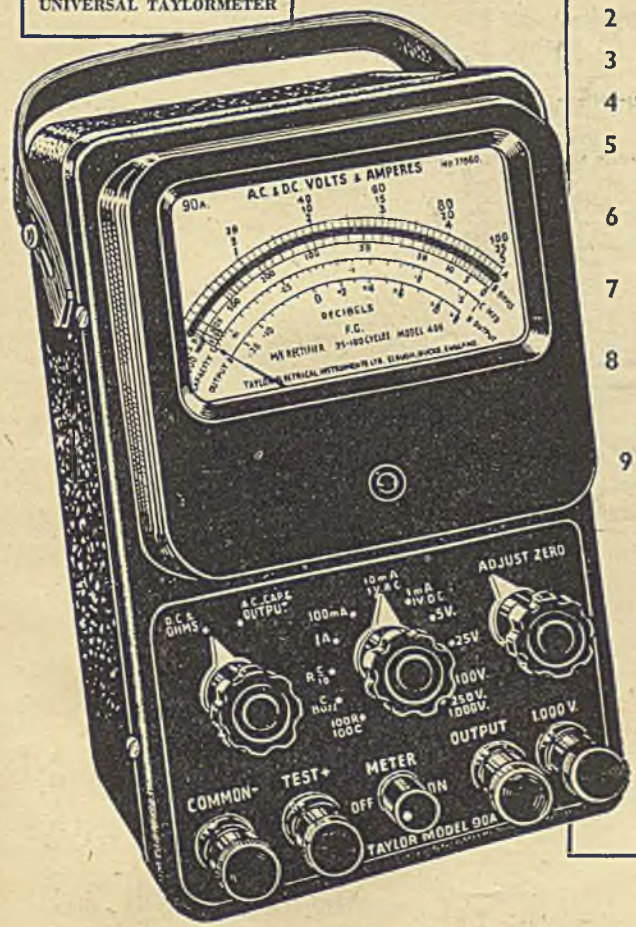

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