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THE

P. 60/46/II

ELECTRICIAN

THE TECHNICAL NEWSPAPER OF THE ELECTRICAL INDUSTRY

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R. 137(1946) No. 21.

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22 NOVEMBER 1946

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"METROSIL"



"Metrosil" is a non-ohmic resistance having the characteristic $CURRENT \propto (VOLTAGE)^4$ and introduces new ideas for your improved peace products.

Some proved uses are in :—
SURGE SUPPRESSION · LIGHTNING
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Switch to

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when daylight fades

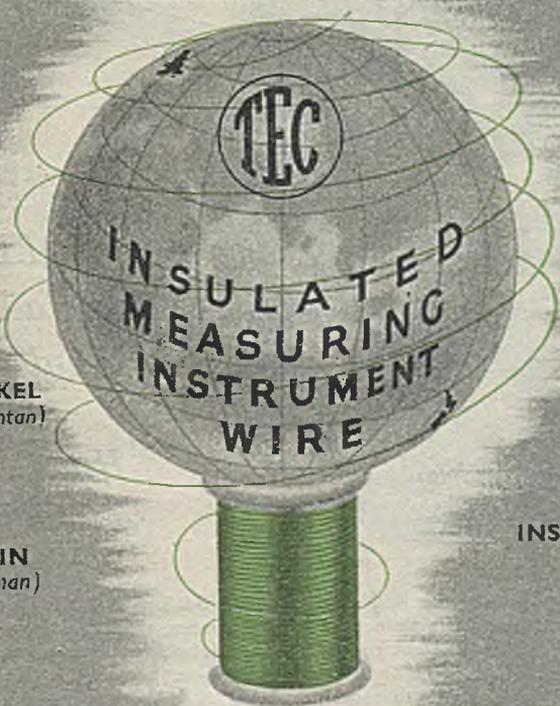
THE ELECTRICAL WORLD DEPENDS ON



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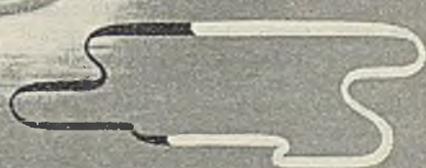
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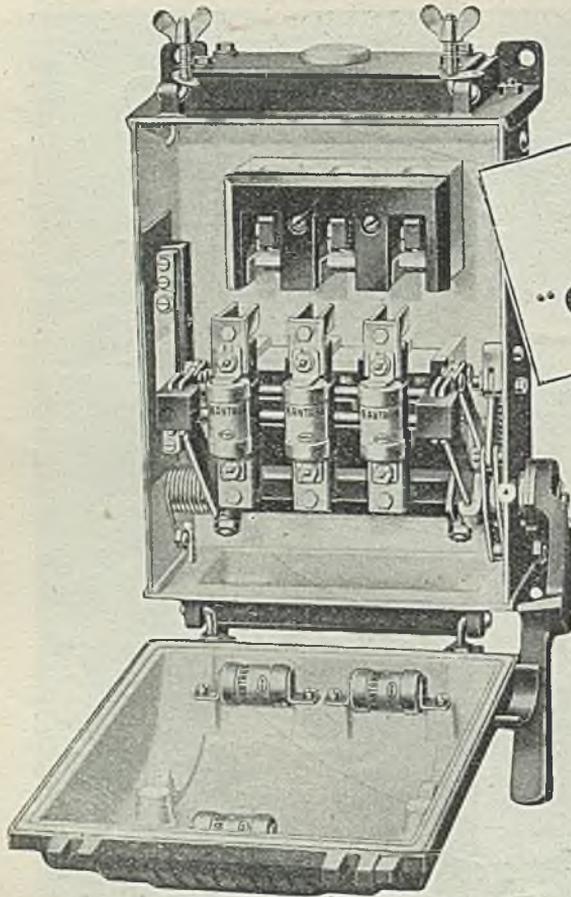
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The **NEW**
"Glasgow-Rex"

*The Famous
M.E.M
Ironclad Switch
Re-designed
—with
H.R.C. Fuses*

M.E.M. designers have shown true leadership again. This new H.R.C. series is a triumph of compactness and adaptability. You can convert the standard switch to an H.R.C. fuse switch in a few moments. It is just as simple to convert a triple pole unit to triple pole and neutral. Here is a new kind of versatility in switchgear.

The "Glasgow-Rex" complies fully with Home Office regulations and the "Kantark" H.R.C. standard cartridge fuses are in accordance



with B.S.S. 88/1939, A.C.4 and D.C.3. Appearance, workmanship and finish of these switches will win the admiration of engineers everywhere. Yet this high quality equipment is offered at reasonable prices. Only M.E.M. intensive specialisation could produce such value.

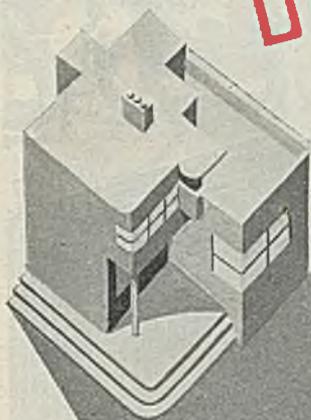
A descriptive list No. 278 is already available. It gives full details of the new "Glasgow-Rex" range, rated from 30-200 amps. Send for your copy now.

*Switch, fuse and motor control gear, electric fires
and localised lighting equipment*

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By eliminating miscellaneous service apparatus and tortuous wiring connections the Consumer's Service Unit offers the advantage of a designed layout. The unit is capable of great variation in layout to suit existing conditions and is so adaptable that extensive domestic circuits can be accommodated. Unobtrusive, pleasingly finished in cream or black stove enamel and affording ample protection to the consumer, the unit being simple to install can reduce time on electrical work in the national rehousing programme. Write for publication No. 204C.

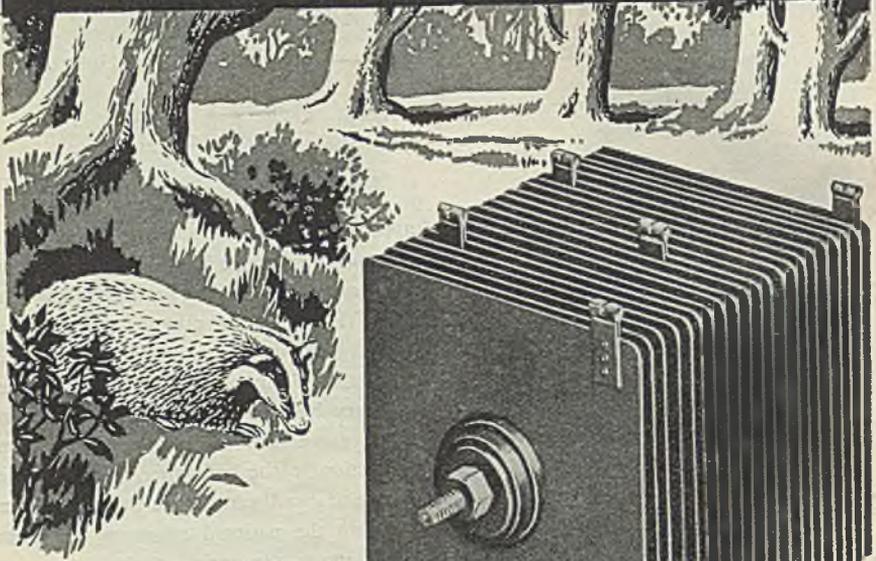
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CONSUMER'S SERVICE UNIT



BRITISH INSULATED CALLENDER'S CABLES LIMITED
NORFOLK HOUSE, NORFOLK STREET, LONDON W.C.2

HOW LONG DOES IT LIVE ?



The Badger

How long does a badger live? Few indeed have ever seen this grey nocturnal animal and probably not many more would be able to do more than hazard a guess at the answer. He can in fact attain an age of 20 years, but the average life is about 8/9 years.

What is the life of a Westinghouse Metal Rectifier? Many of the original copper-oxide units are still giving excellent service after 20 years continuous use and the new "Westalite" rectifiers appear to have an even greater potential life. In any case, it can be stated with certainty that there are no more reliable rectifiers than

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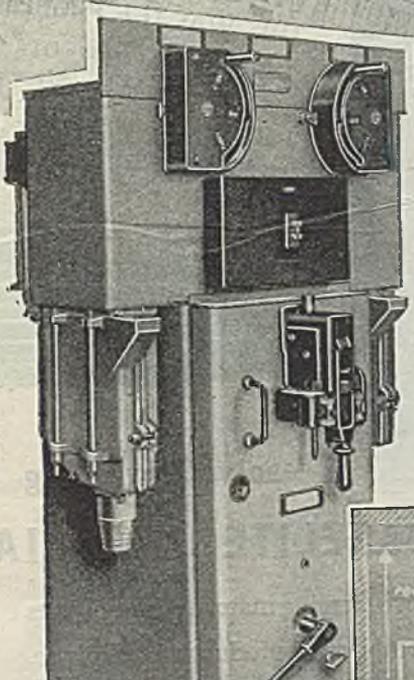
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WESTINGHOUSE BRAKE & SIGNAL CO. LTD.

82 YORK WAY, KINGS CROSS, LONDON, N.1



METAL-CLAD SWITCHGEAR

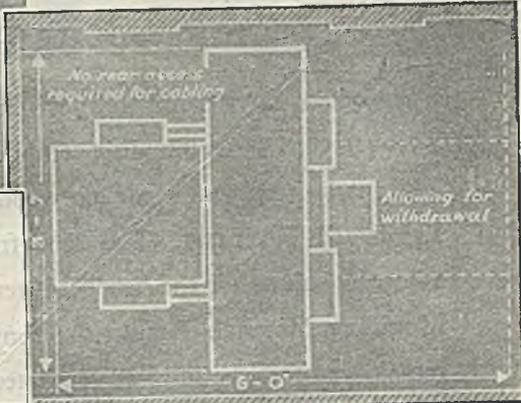


Class QF

Ring-Main Equipments

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DISTRIBUTION
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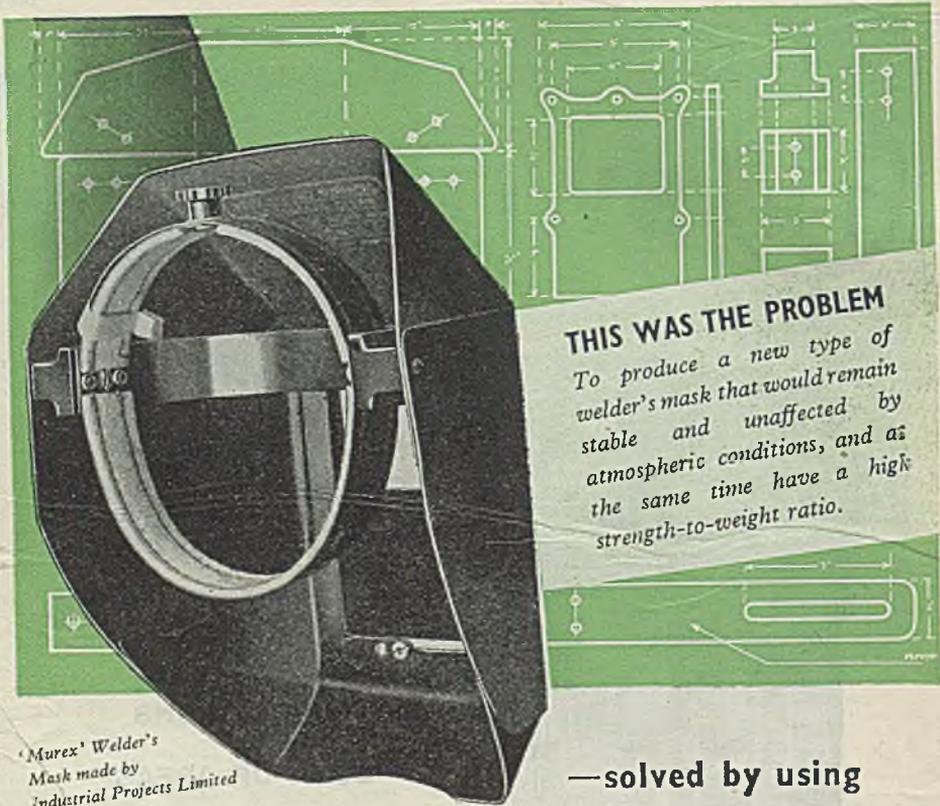
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THE BRITISH THOMSON-HOUSTON COMPANY LIMITED, WILLESDEN, ENGLAND.

A3625





'Murex' Welder's
Mask made by
Industrial Projects Limited

THIS WAS THE PROBLEM
To produce a new type of welder's mask that would remain stable and unaffected by atmospheric conditions, and at the same time have a high strength-to-weight ratio.

—solved by using

BAKELITE MATERIALS

By using BAKELITE Laminated post-forming material these objects were achieved without unduly complicated production technique. The mask itself was made on wooden formers from BAKELITE Laminated F.111141/1. The lens frame, distance pieces and adjusting screws for the headgear were moulded from BAKELITE Moulding Material. Result, a strong, light-weight mask that remains comfortable and well ventilated over long periods of wear.

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Pioneers in the Plastics World

T.76

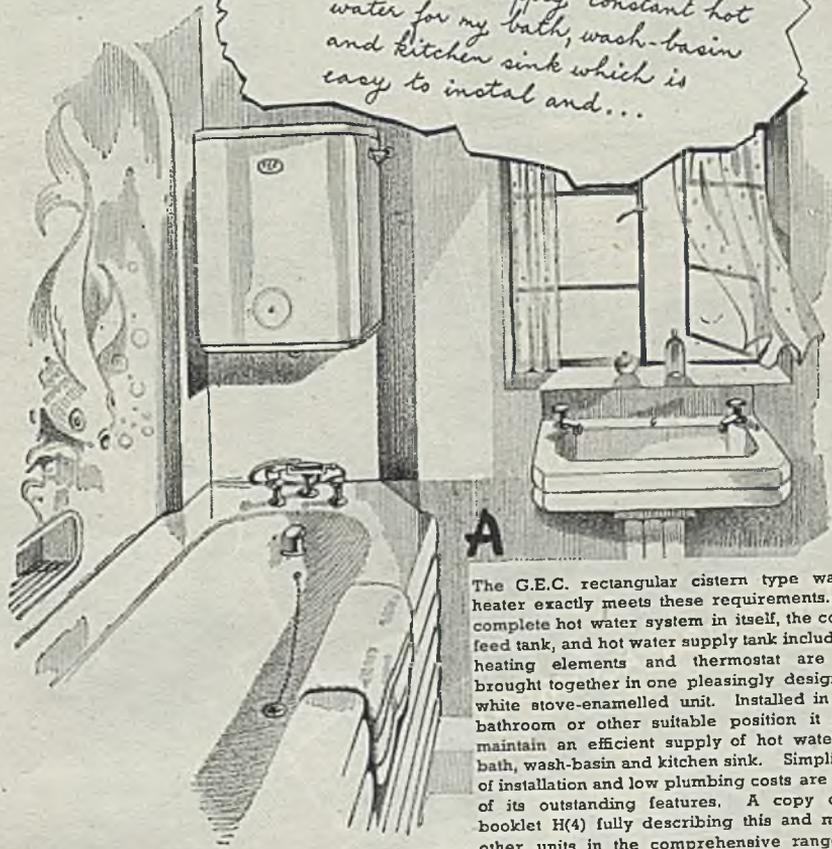
BAKELITE LIMITED · 18 GROSVENOR GARDENS · LONDON S.W. 1

THE ELECTRICIAN

22 NOVEMBER 1946

The housewife gets into hot water!

Q I need a hot water appliance which will supply constant hot water for my bath, wash-basin and kitchen sink which is easy to instal and...



A The G.E.C. rectangular cistern type water heater exactly meets these requirements. A complete hot water system in itself, the cold-feed tank, and hot water supply tank including heating elements and thermostat are all brought together in one pleasingly designed white stove-enamelled unit. Installed in the bathroom or other suitable position it will maintain an efficient supply of hot water to bath, wash-basin and kitchen sink. Simplicity of installation and low plumbing costs are two of its outstanding features. A copy of a booklet H(4) fully describing this and many other units in the comprehensive range of G.E.C. water heating appliances will be gladly forwarded upon request.

G.E.C. ELECTRIC WATER HEATING

Advt. of The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2

On Points

OF PERFECTION



SENSITIVE SETTINGS

PRECISION ACCURACY



HEBBURN-ON-TYNE

RELAYS



120

NEXT TIME HELL GET AN ATLAS

People who buy lamps are talking about this new Atlas Lamp Advertising. It tells a very human story. That moment of baffled exasperation when a lamp fails suddenly—that is when the public is really lamp conscious. *That is when new ATLAS customers are made!*

The Atlas message is easy to remember. It strikes the right note . . . in the right places . . . at the right time. In the leading newspapers and magazines. On the best poster sites . . . in the best dealers' windows.

Atlas offer the dealer generous discounts and rebates—without restrictions. Sales aids include attractive display material and a comprehensive window-dressing service. Give YOUR lamp sales new staying power! *Write for Atlas terms today.*

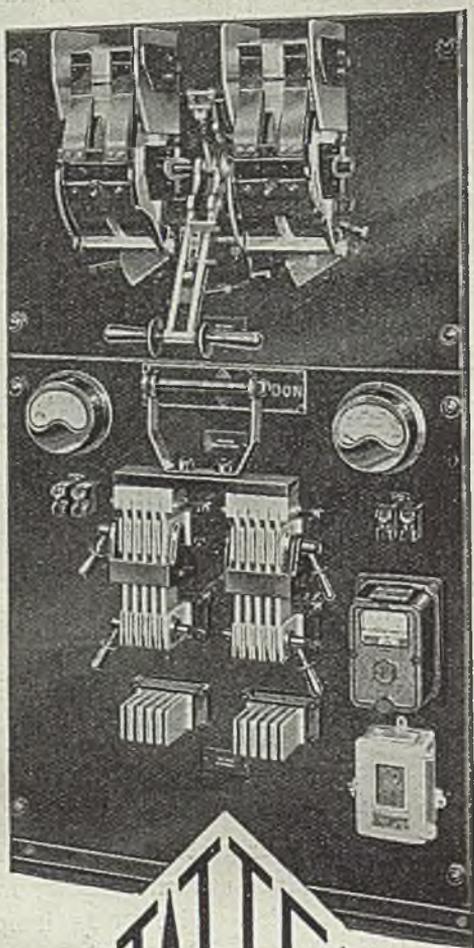
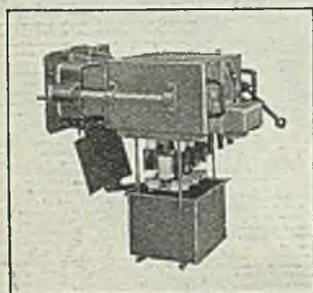
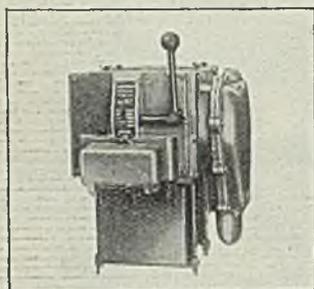
ATLAS LAMPS FOR STAYING POWER



Thorn Electrical Industries Ltd., 105-109 Judd St., London, W.C.1. Phone: EUSton 1183

Northern Branch: Stevenson Square, Manchester, 1. Phone: Central 3185
N.E. Depot: 46 Sandhill, Newcastle-on-Tyne 1. Phone: Newcastle 24068

Circuit Breakers



We manufacture an extensive range of Air-Break and Oil Immersed Circuit Breakers, a wide variety of Switchgear, and undertake the construction of all types of Switchboards.

STATTER

J. G. STATTER & CO. LTD., 82 VICTORIA STREET, LONDON, S.W.1.



SIEMENS

FOR RELIABILITY

Agent of SIEMENS ELECTRIC LAMPS AND SUPPLIES LIMITED, 38-39 Upper Thames Street London, E.C.4
 Branches at Belfast, Birmingham, Bristol, Cardiff, Dublin, Glasgow, Leeds, Liverpool, Manchester, Newcastle-on-Tyne, Nottingham, Shrewsbury



ELEPHANTIDE

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The **BRITISH MADE**
PRESSBOARD INSULATION

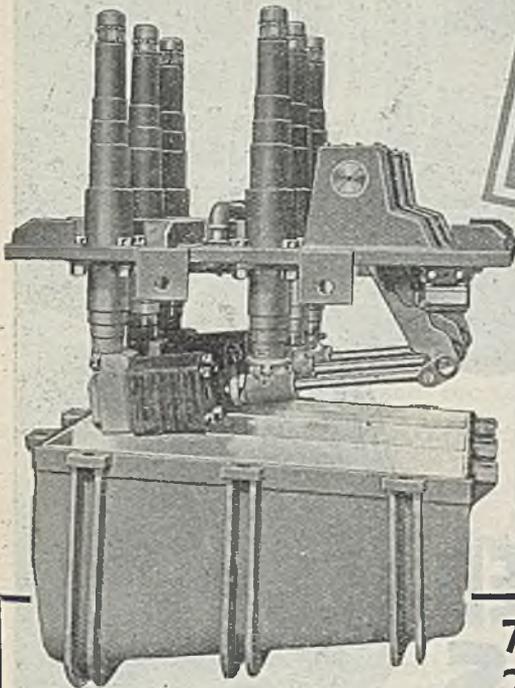
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**TRANSFORMERS
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and all other
**ELECTRICAL
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Telephone: ARTHINGTON 98 and 99

LONDON OFFICE: 104 HIGH HOLBORN, W.C.1
Telephone: CHAncery 7646

HIGH-SPEED • ARC CONTROLLED • SINGLE-BREAK DESIGN



OIL CIRCUIT BREAKER

**750 & 1000 MVA
22 & 33 kV
400 - 800 Amp.**

***Fully tested and Certificated in
accordance with BS 116/1937, Pt2***

The type E.5 low-oil-content circuit-breaker is of the completely phase segregated, arc-controlled horizontal single-break design. The breaker mechanism is simple, robust and trip-free, and has a high-speed operating characteristic.

Type F.E.5 metalclad units of the single or duplicate busbar pattern are arranged to incorporate the type E.5 circuit-breaker; each assembly comprising a completely phase segregated, fully interlocked metalclad equipment.

COOKE & FERGUSON

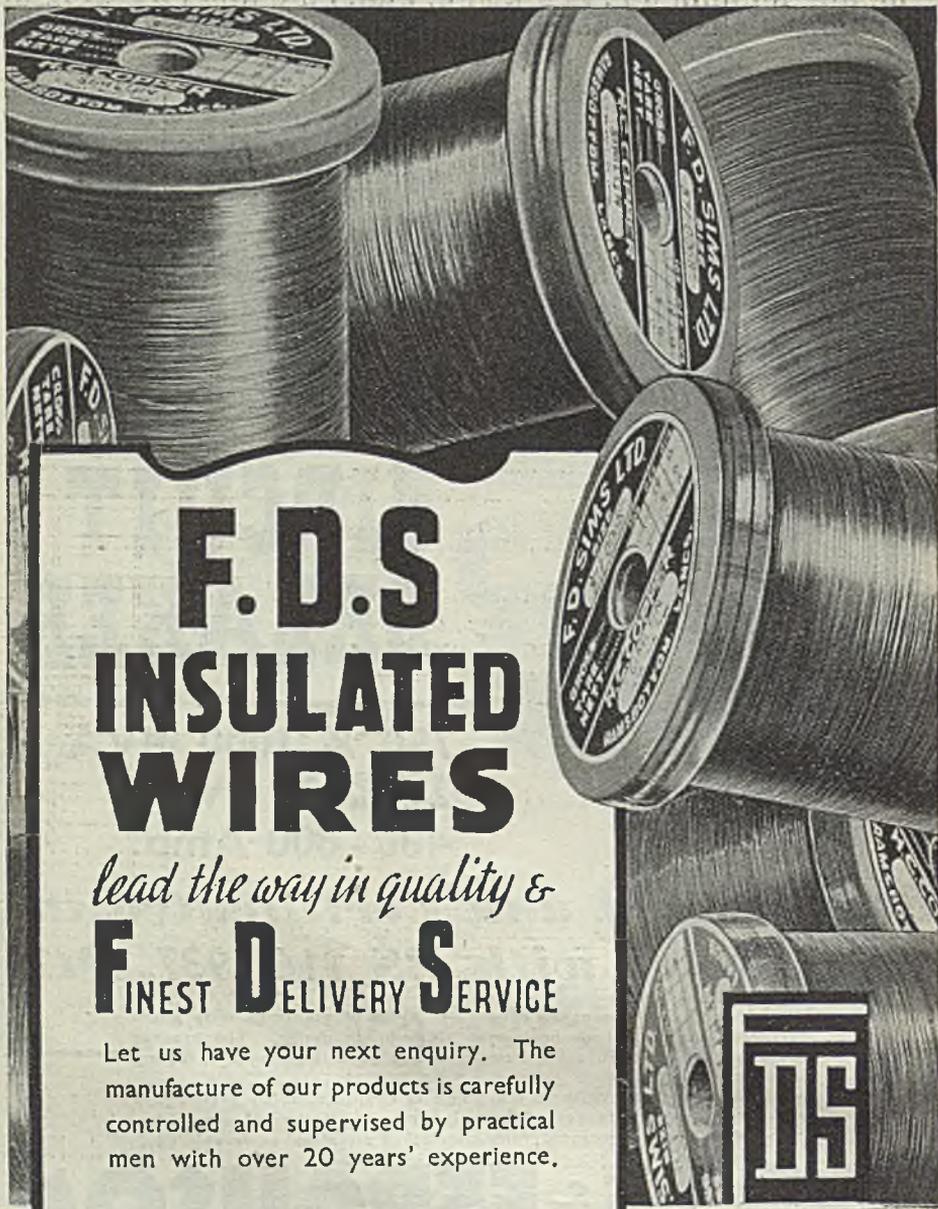
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LIMITED

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F.D.S INSULATED WIRES

lead the way in quality &

FINEST **D**ELIVERY **S**ERVICE

Let us have your next enquiry. The manufacture of our products is carefully controlled and supervised by practical men with over 20 years' experience.



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SenTerCel MINIATURE RECTIFIERS

UNIPLATE RECTIFIERS

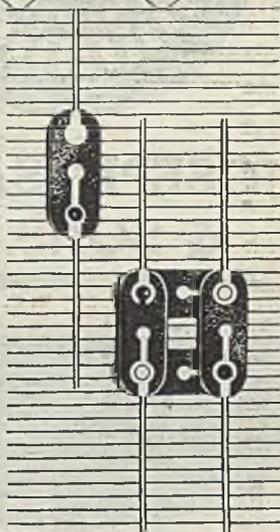
FOR HIGH FREQUENCY

FOR LOW FREQUENCY

IN signal or A.V.C. rectification, crash limiters, measuring and recording instruments, etc., there's a job for the SenTerCel miniature UNIPLATE RECTIFIER.

Assembled in light, compact units they can be supplied singly or in series, parallel, or series-parallel connection. Suitable for any voltages or currents normally met with in this class of work. They are small and light and thus can be suspended in wiring.

There are several sizes with working areas to suit the varied requirements encountered in practice.



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SELENIUM RECTIFIERS

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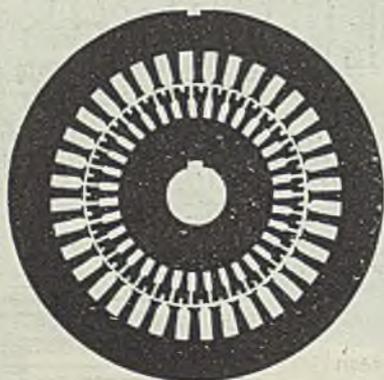
(Rectifier Division)

OAKLEIGH RD., NEW SOUTHGATE, LONDON, N.11

Telephone: ENTerprise 1234

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for
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'MINOR' TEST SET

for insulation testing

Gives direct and dead accurate readings independent of voltage variation. Case of reinforced Bakelite with clear open scale of 5,000 ohms to 20 megohms. Height allows full swing of Generator Handle.



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The Process of Wire Drawing (No 2)

Electrical ANNEALING

All wires, from 44 SWG to the thickest Copper Strip manufactured, are annealed on the latest type British made Electric Furnaces with protective atmosphere, giving the highest possible quality finish obtainable anywhere in the world.

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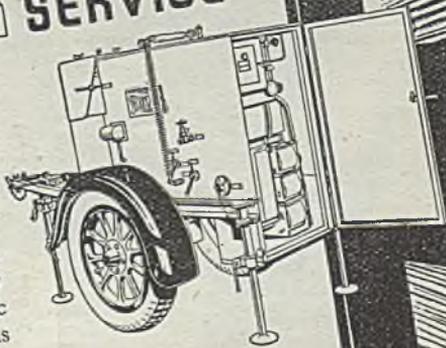


47, Victoria Street,
Westminster, London, S.W.1
Telephone: ABBey 2771 (Pte. Br. Ex.)
Works: Enfield, Middlesex

W E. 12

AN ESSENTIAL SERVICE

The largest Power Companies, the best known Electrical Manufacturers and users of electricity large and small throughout the world employ the Stream-Line Filter to raise the insulating value of the oil in transformers and switch gear to over 60 K.V. in a single passage. Fully portable, weatherproof and automatic plants from 5 gallons to 500 gallons per hour.



STREAM-LINE FILTERS LTD.
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Insulated
WIRES & CABLES



INSTRUMENT WIRES · STRANDS & BRAIDS
TELEPHONE & RADIO CORDS & CABLES
RESISTANCE WIRES · P.V.C. TUBINGS



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TELEPHONE: PERIVALE 5621-2

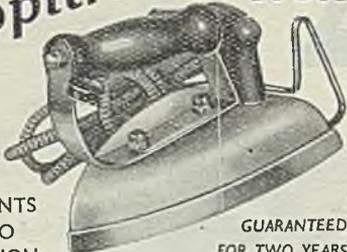
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The
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GUARANTEED
FOR TWO YEARS
AGAINST FAULTY WORKMANSHIP

1. HEAVILY NICKEL PLATED SOLE PLATE
DROP FORGED STEEL
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CHARLTON ELECTRICAL APPLIANCES LTD.
"SPITFIRE" WORKS, CLARENDON PARK, LEICESTER

A full range of
**ELECTRICAL
ACCESSORIES**
embodying many
special features.

Electro Plastics
LIMITED
MILTON STREET, WATFORD.
Telephone: Watford 3324

MISCELLANEOUS ADVERTISEMENTS

TENDERS

BOROUGH OF RADCLIFFE.
ELECTRICITY DEPARTMENT.
Cable Joints (Plumber)

APPLICATIONS are invited for the position of Cable Joints in the above Department. Wages and working conditions in accordance with the Schedule of the District Council No. 3, North Western Area, Electricity Supply Industry, Zone A. Present rate 28.45d. per hour for a 47-hour week.

Applicants must have experience in high and low tension mains jointing, feeder pillar, network boxes and sub-station H.T. and L.T. Boards.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and to a satisfactory medical examination.

Applications stating age and experience, and accompanied by copies of not more than three recent testimonials, endorsed "Joints," should reach the undersigned not later than Tuesday, 3rd December, 1946.

Town Hall,
RADCLIFFE, Manchester.
November, 1946.

H. A. FOX,
Town Clerk.

METROPOLITAN WATER BOARD.
TENDERS FOR ELECTRIC MOTOR AND
STARTER.

THE METROPOLITAN WATER BOARD require an electric motor and Starter, 25 H.P. 200/220 volts, 1450 r.p.m. vertical spindle or suitable for adaptation to vertical spindle drive. New or second-hand. Particulars of plant available should be enclosed in sealed envelopes endorsed "Tender for electric motor and starter," and addressed to the undersigned at the offices of the Board (Room No. 122).

C. W. STOKER,
Clerk of the Board.

SITUATIONS VACANT

THE Electrical Fair Trading Council invites applications for the appointment of full-time Executive Official. Applicants should be not less than 30 years of age and preferably possess a comprehensive knowledge and experience of the trading structure of the Electrical Industry. Apply in writing, giving full information as to age and experience, to the Chairman, Electrical Fair Trading Council, Kern House, Kingsway, W.C.2.

EXPERIENCED Electrical Engineer or Physicist required for large company in East London Area to develop magnetic materials for use in telecommunication equipment. Salary up to £550 per annum according to age and experience. Write stating age and qualifications to Box D. 6725, A.K. Advg., 212a, Shaftesbury Avenue, W.C.2.

A LARGE group of Electricity Supply Companies requires a Publicity Assistant to undertake production of advertising matter and preparation of articles for the press, and for public relations work generally.

Candidates should have had an engineering training and be in possession of some qualification recognised in that profession, as well as having experience of journalism. Experience of the electricity supply industry, although desirable, is not essential. Ability to talk to meetings, in addition to being able to present information in writing, would be an advantage.

Salary in accordance with qualifications. Candidates should apply, stating their age and giving particulars of their training and experience, to Box L.S.V., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

SITUATIONS VACANT

LEYTON BOROUGH COUNCIL.
ELECTRICITY DEPARTMENT.

Senior Sales Assistants.

APPLICATIONS are invited for the appointment of 2 SENIOR SALES ASSISTANTS (Male). Salary in accordance with the National Joint Board Schedule, Grade 9, Class "F" (at present £375 18s. per annum rising to £391 13s.). *Note.*—The classification is likely to rise to "G" next year.

Applicants, who must be not more than 40 years of age at the time of the appointment, must hold the Electricity Development Association Domestic Electricity Salesmanship Certificate, and should have had experience in an Electricity Supply Authority showroom, sale and hire of all types of Domestic Electrical Apparatus. Sound knowledge of the principles of electric cooking, water-heating, refrigeration, and illumination required, and experience of practical installation work an advantage.

Showroom Assistants.

Applications are invited from young persons over 18 years of age for the appointment of 4 SHOWROOM ASSISTANTS at a salary commencing at £200 per annum rising by annual increments of £15 to £250, plus bonus of £48 5s. per annum for females, or £60 per annum for males.

Applicants must have had a good general education, have a knowledge of salesmanship, and be capable of dealing promptly and efficiently with enquiries in the Showroom. Accuracy with figures, clear handwriting, tactful and courteous personality essential.

The above appointments will be subject to the Council's conditions of service applicable to such appointments, and to the provisions of the Local Government Superannuation Act, 1937, and the successful candidates will be required to satisfy the Council's Medical Officer of Health as to their medical fitness. It will be a condition of employment that the successful candidates must be members of a Trade Union.

Applications in the candidate's own handwriting, stating age, qualifications, experience, particulars as to membership of a Trade Union, and when able to take up duties, accompanied by copies of not more than three recent testimonials, to be sent to the Borough Electrical Engineer and Manager, Electricity Offices, Cathall Road, Leytonstone, E.11, not later than first post Monday, 2nd December, 1946. Canvassing in any form will be a disqualification.

Town Clerk.

D. J. OSBORNE.

LEYTON, E.10.
8th November, 1946.

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

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 required by switchgear engineers. Experienced in contract work, protective gear diagrams or design. Applications in writing, with full particulars, to—FERGUSON, PAILIN LIMITED, MANCHESTER, 11.



ESTABLISHED 1887

PLASTIC RAW MATERIALS

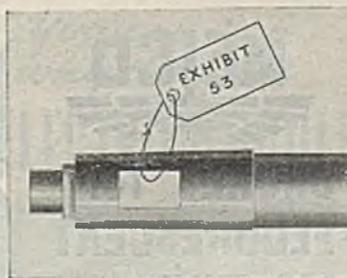
IN SHEETS, RODS & TUBES

EBONITE

LAMINATED BAKELISED SHEET

CASEIN CAST RESIN

ETC.

53b, CITY ROAD
LONDON, E.C.1

FROM THE M.R.E. CASE-BOOK

Charge. Defendants were producing this Gas Cock Body, Exhibit 53, on a centre lathe, whilst other firms were using an M.R.E. Profile Turning Roller Box on a capstan, and machining in 25 seconds.

Defence. The defendants stated that they had been using the same method for 18 years and had always shown a profit.

Verdict. The defendants must adapt themselves to modern methods—or die a natural death.

Made in three sizes: $\frac{3}{8}$ ", 1", $1\frac{1}{2}$ " Bar capacity.

We shall be pleased to quote guaranteed machining time for any components with tapers, multi-diameters, or contours.

MANCHESTER REPETITION ENGINEERS LTD

Reynold Works, Chell St., Longsight, Manchester
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Electrical Insulative Material Manufacturers



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Sheets, Rods, Tubes and Machined Shapes.

LEATHEROID Sheets, Rolls, etc.

"CLIFTEX" Insulating Tapes.

Insulating Staples, Jointing, Presspahn.

MOSSÉS & MITCHELL LTD.

60-68, Ironmonger Row, London, E.C.1.

MEICO



CHOKES for FLUORESCENT LIGHTING

MEICO'S up-to-date facilities include the most modern coil producing machinery available—vacuum impregnating equipment for wax and varnish—completely automatic production test apparatus. MEICO Chokes are precisely wound—meticulously assembled—thoroughly impregnated and carefully finished. Continuous inspection and quality control ensure maximum uniformity and silence in operation.

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MICRAMATIC ELECTRICAL INSTRUMENT CO. LTD.

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TELEPHONE : CONGLETON 607

SITUATIONS VACANT

SENIOR Draughtsmen required in the Glasgow area to specialise on the design of modern electric cookers. Applications stating qualifications, salary required, etc., to Box No. L.S.W., "The Electrician," 154, Fleet Street, London, E.C.4.

CHIEF ENGINEER. — Messrs. RICHARD HEAWORTH & CO., LTD., require a qualified electrical and maintenance engineer to supervise the power plants at their various mills, and to deal with development work. Specialised knowledge of machinery maintenance and some knowledge of steam plant would be an advantage. Applications should be made in writing in the first instance to Tatton and Ordsall Mills, Ordsall Lane, Salford, 5, and endorsed "Chief Engineer."

REQUIRED for Barbados, an engineer to supervise the installation of plant in small sugar factories. Must be able to act on his own initiative and to talk intelligently about quotations. Single man under 30 years of age.—Apply Box, No. L.S.X., "THE ELECTRICIAN," 154, Fleet Street, London, E.C.4.

ENGINEER required for Middle East experienced in laying, jointing paper insulated armoured cables up to 11 kV in power stations, sub-stations and direct. Salary £100 calendar month, free passage out and return, free quarters and messing. Period of contract approximately 2 years.—Applications, stating age, experience, copies of references to Employment Manager, Johnson and Phillips Ltd., Charlton, London, S.E.7.

TWO first class Plumber Joiners required for Middle East. Experienced in jointing paper insulated lead covered and armoured cables up to 11 kV in power stations, sub-stations and direct. Salary £60 calendar month, free passage out and return, free quarters and messing. Period of contract approximately 2 years.—Applications stating age, experience, copies of references to Employment Manager, Johnson and Phillips Ltd., Charlton, London, S.E.7.

EDUCATIONAL

THE ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.

THE SWANN DIPLOMA EXAMINATION.

NOTICE IS HEREBY GIVEN that the Swann Diploma Examination will be held at Centres on May 23th and 29th, 1947.

Subjects: Electrical Installation.

Electrical Maintenance.

Application Forms and copies of Regulations and Syllabus may be obtained from the General Secretary. The Association of Supervising Electrical Engineers, 54, Station Road, New Barnet, Herts.

The latest date for receipt of Application Forms is March 1st, 1947.

A. BRAMMER,

General Secretary.

31st October, 1946.

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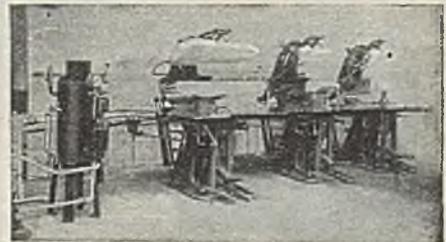
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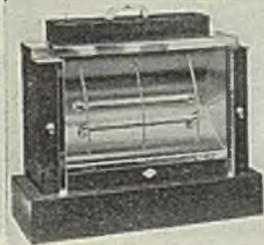
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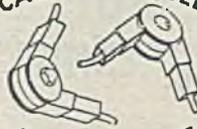
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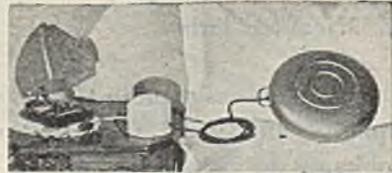
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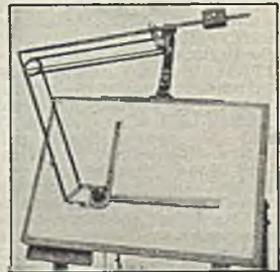


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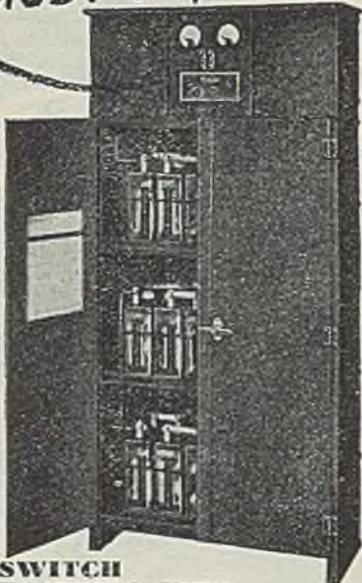
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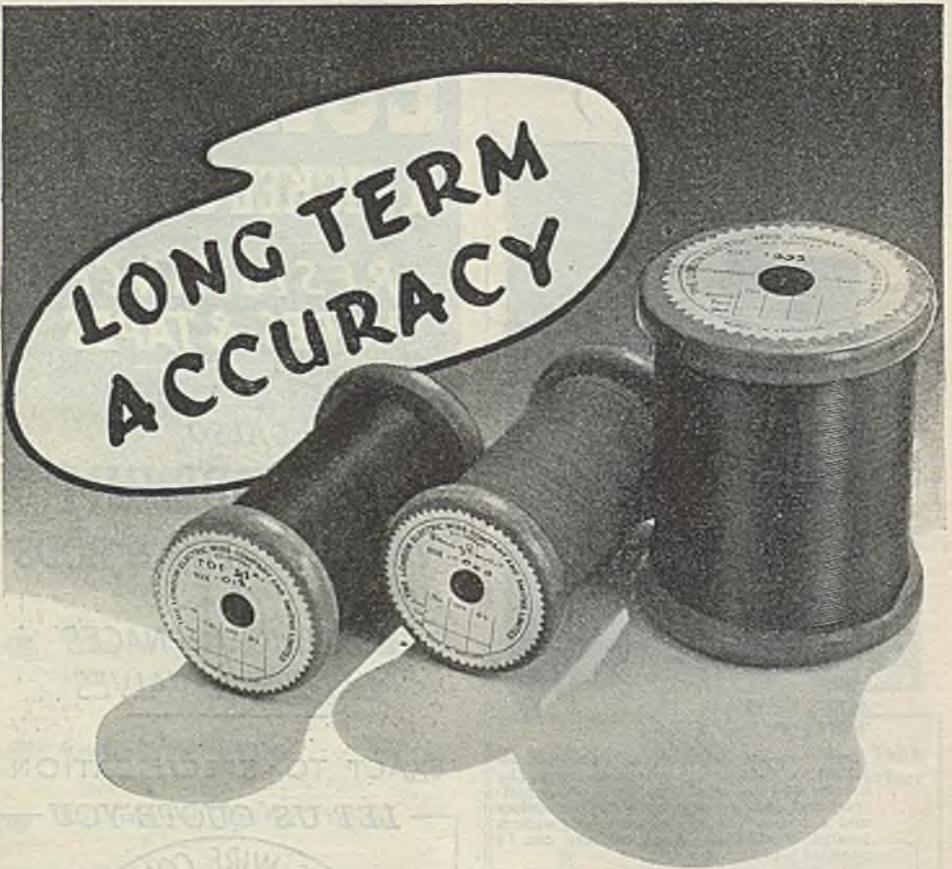
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Exports and Example

THE attention of the industry this week might be said to have been concentrated on cables, for at the I.E.E. last week was read and discussed a paper dealing with gas-cushioned cables, on Tuesday was delivered, at a meeting of the A.S.E.E., a paper describing present-day cable practice, and in this issue will be found details of an exhibition and luncheon whereat gas-compression cable of the self-contained type was subjected to display and description.

Against this background, the industry is reminded of the unique position in which this country has been able to establish itself from a technical point of view, and of the necessity for the rest of the world to be made more fully aware of the service which the British electrical industry is able to offer in the way of underground high voltage transmission.

Because the grid with its overhead line system was at the time of its construction international news, there may be some potential overseas buyers of British-made power transmission equipment who hold the view that most developments in the country will, as a natural consequence, have been born out of experience gained with overhead lines, and progress will have been confined to transmission by this means. That there have been developments in overhead line technique is not in question, for there have been most valuable contributions made to the sub-

ject, many obstinate problems have been solved, and the lead established by the British engineer in this field is still maintained. Running parallel with these developments, however, has been research in the building of underground cables, first for 33 kV transmission and thence for all pressures up to 264 kV, and it is in this connection that the electrical industry looks to the country to show further examples of faith in British achievement.

Seeing is Believing

IT is appreciated that existing installations in this country of underground high voltage cable are already important in size and number, but the view has been expressed that by an even wider adoption of underground transmission, our export trade in the manufactured goods that render such transmission possible would benefit, and our national prestige increase still further. Those concerned with power transmission in overseas countries are frequent visitors to the United Kingdom where, as is generally known, a careful examination is made of all that is new, and installations of plant, transmission systems and so on inspected. If during those visits our overseas friends are able to see increasing evidence of the fact that we practise what we preach, the reward will be even larger and sooner attained.

Still More Generation

OUTPUT figures for October reflect the determined efforts of the supply industry to meet demand, for during the month the number of units generated was 17.4 per cent. greater than in the same month last year. In the ten months, January to October, 32 930 million units were generated, an increase of 9.2 per cent., when compared with the same period of 1945. This year, not only has peace-time industry quickened its tempo, but the slight increase in availability of electrical appliances has increased the domestic load. The supply industry is, in all but exceptionally steep peak periods, meeting every demand made upon it, but the chances are that with the present growth in demand, what is now looked upon as a peak will sooner or later become average load. Apart from sporadic regional cuts the industry has succeeded in cop-

ing with the situation, but with the limited generating capacity available, it is not unreasonable to anticipate the possibility that a time may come when the basic load will be such that the approach to the load-shedding peak will be shorter, and general electricity cuts be made more frequently in consequence.

I.E.E. Section Papers

PROBLEMS in connection with the submission of an adequate number of papers to the various Sections of the I.E.E. have been a matter for discussion for some time, and at the meeting of the Installations Section last week, the chairman, Mr. J. F. SHIPLEY, asked for more help in this respect. He said that at one time it took about three months to get a paper through; more recently it had taken six to nine months, and now it took a year to 18 months. Therefore, the Committee was asking for papers two years hence. He reminded the meeting of the very wide scope of the activities of the Section and also asked members to consider the preparation of papers of short duration. Many had knowledge of special processes and machines, an account of which would be invaluable to the Section, and if these were received they would have special consideration. The Committee has in mind papers of about 2 000 to 2 500 words.

A Good Proposal

ANOTHER matter mentioned at the I.E.E. Installations Section meeting last week, was that it is proposed to hold towards the end of the present session, a discussion meeting at which three subjects will be discussed and the papers will be chosen by the members of the Section themselves. The authors of the papers will be limited to those under 30 years of age; they will have freedom of choice of subject and presentation; and they will be allowed to speak for 10 minutes only. There will, it is proposed, also be a discussion after each individual paper, wherein members of any age can take part, providing they limit their remarks to two-minute periods. Thus, there will be under such an arrangement, ten minutes allotted for the presentation of each paper and twenty minutes for each discussion. The meeting has been arranged specially to

interest the younger members and the Section is to be congratulated in giving this encouragement to many who have not yet made the plunge into public speaking.

Coal Industry Nationalisation

IN view of the importance of coal in the electricity supply industry, the announcement by Mr. E. SHINWELL in the House of Commons on Monday, that the date for the transference of the mines to national ownership will be January 1 next, will have been read with some interest. The National Coal Board, it is understood, will not by that date be fully staffed and it is anticipated that some temporary arrangements and agreements will need to be made in consequence. Whether one agrees with the nationalisation of the coal industry or not, it will become an accomplished fact at the end of the year. The electricity supply industry as such is not concerned with the politics behind the altered circumstances but the hope is expressed that settlement of the controversy, which has been current for so long, will at any rate result in more and suitable coal.

Solving a Traffic Problem

THE official opening by the Minister of Transport, on December 3, of the extension of the Central Line tube from Liverpool Street to Stratford, will mark the completion of the first step towards the solution of the traffic problem of the densely-populated East and North-East London areas, which are worse served with railway facilities than any other part of the Metropolis, there being only five miles of railway per 100 000 people as against eight to ten miles in other areas. It is hoped that within the next two years the line will be extended to Loughton and Ongar, and Newbury Park and Hainault—a total of 32 miles of electrified track—and that it will be used by 50 million passengers a year.

An Engineering Achievement

THE four-and-a-half-miles of tube from Liverpool Street to Stratford passes through the Lea Valley marshes and its construction constituted a remarkable engineering feat. The soft, water-logged ground presented unusual difficulty, and at places the tunnelling had to be done in compressed air up to

25 lbs. per sq. in. pressure. A raft was used on one of the tributaries of the Lea and a soil-solidifying liquid, pumped through pipes going down into the river bed, turned the marshy land beneath into a hard substance which would bear 400 lbs. pressure per sq. in. Simultaneously, a narrow pilot tunnel was driven under the river and the same liquid was injected into the ground from below the river bed. Thus was formed a safe stone-like canopy under which the tunnel was bored. Another interesting feature of this new section of the tube railway will be its comparative freedom from noise. At wheel level the tunnel is being lined with sound absorbing material, and the usual 60-ft. lengths of rail have been welded into continuous sections 300 ft. long to eliminate chatter caused by the wheels passing over open joints.

Electricity in the Highlands

THE North of Scotland Hydro-Electric Board announced on Tuesday that contracts valued at £3 000 000 have been placed for work on the Loch Sloy scheme, the most important and furthest advanced of the Board's projects. The scheme is expected to be completed by the end of 1948, when 130 000 kW of generating capacity will be available. It is understood that among the main contractors for the work, Balfour Beatty and Co. will build the dam, Sir William Arrol and Co. will supply the pipeline and the English Electric Co., Ltd. the power station equipment. The scheme involves the construction of a 160 ft. high dam at the loch, the driving of a tunnel one mile and three-quarters long and 15 ft. 4 ins. in diameter through a mountain, Ben Vorlich, and the erection of a power station on the shores of Loch Lomond. Work on the scheme began last June.

Nationalisation Fears

SPEAKING of the future of the scheme, Mr. T. JOHNSON, chairman of the Board, has expressed the hope that nothing will be done to prevent the profits of the plan being ploughed back into the Highlands. Mr. SHINWELL, has already promised that the Board will continue as an autonomous body, but as Mr. JOHNSON says, one never knows what might happen with centralised control of the supply industry.

NEW TUBE TO STRATFORD

EASTERN EXTENSION OF THE CENTRAL LONDON LINE

THE first section of the eastern extension of the London Central Line, 4½ miles in length and running from Liverpool Street to Stratford, is to be opened by the Minister of Transport on December 3. The ceremony will mark the completion of an important stage in a large scheme which, within the next two years, will provide electric train services to Loughton, Ongar, Newbury Park and Hainault, and was estimated before the war to cost £40 million. Actually, it will cost considerably more. The construc-

existing L.N.E.R. lines, which are being electrified, to Leytonstone, Snaresbrook, South Woodford, Woodford, Buckhurst Hill and Loughton, and ultimately to Epping and Ongar. Between Leytonstone and Woodford there is a loop line running *via* Hainault. From Leytonstone a new tunnel will carry the line round the south side of the loop to Wanstead, Redbridge, Gants Hill and Newbury Park, then over L.N.E.R. lines, which are being electrified, to Hainault. A tube train service will be run round the north side of the loop between Woodford and Hainault *via* Chigwell. It is hoped that the line will be opened to Loughton and Hainault at the end of 1947, and to Newbury Park and Ongar in 1948.

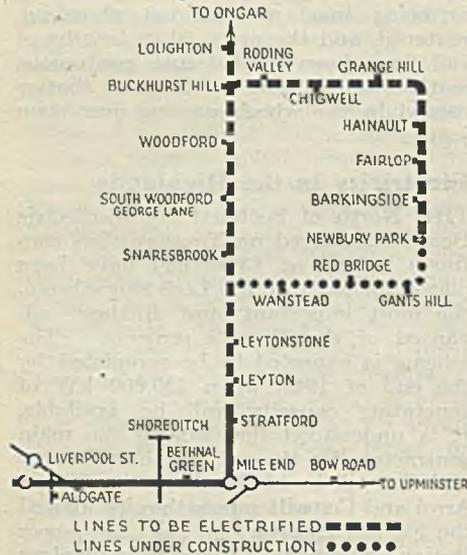
The old Great Eastern main line, which is being electrified by the L.N.E.R., from Liverpool Street to Shenfield, will connect with the London Transport extension by platform interchange at Stratford.

Bethnal Green Station is said to be regarded as the prototype underground station of the future. It has three escalators, a spacious booking hall, and two 420 ft. platforms. Flickerless fluorescent lighting has been installed. The air is changed four times an hour through bronze grills on the platform by an improved ventilation system, which provides 20 000 cu. ft. a minute.

Liverpool Street Central Line platforms have been extended, and shunting accommodation has been provided.

The new line will set a standard in silence on tube railways. The tunnel is lined on both sides at wheel level with slabs of a composition which absorbs 80 per cent. of the sound falling upon it, and the rails are welded in 300 ft. lengths, thus preventing the usual click of the wheels on the joints.

The tunnelling under the old East London marshes caused an expert to say that he doubted whether more difficult engineering had ever been done. On one of the tributaries of the Lea a raft had to be used, and a soil-solidifying liquid which was pumped into the river bed through pipes turned the marshy land into a hard substance capable of bearing 400 lb. pressure a sq. in. Simultaneously, a narrow pilot tunnel was bored under the river bed and the same liquid was pumped into the ground from beneath the river. A safe and stone-like canopy was thus formed, allowing the tunnel to be driven below. Under the Mile End Road the existing station has been enlarged without disturbing the flow of traffic above.



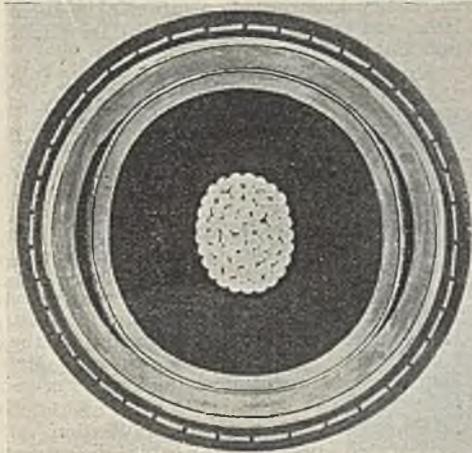
The above diagram shows the extension of the Central Line contemplated by the L.P.T.B. in the scheme which is to be completed within two years. The first section between Liverpool Street and Stratford, to be opened on December 3, is indicated by the continuous black line

tional cost of the line between Liverpool Street and Stratford has been of the order of £3½ million.

Practically the whole of the Liverpool Street to Stratford line is in tunnel. Starting from the existing Central Line station at Liverpool Street, it has stations at Bethnal Green, Mile End and Stratford. It connects with the District Line trains by means of platform interchange at Mile End. After running beneath the Lea valley the tube comes to the surface to link with the platforms of the L.N.E.R. main line at Stratford.

From Stratford the line will run in tunnel to Leyton. It will then go over

Views on Gas-Compression Cables



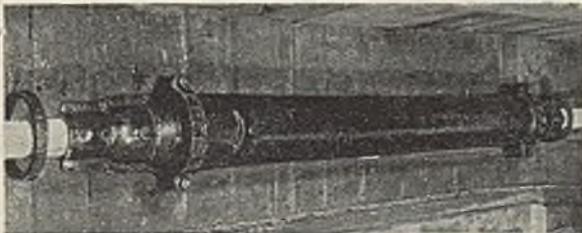
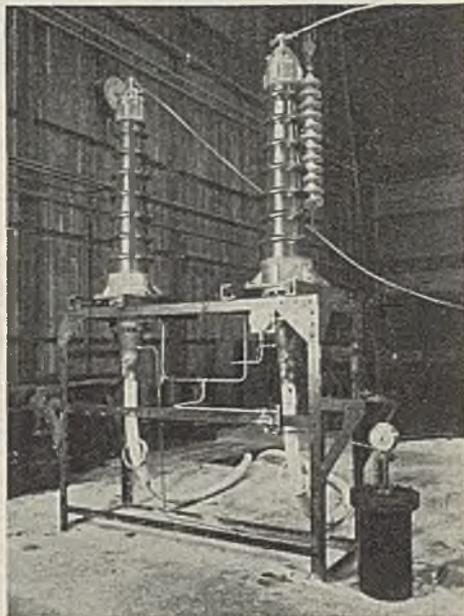
We give below a brief history of gas-compression cables as developed by Enfield Cables, Ltd. The illustrations on this page are: Left: Cross-section of Enfield 264kV single-core self-contained gas-compression cable. Below: Terminal arrangements of 264kV experimental installation at the company's Brimsdown works. The third illustration is of a single-core straight-through 264kV joint.

At a luncheon and exhibition in London last week, an opportunity of examining the cable was accepted by many well-known personalities in the industry, while during the proceedings some constructive views on export trade and prospects were expressed. The opinion was given that if the industry of this country more widely adopted new developments as they came about, the example would have a beneficial effect in influencing visiting overseas buyers.

IT will be remembered that in THE ELECTRICIAN of October 20, 1944, and May 18, 1945, reference was made to the gas-compression 132 kV cable installation of Enfield Cables Ltd., at Osbaldwick, while reference was also made to earlier installations carried out by the company. For this reason and so that we might be able to obtain further information on the subject of high voltage gas-compression cables, we welcomed an opportunity to attend a luncheon of Enfield Cables Ltd., at the Savoy Hotel, London, on November 14.

In order that their guests might be fully acquainted with the development of the gas-compression cable for all voltages up to 264 kV, the company staged a comprehensive exhibit on the lines of that seen at Blackpool during the I.M.E.A. Convention last June, including among the items shown sections of the gas-compression cables themselves and operating data, based on works tests, the Osbaldwick, Walthamstow, and other already well-known installations.

The company have on test at their Brimsdown works an experimental length



of 264 kV cable, and samples of this, together with details of the straight-through joint, were also exhibited.

The Enfield record with respect to compression cable installations dates from 1932, when a length of 66 kV cable was installed in London, and as a matter of interest, we

indicate from a general list below a number of the contracts so far carried out.

The Earl of Verulam, chairman of the company, presided at the luncheon, with Sir Johnstone Wright, general manager of the Central Board, as the chief guest. Mr. Harold Hobson, chairman of the Board, was also present.

The Chairman, in welcoming those present, said that he was a member of the Enfield organisation 32 years ago, when he joined the late Mr. Plutte, the founder of the company; the latter was then setting out to manufacture v.i.r. cable in a small bay at Brimsdown. To-day the Enfield works covered some 35 acres of ground, employed some 3 500 people, and the steady advance had not yet stopped. The Enfield group was one of the only two groups of companies in the country which refined, rolled, drew and insulated copper within one works' boundary. Enfield had also branched out into the manufacture of copper and zinc sheets, and the refining of secondary aluminium, at Bradford as well as at Brimsdown; and in a factory at Tottenham the manufacture of zinc battery cans to a number of seven million a week was carried on. The company also had a modern engineering works at Northumberland Park, Tottenham.

Recently they had begun to erect in South Wales a new factory, which was to have about 250 000 sq. ft. of floor space. It was being put up near a small factory already in production, and the new factory was designed to be one of the most modern rubber-manufacturing plants in the country; if present trends continued, the Enfield group ought by 1950 to be employing about five thousand citizens.

Against this background, and under the leadership of Mr. F. W. Main, technical director, the company had developed a

compression-cable for use at the highest voltages. Interest in such cable was today greater than it had ever been, and they were glad that in their development of it they had the co-operation of Siemens Bros. and Co. Ltd. and Standard Telephone and Cables Ltd.

Sir Johnstone Wright, in reply, said that the development of the cable industry in this country had been full of achievement, and those who had been in the industry for the past forty years admired the way in which the problems born of the ever-increasing voltages had been solved. Mr. Main, in his presidential address to the London branch of the Association of Mining Electrical Engineers in 1939, had mentioned the Ferranti cable, commonly known as the Ferranti-Deptford cable, the beginning of the development of the high-tension cable in this country. Mr. Main had also mentioned the Brooks semi-solid system of cable.

When the value of the application of mechanical pressure to cable dielectrics became apparent, cable manufacturers on the Continent, in America and in this country, turned their attention first of all to oil-filled cables, and finally to a cable in which an inert gas formed the compressing medium. The Enfield Cable Co., between 1927 and 1930, came to the conclusion that such gas should not come into contact with the dielectric, which meant the provision of a wall to contain the gas surrounding the cable and in drawing the cable through a steel pipe. The first British installation of this type was carried out for the Central Board in 1932, between Hackney and Walthamstow, over a route of about two-and-a-half miles and was designed to carry 31 500 kVA at a voltage of 66 kV. The installation comprised a 33 kV three-core solid cable pulled

No.	Year installed	kV	Cross-section in sq. in.	Length in yds.	Load kVA	Type
London* ...	1932	66	3/0.15 Cu	4 370	31 500	Pipeline
Muldenstein ...	1934	60	2/0.186 Cu	427	22 000	do.
Copenhagen ...	1934	55	3/0.147 Cu	14 400	28 000	do.
Arnheim* ...	1935	150	3/0.375	110	100 000	do.
Oslo... ..	1935	66	3/0.232 Cu	3 440	45 000	do.
Stettin ...	1935	110	3/0.186 Cu	8 270	60 000	do.
Brunswick ...	1936	50	3/0.232 Al	5 850	28 000	do.
Barmen ...	1938	50	3/0.186 Al	18 000	25 000	do.
Elberfeld ...	1938.9	50	3/0.232 Al	1 780	27 000	do.
	1939	50	3/0.232 Al	3 060	27 000	do.
	1939	50	3/0.147 Cu	4 570	27 000	do.
Munich ...	1940	100	2/0.372 Al	5 900	36 000	do.
Watenstett ...	1940	120	3/0.287 Al	3 010	60 000	do.
Magdeburg... ..	1940	60	3/0.372 Al	9 200	40 500	do.
Brunswick (2)	1940	60	3/0.202 Al	6 550	32 000	do.
London (2)* ...	1940	66	3/0.15 Cu	4 370	32 000	Self-contained
Ferrybridge*	1940	66	3/0.5 Cu (singles)	150	60 000	do.
Rotherham*	1942	66	3/0.175 Cu	900	37 000	do.
Doncaster* ...	1942	66	3/0.175 Cu	80	37 000	do.
Osbaldwick* ...	1944	132	3/0.40 Cu	500	90 000	do.
Newcastle* ...	1945	66	3/0.15 Cu	500	30 000	do.
	1945	66	3/0.15 Cu	500	30 000	do.
Sidney* ...	1945	33	3/0.15 Cu	100	16 500	do.

* Enfield compression-cable installations.

into a steel pipe, the space between the cable and the pipe being then filled with nitrogen gas at 200 lb. pressure per sq. in. The cable was then operated at 66 kV. Although electrolytic corrosion trouble developed on the steel pipe, due to the presence of a nearby tramway system, the cable itself had given no trouble whatever. The electrolytic difficulty was overcome, again by Enfield, by the application of what they called their "sandwich" system, i.e., a coating of bitumen, and on top of that, protective tapes. It was interesting to recall that the extended maintenance period of that sandwich protection system only terminated in August of this year. The pipeline was examined at several points along the route, and was found to be in excellent condition.

Ultimately there developed the self-contained double-sheath form of cable, with the inert gas contained between lead sheaths. Such a cable was first put in at short lengths on the grid, at Ferrybridge in 1940, and at Rotherham and Doncaster in 1942. In the same year a complete new cable of the same construction was laid between Hackney and Walthamstow. It consisted of a three-core cable with oval conductors, each core having its own lead sheath; these were bound together in triangular formation, and outside and overall was provided a circular lead sheath to contain the gas. When the cable was being laid between Hackney and Walthamstow, a bomb was dropped in the vicinity of the cable before the gas pressure had been applied and the explosion compressed the outer circular lead sheath against the inner cores, causing it to become triangular in shape. The portion of the cable affected was cut out and taken to the works for examination, where the full gas pressure was applied, and the outer sheath returned almost exactly to its original shape. Electrical tests were then carried out, which showed that the cable, in spite of this treatment, was thoroughly sound for service; a tribute to the mechanical strength of its construction.

The amount of punishment h.t. cables could stand, and still be fit to carry on was one of many things learnt during the war, and the experience applied, not to one cable-maker, but to cable-makers as a whole.

In 1944 the Enfield Co. developed a 132 kV single-core compression type of cable, and a length of about 500 yds. was

laid at Osbaldwick, York. The cable and the terminations had passed the test well, and no trouble had resulted.

Cable manufacturers in general in this country were progressive, and there was very healthy competition between them. Indicative of this was the fact that the Board had had in operation since 1937



Left to right, MR. H. HOBSON, SIR JOHNSTONE WRIGHT and LORD FORRESTER discussing one of the compression cable exhibits at the Savoy Hotel, London, last week

one mile of 132 kV single-core gas-filled cable, as opposed to gas-compression cable with nitrogen gas dispersed throughout the paper insulation. Five miles of such cable had been in operation in the Mersey tunnel since 1941. Again, the Board had had in operation since 1944 a mile of 132 kV three-core gas-compression-type cable, an impregnated gas-pressure cable; that was, with gas internal to the dielectric, and in contact with the dielectric. This was the first three-core gas-filled cable in existence, it was believed. In addition, the Board had in operation, about ten miles of single-core gas-pressure and gas-cushion type cable, in which the gas was in direct contact with the dielectric.

Lord Forrester, managing director, of Enfield Cables, Ltd., said that it was not, perhaps, generally realised that the first 132 kV compression cable was made in the company's works for test purposes in 1927. The first installation of compression cable, or, for that matter, gas pressure cable of any kind, was the Hackney-Walthamstow installation. Led by Mr. Main, Enfield had for many years maintained that the gas should be kept outside the dielectric, and that it should not be leaking in the allegedly non-existing interstices of the dielectric. Mr. Main's idea was that "the wolf should be kept from the door" with a lead sheath, and though that membrane

might cost a little more, it gave a factor of safety twice that which could be attained without it.

They were proud of the fact—Mr. Mam perhaps particularly so—that so far as they knew it was an Enfield three-core 66 kV compression cable that withstood the highest impulse breakdown stress that any cable had so far been able to withstand. It was at the beginning of this year at the N.P.L., and the figure of 1 270 kV per cm. was registered; if the strand factor was allowed that was, he believed, equivalent to 1 600 kV per cm.

With Mr. Booth, he had recently been to South Africa, Australia, New Zealand, Malay, Egypt, and India. They, as had many others, had been impressed by the possibilities that existed for the super-tension cable. The opportunities presented could only be made the most of, however, if the industry in this country as a whole, working with the Government, was prepared to carry out experiments that might at the moment seem somewhat revolutionary. He believed that the compression cable had a great future as an under-water cable for crossing the narrow waters of the world, and—though for all he knew, quite impossible—he would like to see the coal field of Machrihanish, in the Mull of Kintyre, linked by a super-tension cable with Fair Head on the north-east Irish coast. When he was in Wellington, the opinion had been expressed that it was ridiculous that New Zealanders, who had a power famine every day in the northern island—where the population was—should at the same time have some of the most magnificent unexploited water resources in the world, in their southern island. All that their Government could do in the matter was to propose a scheme to put 17 consecutive power stations on the Waikato river, which ran dry every summer. It was suggested in the circumstances that it might be worth while connecting the south island to the north with a power cable system. The idea was, six months later, still being discussed in the New Zealand Press.

As developments progressed further, and as they came to the field of high tension d.c. transmission, he even dared to hope that the Norwegian resources might not perhaps be altogether out of reach of this country.

Apropos of his last remark, Lord Forrester said that two single-core cables of the 132 kV compression type, as installed at Osbaldwick, could be used to transmit 550 kV d.c. with the mid-point earthed. The 264 kV cable, which was now made ready for test at Brimsdown, could, of course, be used for a very considerably higher voltage d.c.

Continuing, Lord Forrester said that

it seemed to him to be essential that we should be prepared, working co-operatively between the different authorities concerned, to initiate experiments, and very substantial and costly experiments at times, as part of our export policy, and these experiments should be done at home. He believed that we should tackle the Severn barrage for that reason. Several cable makers had already claimed to have solved the question of high tension d.c. according to their own lights, and he hoped for more boldness in the acceptance of such things.

While he was in Switzerland a few days ago, it was a little galling to see that country, with four million inhabitants, shipping 10 kW gas turbines to Bucharest and Peru, and preparing plans for a 40 000 kW gas turbine station for Baden.

Mr. V. Z. de Ferranti said that it had been the view of his father that the main reason why the English cable industry led the world was due to our climate. Cable makers took the necessary steps to see that their cables were properly dry and impregnated, and in consequence they gave a splendid and satisfactory service.

New Zealand Railways

IN his sixth annual statement, the Minister of Railways for New Zealand, the Hon. R. Semple, states that in the case of the Hutt Valley electrification scheme, the supply of materials from overseas was a matter of difficulty and uncertainty, and it was considered that the only satisfactory method of overcoming the difficulties lay in personal contact. Mr. F. W. Aickin, staff superintendent and chief legal adviser, and Mr. P. R. Argus, chief mechanical engineer, therefore proceeded to Great Britain, and had successfully completed negotiations for the manufacture and supply of the necessary electric locomotives, multiple unit stock, and so on.

The Auckland suburban electrification also raised difficult problems, particularly as the project envisaged the first underground railway in that country. The chief engineer (civil), Mr. H. C. Lusty, had, therefore, proceeded overseas to investigate the problems entailed in underground operation and to obtain first-hand information on the latest developments in underground station layout and allied problems.

The financial results for the year were better than was anticipated. The gross revenue for the year was £15 444 847, which established a new record for railway gross revenue. The increase over the previous year's figure was £985 097, or 6.81 per cent.

Mersey and North Wales I.E.E.

Annual Dinner at Liverpool—Prospects of the Industry

HOW great is the field of opportunity for electrical engineers, was the keynote of several of the speeches at the annual dinner of the Mersey and North Wales Centre of the I.E.E., at Liverpool, on Monday.

Mr. V. Z. de Ferranti, president, made an announcement which was obviously pleasing; it was to the effect that his father was born in Liverpool, at 132, Bold Street. Mr. R. Varley, who presided, voiced a popular sentiment when he suggested that the premises should be identified by a commemorative plaque.

Emeritus Professor G. E. Scholes, who proposed the toast of the I.E.E., said that the electrical engineering profession was fortunate in the sense that it did not have a long history. It developed from the discoveries of scientists, who to-day, would be classed as physicists. In order to grasp the comprehensive problems with which electrical engineers were faced, it was essential that they should have a scientific background. In that connection, he regarded the I.E.E. as in the front rank of professional societies which encouraged high scientific endeavour and attainment. Of all the thorny subjects in the world, education had some claim to be considered the thorniest and it was a subject on which the man with little experience could get quite lyrical. In assisting research, the I.E.E. had done extremely useful work and it was pleasing to note there was a closer relationship between the I.E.E. and the universities than could be claimed by many other societies.

Mr. V. Z. de Ferranti, in reply, said it was the job of the industry to electrify the whole of the country and to bring the

blessings of electricity within the reach of every citizen. "We must be sure that more power is available for use by the men and women of the country, to lighten their burdens, to produce more so that we can increase our exports—and by fullness of time to reduce the length of the working week."

Mr. Oscar C. Waygood, who proposed the guests, said that within a quarter of a mile from where he was standing there were twelve large ratepayers, each of whom in due course would want to build his own boilerhouse, each with its own chimney to contribute to the pollution of the atmosphere. Why could there not be one super boilerhouse with one chimney to supply all the steam and heat required by the particular industries?

Lord Mayor of Liverpool, Ald. W. G. Gregson, referred to the question of Government control of electricity undertakings, and said he understood that before that step was taken, those who knew something about the industry would be taken into conference. From what he had heard and seen he judged the industry could produce the right type of evidence to prove it might be possible to leave the industry to those who had had the direction of it for so many years—who had piloted it through many difficulties before it reached its present state of perfection. If the powers-that-be decided that Government control must come about, then we as citizens in a democratic country had no option but to accept the edict.

The final toast of the evening, "The Chairman," was proposed by Mr. J. Cormack, and acknowledged by Mr. R. Varley.



Group taken during the annual dinner of the Mersey and North Wales Centre of the Institution of Electrical Engineers, which was held in Liverpool on Monday

Electrical Personalities

LT.-COL. D. G. N. LLOYD-LOWLES, on the termination of his war service, is joining Electric and General Industrial Trusts.

MR. C. R. WESTLAKE, general manager and engineer of the Finchley electricity undertaking, is to be released from his duties at the request of the Secretary of State for the Colonies, for a further visit to East Africa for a period of two months. Earlier in the year, Mr. Westlake was in charge of a team of civil and electrical engineers who carried out investigations in connection with electric power developments in Kenya Colony,

the Uganda Protectorate and Tanganyika Territory, and it is understood that he has already submitted to the East African Governments a preliminary report on electricity supplies throughout the three territories. Mr. Westlake expects to leave by air early in January.

MR. NORMAN ELLIOTT, general manager and chief engineer of the London and Home Counties Joint Electricity Authority, has been appointed to represent that body on the Registration Board of the National Register of Electrical Installation Contractors in place of Mr. F. W. Purse, who has retired.

MR. A. B. STRACHAN has relinquished the position of constructional engineer of the General Electric Co., Ltd., for health reasons. His association with the company, which extends over 28 years, will be continued in a consultative capacity. Since joining the company in 1919, he has been responsible for extensive development schemes at Coventry, Witton and Wembley. Other of the firm's factories which were extended

on a large scale were the glass works at Lemington-on-Tyne, the Fraser and Chalmers engineering works at Erith, and Peel Works, Salford, now the main works

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.

of Salford Electrical Instruments, Ltd. He supervised the construction of 23 branches and six depôts throughout the country, either by building or adapting existing premises. Mr. R. Bennett has been appointed constructional engineer of the company. He has had 25 years' experience of constructional engineering. During the war he served as a captain in the Royal Engineers and was attached to the Indian Army as a garrison engineer.

AIR COMMODORE W. C. COOPER has been appointed by Ericsson Telephones, Ltd., as manager of their factories at Beeston and Sunderland. After obtaining his commission in the R.A.F., which he joined as an apprentice, he gained the degree of M.A., at Cambridge University (Engineering Department). He has been employed at the Royal Aircraft Establishment, Farnborough, as service adviser to the head of the Radio Department, and then as head of the application

section in the Radio Department, and has been in charge of the special unit responsible for the assembly installation of "Queen Bee" and other pilotless aircraft. In October, 1942, he was awarded the rank of Group Captain and was posted to the Ministry of Aircraft Production as Deputy Director of Communications Research and Development, and in July, 1945, he was promoted to Air Commodore and appointed Director of Communication Development. Air Commodore Cooper is a member of the I.E.E. In the Honours List of June, 1946, he was made a C.B.E. and in September, 1946, was elected to the Council of the British Institute of Radio Engineers. On September 30, he retired from the R.A.F. with the rank of Air Commodore.

MRS. K. M. GARRARD, wife of Dr. C. C. Garrard, a director of the General Electric Co., Ltd., has been chosen as Sutton Coldfield's first woman Mayor. She was elected to the Council in 1935 and is chairman of the Maternity and Child Welfare Committee, a member of the



MR. C. R. WESTLAKE



AIR-COMMODORE
W. C. COOPER



MR. A. B. STRACHAN

Divisional Education Committee, and of the Board of Guardians. Mrs. Garrard is also a member of the Electrical Association for Women, of whose Birmingham branch she was formerly chairman. Miss Garrard will be Mayoress during her mother's year of office.

MR. E. A. BRION, of High Wycombe, has been appointed by the Southwark Electricity Committee as shift charge engineer.

MR. S. M. HARRIS, sales manager of T. M. C. Harwell (Sales), Ltd., distributors of Temco electric clocks and wiring accessories, has been appointed to the board in the capacity of sales director.

MR. W. A. MILLARD has been appointed an additional director of Walsall Conduits, Ltd. He has been in the service of the company for the last 14 years.

MR. H. COBDEN TURNER, the managing director of Salford Electrical Instruments, Ltd., at the recent municipal election, retained his seat on the Salford City Council.

MR. ROBERT DUNNETT, of the B.B.C., addressed the members of the Radio Industries' Club of Scotland and guests from the Scottish Radio Retailers' Association at the monthly meeting of the club at the Scotia Hotel, Edinburgh, recently.

MR. FRANK FOWWEATHER, who has been appointed assistant lecturer in physics at Manchester College of Technology and Manchester University (Faculty of Technology), was a research engineer physicist with Ferranti, Ltd., concerned with the design and development of radar equipment during the war.

MR. ROBERT WRATHALL, radio sales manager of Philips Lamps, Ltd., proposed the toast of the R.T.R.A., at the annual dinner of the Radio and Television Retailers' Association at Norwich last week.

MR. L. WOOLF has, as a result of a reshuffle amongst executives of A.B. Metal Products, Ltd., recently, been appointed sales manager of the company with effect from November 1. Mr. F. Willmott is now purchasing manager and will be responsible for outside purchases with effect from the same date.

MAJOR-GENERAL A. W. SPROULL has accepted the invitation of the Council to become president of the Junior Institution of Engineers for the 1946-47 session. Mr. Rex Wailes has been elected chairman of the Council, and Messrs. P. W. Dunn and H. M. Lees have been chosen as vice-chairmen.

MR. G. L. FORD has joined Frank Westerman (Wholesale) Ltd., as sales manager. He received his early training at the works of the General Electric Co., Ltd., at Witton, Birmingham, and later

spent a number of years on the sales side of that company's Moor Street branch. Since just before the war, Mr. Ford has been on the technical sales staff of Crompton Parkinson, Ltd., at Birmingham.

DR. P. DUNSHEATH, who has recently been appointed consulting engineer to



Presentation to DR. P. DUNSHEATH at the Henley Research Laboratories. In the picture (left to right) are DR. DUNSHEATH, MR. W. C. BARRY (research manager), MR. S. E. GOODALL (chief engineer) and DR. H. A. TUNSTALL (assistant research manager)

W. T. Henley's Telegraph Works Co., Ltd., received a unique gift from the staff of the Henley Research Laboratories at a ceremony held in the laboratories on November 13. Mr. W. C. Barry, research manager, in making the presentation, reviewed Dr. Dunsheath's career from 1919, when he was appointed the first head of the department, until 1929, when he became research and technical manager, to be followed by rapid promotion to chief engineer in 1934 and director in 1937, and said it was a source of pride to the staff that the laboratories had supplied a president to the I.E.E. The presentation marked the esteem in which Dr. Dunsheath was held and was in the form of a cigarette lighter, constructed as a miniature-scale model of the super-tension impulse generator and cathode-ray oscillograph in use in the laboratories. Dr. Dunsheath recalled the early days of the Henley research laboratories, reminding his audience that they had grown from small beginnings to occupy a position of responsibility at a time when scientific and technical developments in cable design were passing through a very important phase. His new duties would prevent his maintaining personal contact and he would like, therefore, as a reminder of the many strenuous years he had spent in happy collaboration with a loyal band of enthusiasts, to present to the laboratories an enlarged portrait of himself. This memento was accepted by Mr. Barry on behalf of the staff.

MR. H. C. YOUNG is retiring from the

full-time position of chief sales engineer to Rubber Bonders, Ltd., this month. He has held this appointment, and for a portion of the time, the position of chief factory executive since 1941. His services will be available as consultant. Mr. W. Boyle, late of the Harland Engineering Co. and Lee, Howl and Co., Ltd., is succeeding Mr. Young as chief sales engineer.

MR. I. A. MARRIOTT has joined the boards of Associated British Oil Engines, Ltd., and British Oil Engines (Export), Ltd. Mr. A. P. Quarrell has been appointed managing director of British Oil Engines (Export), Ltd., and sales manager of Associated British Oil Engines, Ltd. These companies are now responsible for the sale in the export and home markets respectively of Mirrlees, Petter, McLaren, Petter-Fielding and "Cub" engines.

MR. G. A. BENNETT, who recently retired after working for 45 years as a tech-

nical assistant in the electrical laboratory of Oxford University, has been presented with a cheque subscribed by members of the teaching staffs, research workers and assistants. The presentation was made by Ald. E. W. S. Gill, one of the senior university demonstrators in electricity. Mr. Bennett started work in an Oxford laboratory in 1901, going there from Cambridge. For many years he had been chief laboratory assistant.

MISS JOAN WHITGIFT, the first holder of the Caroline Haslett Trust Travelling Exhibition, was given a send-off on Monday, when the Trust Committee assembled at the E.A.W. headquarters at 35, Grosvenor Place, S.W.1. She left for the United States on Wednesday. Miss Whitgift is the daughter of Mr. M. Whitgift, secretary of the Batti-Wallahs' Society.

N.E. Supply Company Appointments

THE following appointments have been made by the North Eastern Electric Supply Co., Ltd., with effect from January 1. Mr. J. C. Mitchell, to be chief mechanical engineer, received his early training with Corsar Brothers, Arbroath, and the British Electrical Plant Co., Alloa. He then joined the Dundee electricity department and became senior charge engineer at Carolina Port generating station. In 1920, he was appointed assistant charge engineer at the Carville power station of the Newcastle-upon-Tyne Electric Supply Co., Ltd. (now the North-Eastern Co.), and then made charge engineer at their new station at North Tees, where a year later, he became superintendent. In 1935, Mr. Mitchell was appointed deputy superintendent of the company's power stations and in 1936 chief superintendent. Since 1938, he has been head of the operation department (generation). Mr. T. M. Ayres is to be chief electrical engineer. After serving as a pupil with the Urban Electric Supply Co., Ltd., he was appointed a junior engineer in the Loughborough electricity department. In 1914, he joined the Cleveland and Durham County Electric Power Co. as an assistant engineer. He served with the R.A.F. in the 1914-18 war and was then sent to the Newcastle-upon-Tyne E.S. Co., Ltd. In 1935, he was transferred to Newcastle as chief assistant in the electrical construction department and, in 1937, was appointed deputy engineer, operation department (transmission and distribution), of which he became head in 1943. Mr. Ayres is chairman of the North-Eastern Centre of the I.E.E. During the late war, he was a member of the Northern Regional Commissioner's Special Committee, being

mainly concerned with the electrical aspect of emergency defence plans. Mr. J. B. Jackson, who becomes head of the operation department (generation), joined the Newcastle-upon-Tyne E.S. Co., Ltd., in 1929 under the company's three-year student engineers' scheme. In 1932, he became an assistant engineer in the construction department (mechanical and civil) and, in 1934, was transferred to the operation department (generation) subsequently becoming personal assistant to the head of that department. Mr. H. Esther, who is to be head of the operation department (transmission and distribution), graduated at Liverpool University, and, in 1923, became a student engineer with the company. In 1925 he was appointed an assistant engineer in the electrical construction department. He was then posted to the Cleveland and South Durham area. In 1940 he was transferred to the operation department (transmission and distribution), at Newcastle, where he became personal assistant to the head of his department. Mr. W. S. Ramsdale is to be head of the construction department (electrical and wayleaves). Mr. Ramsdale received his technical training in the Whithy electricity department and, in 1919, joined the company as a junior engineer in the operation department where he became an assistant district engineer. In 1930, he was appointed assistant to the superintendent of the company's southern area and in 1937 was transferred to Newcastle as deputy head of the electrical construction department. During the 1914-18 war Mr. Ramsdale served with the Royal Engineers. He is a past-chairman of the Tees-side Sub-Centre of the I.E.E.

Gas-Cushion Cables

Discussion on the Importance of Impulse Voltage Tests

THE I.E.E. Transmission Section on November 13 discussed a paper by Mr. T. M. P. Harrison on "The Development of the Gas-Cushion Cable System for the Highest Voltages." Abstracts and diagrammatical illustrations from the paper were given in our last issue.

The author gave a review of high-tension underground cable developments in this country, described the manufacture of gas-cushion cables, and then went on to deal with testing procedure and cable performance.

MR. D. T. HOLLINGSWORTH (British Insulated Callender's Cables, Ltd.) said this was the first time the institution had had a paper which included all the type tests which had been carried out to prove the electrical performance of a new type of cable. It had been his experience, however, that in the development of a pressure cable an equal amount of work had to be carried out in connection with the development of accessories in order to make the cable gas tight, and he would have liked to hear more about that. From the title of the paper he presumed the author was referring to 66 kV, 132 kV, and possible 264 kV, but with the present lead shortage in the cable industry there were special reasons why the pressure cable should be considered for 33 kV. For the transmission of a given amount of power, the diameter of the pressure cable was considerably less than the diameter of the solid cable, so that a considerably longer length of pressure cable could be manufactured for a given amount of lead. For this reason, also, he was a little disappointed by the author's statement that it was usual to apply a second lead sheath around the reinforcement of the cable for corrosion protection. In the cable with which he was associated, this corrosion protection was provided for by a special serving of alternate layers of rubber and bitumen tape. This had been subjected to extensive tests under corrosive conditions, and its performance in regard to corrosion prevention had been well proved. Using only one lead sheath, nearly twice the length of 33 kV pressure cable could be manufactured for 100 tons of lead than in the case of the solid cable. For 66 kV, with one lead sheath and the sandwich protection against corrosion he had mentioned, nearly three times the length of cable could be manufactured for the same amount of lead. It was not clear from the paper whether the pneumatic pressure tests of the lead

sheath at the factory were applied prior to, or after, the application of the reinforcing tape. In either case, only a relatively low pressure should be applied, because it was undesirable to expand the lead sheath on to the reinforcement prior to the flexing the cable would receive during installation on site. At the same time, he questioned whether a low pressure would show up anything but the most obvious flaws in the lead sheath, and if it were considered necessary to carry out those tests it should be done with the cable on site before jointing.

MR. R. DAVIS (National Physical Laboratory) said he thought the time had come for systematic tests on cables. In the case of surge tests, for example, it had to be decided what the duty of the cable should be and in what respect the cable was capable of carrying out that duty. He submitted that at the moment the first question was far from being solved. As to the surge strength of the cable, if one took the cable by itself it seemed to be generally accepted that for the mass impregnated cable without pressure, the breakdown strength in the radial field was of the order of 1 000 kV per cm., and the paper quoted figures which suggested that with a gas pressure of 200 lb. per sq. in. that strength was of the same order. It was an interesting fact that the surge strength was not affected by the 200 lb. gas pressure. He discussed various points of detail, and said there had been enormous progress on the part of cable makers, and with the increased facilities at their disposal he hoped they would, in a very short time, provide answers to various questions relating to cable tests.

MR. W. C. BARRY (W. T. Henley's Telegraph Works Co., Ltd.), as a colleague of the author, said he would like to give credit for the manner in which that work had been carried out. The laboratory was in "bomb alley" and the work was carried out during the war under conditions which made it extremely difficult to concentrate. The paper described the tests which the cable maker had used, on which to base decisions and there might be a danger that the customer would be tempted to put those details into his specification. It was much too early, however, for those type tests to be included as acceptance tests. Long-time tests took over a year and they tied up plant and space. Those cables for high voltages could only be put forward after long tests,

and it was necessary to accumulate experience under service conditions. Therefore, the paper was really leading up to a request that they might, in due course, have another paper in which the C.E.B. engineers would give the results of experience with gas cables of various types. This would enable the designer to criticise his own tests and make suggested modifications. The impulse test was in its infancy, but it was very gratifying that a number of investigators—Irving, Dunsheath, Brazier and now Harrison—had obtained results that so closely coincided with one another.

MR. D. P. SAYERS (Birmingham electricity department) said his first impression of the paper was that the author had set out to debunk some of the aura of mystery with which pressure cables had been invested since the use of nitrogen gas had been adopted. He had listened to lengthy debates on the subject and it was refreshing to find that the author did not seem to worry where his gas went so long as it stayed inside the cable. The paper therefore served a useful purpose in presenting a simple rather than a complicated picture of the present fashions in high voltage cable technique. However, the paper was very sketchy in places and users would want to be satisfied on numerous points which were very inadequately dealt with. If cable makers expected the operating engineer to instal gas cables with confidence, they must satisfy him on two practical points. First, they must produce a cable which would remain gas-tight and would not leak; and secondly, they must provide some arrangement for locating leaks which was not more cumbersome or difficult than the methods at present available for locating electrical faults in ordinary type cables. No amount of theoretical perfection would make up for the absence of those attributes. He failed to see how a second lead sheath permitted of accurate gas leak location, as stated in the paper, except by frequent cutting and puncturing of the outer lead sheath. The author admitted the migration of compound in the test cable during the long-time stability test. His experience was that compound-filled joints in which pipes were provided for gas communication across the joint had serious objections. Emphasis had rightly been placed upon the importance of impulse voltage tests, but in discussing that matter the conditions should be clearly defined. The number of impulses had a very definite bearing on the result and type tests for the 132 kV cable at present being installed in Birmingham called for ten positive and ten negative impulses, each of 640 kV peak value.

MR. W. H. LYTHGOE (Henley's) thought that paper and others of a similar

character were comforting to the user engineer in that they demonstrated the large amount of testing which cable makers applied to their cables. A notable omission from the paper was the provision of any details as to cost. It could be taken that there were eight different types, and it was clear that the author and others were wise in avoiding the question of cost at the present moment, for the time was not yet ripe readily to assess the relative costs of the different types of installation. Personally he thought it would be some years before an answer would be possible. Only time would show which of the various types would persist into the future and which would fall by the wayside. The paper suggested there were two types of cable being developed by the author's firm, namely: one with a double lead sheath and one with a single lead sheath. That was important because the cable industry was very much concerned with the minimisation of demands on lead. Reference was also made to synthetic insulating materials, and in the view of many, something in the nature of a revolution in ideas in cables and cable standardisation might result during the next few years as the result of the remarkable developments now taking place in synthetic materials.

MR. J. E. BRIGG (B.I. Callender's Cables, Ltd.), speaking from the point of view of installation and maintenance of those higher voltage cables, said there seemed to be considerable misunderstanding as to what were the differences, if any, between the different types of pressure cables available, and that had been confirmed to some extent by what previous speakers had said that evening. Dr. Dunsheath, in a paper which he read in Paris a few years ago, described a gas-cushion cable as one in which a spiral barrier was formed over an insulated core, on top of which was a narrow metal strip which became welded with the lead sheath during the extrusion process. He understood that this was with the object of forming a series of gas cushions along the cable each of which contained gas at a pressure of 200 lb. per sq. in., all of which were isolated from one another by slabs of compound which were allowed to form in the lower part of the helix. That rather appealed to him at the time, and it would be interesting to know why that system had been abandoned, and also why the name "gas cushion" which was given to that type had now been applied to the new design described by the author.

MR. J. CONNING (B.I. Callender's Cables, Ltd.), referring to the use of oil polymer compounds, said they had excellent electrical characteristics when

properly treated, and suggested that the extra care necessary when using those compounds in the manufacture of the gas-cushion cable might be justified.

MR. P. M. HOLLINGSWORTH said the effect of drainage on the characteristics of the cable was mentioned in the paper, but the author seemed to be rather more concerned with where the free compound was going than where it came from. It was a matter which should be more thoroughly investigated. It seemed to him that the effect of drainage on a section of the cable, which might easily be liable to occur, particularly after long periods of time, would be to reduce the breakdown strength by 10 or 15 per cent., and that was a subject which merited further investigation.

MR. T. R. SCOTT (Standard Telephones and Cables, Ltd.) said it was unfortunate that papers on cables were always in the form of expositions of one type, and it was difficult to gather together in one document all the facts about all such cables. Mention had been made of eight different types, and it would be valuable to be able to compare the merits and demerits of them. The author was not very clear in his introduction to the paper as to the various types. For instance, he did not mention that there was in existence an oil-filled cable which was worked at a pressure comparable with that of gas cables, nor that in the types using gas there were differences between those which had gas in contact with the dielectric and those which had the gas carefully kept from the dielectric. He mentioned that because he thought it was becoming a recognised fact that the answer to those cable problems would be given by impulse tests. In America they were very keen on the high pressure oil-filled cable, and it was found that the limitation was the impulse test. There was no great likelihood of there being any higher pressure than 200 lb.; therefore, in the case of the gas type of cable the question of the impulse strength was of the greatest importance. Indeed, it was an urgent requirement from the fundamental point of view. In the types of cable where the gas was in intimate contact with the dielectric, it was necessary to consider the phenomenon that occurred during the heating and cooling cycle. That had been carefully worked out from the point of view of 50 cycles, but he was not quite so sure about it from the point of view of impulse tests. He did not think they should be satisfied entirely with purely static conditions, from the point of view of impulse tests, on a well-manufactured cable fresh from the makers' works. This led to a question mentioned by a previous speaker, viz., cost. Comparison between one cable and another would not

be possible on a correct basis until cables could be compared not only on 50 cycles, but also on an impulse test basis.

MR. HARRISON, replying to some points raised in the discussion, said he had not said that a second lead sheath was vital, but he had stated that the protection of the reinforcement was vital. A second lead sheath was a handy way of doing this and it was more useful for gas leak location, but he agreed that everything should be done to economise in lead. The gas pressure test was applied to the cable before the reinforcement was applied and the pressure was low. As to the criticism that the paper dealt more with the cable than joints and sealing ends, the reason was not that work had not been done in that connection, but to bring out what had been done on the cable. Nevertheless, there was a section of the paper devoted to cable accessories. Some joints that had been tested had properties comparable with those of the cable itself. As to the gas-cushion cable described by Dr. Dunsheath in Paris, that design had for its object making the cable self-sealing. Dr. Dunsheath, in this as in all things, aimed at perfection and very nearly obtained it in that respect, but other difficulties came in relative to the joint, and as the cable could not be made absolutely self-sealing, it was extremely difficult to ensure that a pressure of 200 lb. per sq. in. was maintained after jointing. A number of difficulties arose, which, at that time, they were, perhaps, not clever enough to solve. Those things were expensive and it was not always easy to get evidence to induce purchasers to pay the price for ultimate perfection. As to the request for more data under impulse conditions, some work had been done in recent years, but it was under war conditions and was therefore somewhat spasmodic, but there would probably now be opportunities for getting down to that work in a really thorough manner.

Already recognised as a centre for international trade exchange, the Foire de Paris will offer additional facilities when it opens on May 10, 1947. To the existing 131 000 sq. yd. of hall space, which proved inadequate for all those wishing to participate in the 1946 fair, a further 36 000 sq. yds. are being made available. The Parc des Expositions (Porte de Versailles), specially constructed for the purpose in 1925, covers an area of 100 acres. It is claimed that the technical section will constitute the most important industrial exhibition throughout the world. Application forms, and further particulars, may be obtained from the London representative of the Foire de Paris, Miss E. Lambert, 11/13, Rugby Chambers, 2, Rugby Street, W.C.1. (Phone: Chancery 6794).

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

Protective Multiple-Earthing System

Sir.—Our attention is directed to an article in *THE ELECTRICIAN* of September 6 last, under the pen name of "Supervisor" on the above subject. I feel somewhat reluctant to cross-swords with your contributor in view of his confirmed opinion against this form of protection as evidenced by the innuendos persisting throughout the article and culminating in the last paragraph when he refers to, "the protective multiple earthing system, as we euphoniously and quite mistakenly call it"—"certainly it calls for very serious consideration before any thought of adoption should exist."

By all means let us give this important matter very serious consideration. I will try to forget the sarcasm that has been thrown at this system by all and sundry mostly—dare I say without exception—by those who have no practical experience of the system.

To me the question is so very simple. Why bother with all these articles from the Dominions? Why not take a practical example at home?

It is many years since the protective multiple earth system was installed in our rural area. This was done after due consideration and in view of the uncertainty of the operation of the type of earth leakage trip switch at that time. The scheme has been carefully watched by the E.R.A. and other official bodies, and we have yet to have our first trouble with it. By this I mean it is a protective system. Main fuses have been properly blown at the pole transformers when a linesman has crossed the leading in wires of a service. On one occasion when a tree was felled, it dropped clean through the middle of a span; the main fuse blew clearing the whole line. But it is on small section fuses on installations in rural districts that most attention should be concentrated, as these will invariably not clear a fault under the single earthed neutral system as applied to towns.

The trouble with earth leakage trip switches is that after months of inactivity they have been known to "stick" and not operate just when they are required.

I am at a loss to understand why it should be a comfort to "Supervisor" that supply authorities in the country would seem unlikely to be keen on introducing the system.

If it is good and efficiently protects the consumer and also enables our maintenance men to sleep in bed at night, why should not everyone know about it?

I personally should worry considerably if I had the responsibility of some of the rural distribution schemes in this country.

Yours faithfully,

T. D. MARTIN.

Engineer and Manager.

Nelson.

The Social Side

THE J. and P. Staff Association's annual dinner and dance, at Pyne's Restaurant, Lewisham, on November 15, was attended by approximately 260 members and guests. Mr. W. Glass, general manager of Johnson and Phillips, Ltd., was in the chair, supported by Mr. G. Leslie Wates, managing director of the company. Proposing the toast of "The Chairman," Mr. P. M. Hollingsworth said nobody had done more than had Mr. Glass to foster the association and to look after the interests of its members. Examples of this were in the provision, through the welfare organisation, of improved medical services and the convalescent home, the Benevolent Fund, increased holidays, and the formation of the staff association. While Mr. Glass was not solely responsible for such benefits, he had played a very leading part in their introduction. Replying, Mr. Glass welcomed back those members of the association who had been serving with the Forces, and said he would like them to know that those left behind had performed a great task during the war years. J. and P.'s war record was second to none. Mr. Glass expressed his pleasure at seeing Mr. Boorn and Mr. Clark present, after completing 59 and 50 years' service, respectively, with the company, and regretted that Mr. Easton (51 years) had been prevented from attending. With his toast to the association, Mr. R. T. Lythall, coupled the names of Miss Burnett and Mr. Olley, to whom so much of the success of the association was due. Replying, Mr. Olley, chairman of the association, spoke of the purpose of the association and mentioned that after ten years' operation the Staff Provident Fund would have invested £50 000, of which half would be a gift from the company. Entertainment was provided by West End artistes, followed by dancing to Leslie Bennett's orchestra.

Electrical Control of Machinery

I.E.E. Discussion on the Prevention of Accidents

CONSIDERABLE interest was evinced at the meeting of the I.E.E. Installations Section on November 14 in the paper on "Electrical Control of Dangerous Machinery and Processes," by Mr. W. Fordham Cooper, a member of the Factory Department of the Ministry of Labour. An abstract from the paper was given in our last issue.

MR. R. H. RAWLL (Shoreditch electricity department) said he approached the subject from the point of view of a supply engineer, and the experience gained in having to deal with consumers' installations. He considered the main objective should be safety to life and limb, and the position was more clearly seen if this was divorced entirely from protection of the plant against damage. Therefore, safety devices should not merely be added to existing plant protective apparatus, which, in too many cases, had been done. Safety devices should be of good design, and the maintenance must be of a high order. Indeed, the safety device should be of a higher order of excellence than the plant itself, because more depended on it, if it were to be of any value. Permits to work should be simple and flexible so that they could also apply to a major breakdown, which was liable to happen on the best systems. The men, too, must have confidence in the system adopted. For example, certain jobs took longer than the normal shift to complete, and there must be satisfactory arrangements for handing over to the next shift. One man only should be responsible for safety in such cases. The maxim should be to assume everything was alive until it was proved to be dead.

MR. L. N. DUGUID (representing the I.Mech.E.) first referred to cranes, and spoke of accidents that had occurred through lack of standardisation of controls. The emergency stop button, he said, could also have its value exaggerated; and, in fact, it was not, in itself, a very good device, because it was only operated after an accident had happened. What was wanted was a device which would bring machinery to rest in order to prevent an accident. Electrical engineers, too, loved to group control, but this was a dangerous practice when machinery was run intermittently, because the start and stop controls were not always easy to hand unless they were made distinctive. In regard to conveyors, it was essential to arrange a proper sequence of starting and stopping, and

that was a safety precaution which could be performed electrically. He did not think sufficient credit had been given to electrical engineers for the good work they had done in preventing accidents. Certainly accidents on lifts had been enormously reduced by electrical safety devices, for the total was now only about one-third of what it was in 1937. Actually, fatal accidents on lifts had dropped from a regular 25 per annum until in 1944 there were only two.

MR. J. J. CHASE (Harris Lebus, furniture makers) referred particularly to the control of woodworking machinery, and said that whilst a great deal had been said against group control, it had proved satisfactory in regard to that class of machinery. It was possible to have a central control with means for subsidiary operators to stop any particular portion of the machinery in case of need. Another problem in the woodworking industry was the control of saws. Even when they were switched off they took some time to stop and something better than the ordinary interlock switch was required to ensure that the saw had really stopped before access could be obtained to it.

MR. H. BRIGHT (Richards and Bright) urged that permits to work should not be made out by the man who was to do the job, unless it was absolutely inevitable, because accidents had happened in such cases. Lack of maintenance of control gear often led to accidents. In the case of a double-pole contactor being used for three-phase motors, as was often done, the motor was left alive at full line voltage to earth, even though it was not running, and that had led to accidents. Again, it was often not appreciated that a machine running light took longer to come to rest than one running on load, and then the emergency safeguard was of no value. Another desirable feature was that means should be provided for turning machines backward in case of accident so that an operator who might unfortunately be caught in it could be released as quickly as possible.

MR. G. T. SHEARS said that for the purpose of carrying out maintenance work on a switchboard, interlocks should be as few as possible, especially from the point of view of carrying out emergency operations. Otherwise the key exchange system became cumbersome. Permits to work should be given out by the engineer in

charge of the work and who had personally seen that the section was dead. He also urged that greater care should be exercised with 2 000 or 3 000 V gear, which was apt to be treated rather lightly. It should be treated with the same care as 11 kV, 33 kV and higher voltages.

MR. R. W. J. COCKRAM thought that the greater part of the recommendations made by the author was met in modern gear, but as to older gear a great deal of trouble was due to lack of suitable maintenance, probably in a desire to reduce overhead expenses in many cases. As to the suggestion that there should be a smaller movement before the release of the spring mechanism, in order to prevent backlash in switches, he suggested this would entail a higher rate for the spring and thereby make it more liable to failure at an early date. A better approach might be to re-design the toggle mechanism. He did not think it fair to compare the railway engineer with the industrial engineer, as the author had done, because the industrial engineer had to design his gear for operation by all and sundry, whereas the railway engineer designed his gear for operation by a specially trained staff. In the case of machine tool design, greater safety was ensured by designing the machine tool and the control gear as one unit. That was being done by some manufacturers now. If more research information was made available as to the forces to be met in the interruption of electrical circuits, this would enable engineers to improve reliability.

MR. F. C. FUKU, commenting on the statement in the paper that springs became weak, said this seemed like the acceptance of the inevitable. Personally, he could not accept it; it was a question of good or bad design of the spring. Evidence that springs could be made which did not become weak was afforded by the exhaust valve spring of the ordinary motor car engine. He had never had one fail yet; an example of good design.

MR. A. N. IRENS spoke of difficulties with magnetic chucks on machine tools. The general practice for machine tool makers was to have a small rectifier connected to the dead side of the isolating switch, so that if the supply was cut off inadvertently, the chance of having half a ton of material flung across the shop and causing considerable damage was prevented.

MR. F. JERVIS SMITH emphasised the danger of a hidden trap that might exist in connection with electrical plant where there might be an unexpected undischarged condenser. This trap could exist in two forms. There might be a smoothing condenser associated with the gear in some ancillary part of the equipment which

might still be charged, and the maintenance men might attempt to carry out some legitimate operation, expecting to find no serious voltage anywhere. There might, however, be an unexpected shock from an undischarged condenser, and it was the unexpected nature of it rather than the inherent danger that might cause a serious accident. The second form in which this hidden trap might occur was in the case of a sizeable rectifier equipment with smoothing condensers connected to the load, so that the voltage of the d.c. condensers collapsed rapidly when the source of a.c. was removed. It might be that the designer had foreseen that contingency and had connected a comparatively high resistance "permanent" bleeder across the condenser, but there might still be considerable risk of danger. Therefore, he suggested that consideration should be given—where such circumstances existed—to interlocking the control gear, so that whatever else it did, it put a physical circuit against any condenser of that type.

MR. G. D. LEWIS urged the need for making the control of machine tools fool-proof. In addition to making the machines safe for the careless and the thoughtless, as well as the absent minded, as a designer he did not think he would have done his job unless he had endeavoured to prevent, as far as possible, deliberate interference with the interlocking guard and switches.

MR. F. W. ROBERTS, speaking on the question of circuit design and the effects of leakage, said a method of avoiding the majority of troubles in that connection was to connect whatever piece of apparatus was under consideration to the earth wire or, in some cases, to a common return wire, and all the controlling devices, such as switches, interlocks, etc., should be put on the feed. This meant that whenever two control wires became joined together by leakage or other means, they were connected together at the top ends of the cable or piece of apparatus, and as the bottom ends were already joined together, they did not receive the feed from somewhere else. Safety devices must not be such that the operator could deliberately put them out of use.

MR. J. F. SHIPLEY (the chairman) suggested that there should be only one safety key for any particular piece of apparatus, and mentioned a fatal accident caused through one man taking the spare key and not knowing that the original key was also in use.

MR. FORDHAM COOPER said that if a more correct mental attitude was adopted, protective devices could be made safe and fairly simple, provided one started early enough in the design.

Power Cables To-Day

COMPREHENSIVE SURVEY OF MODERN PRACTICE

THE twenty-first annual combined meeting of the Association of Supervising Electrical Engineers and the Institution of Engineers-in-Charge was held on Tuesday evening, under the chairmanship of Mr. F. Winstanley. Mr. H. Nimmo, president of the A.S.E.E., was also present.

The main event of the meeting was the reading of a paper by Mr. J. R. Harding, entitled "Notes on Present Day Cable Practice," which was illustrated by some interesting samples, provided by the Pirelli General Cable Works, Ltd., of the types of cable discussed.

Mr. Harding began by saying that, although it was now fifty years since impregnated paper was introduced as a power cable insulation, nothing of comparable all-round merit had yet been discovered. Its high dielectric strength resulted from the great breakdown strength of oil in thin films, this being many times greater than that of the same oil in bulk. The commonly used laminated structure was thus explained, each layer acting as a barrier separating the oil into thin films.

On account of its high standard of uniformity, "chemical wood pulp" had entirely displaced manilla fibre as the chief constituent of insulating paper, although a certain amount of manilla was re-introduced during the war years. Various grades of paper, with their special advantages, were available. A more even distribution of voltage across the cable insulation could be obtained by a form of capacitance grading, in which dense papers were applied next to the conductor in the region of maximum electrical stress, changing progressively to softer papers in the external layers.

MODERN EXTRUSION METHODS

After referring to the types of impregnating materials commonly employed, Mr. Harding went on to say that the present-day method of extruding the lead sheath on cables was by means of the horizontal extruding machine, in which the metal was forced through dies by a screw impeller, a practice which produced a uniform seamless sheath of unlimited length. Small percentages of other metals were frequently included with the lead to form an alloy having a greater resistance to vibration fatigue.

The present-day shortage of lead had resulted in experiments with thermoplastic substances for sheathings, but operational experience was lacking and users had to accept a certain amount of risk in return for obtaining possibly re-

duced delivery periods of the cables.

Above working pressures of 22 kV, it became more difficult to eliminate voids in the insulation wall on account of the greater quantity of insulation required. These voids often resulted in electrical breakdown on supertension cables. The oil-filled cable eliminated voids, longitudinal flow channels being provided for the surplus expansion of low viscosity impregnating oil under heating due to load to reach reservoirs situated at intervals along the route. When the load was switched out and the cable cooled, this oil was returned under pressure to the cable. Many miles of oil-filled cable at phase voltages up to 220 kV had been installed since the late 1920s, with 100 per cent. operational success.

GAS-FILLED CABLES

Another method of preventing void formation, Mr. Harding continued, consisted in enclosing each insulated oval-shaped phase in a tight-fitting lead sheath, surrounded by nitrogen gas at 200 lb. per sq. in. pressure. A pressure retaining sheath enclosed the three phases and compound expansion under load cycles pushed the oval sheaths into a more circular shape. Some doubt had been expressed as to the ultimate cumulative effect of the flexing which the lead sheath underwent with load cycles.

The alternative method of high voltage working was the suppression of ionisation in voids, and several designs of cable having nitrogen gas either in contact with or disseminated throughout the insulation were now available. The basis of these designs were that the ionisation stress in a gas varied directly with the pressure, and this allowed maximum stresses to be increased much beyond the limits permissible with normal mass impregnated cables.

The various types of gas-filled cable were of comparatively recent introduction, and no final assessment of their merits could yet be effected. The overall costs usually worked out about the same as for oil-filled cable, although loss of pressure in a gas-filled cable was a more serious matter than in oil-filled, which could remain in service with the oil at atmospheric pressure.

Mr. Harding next mentioned methods of mechanical cable-laying, and turned to aerial power cables, for which, he said, there was an economic field intermediate between those of overhead lines and underground cables. Relatively little progress

had been made in this subject in this country, although aerial cables had been employed by the Post Office Engineering Department for very many years.

The two methods of aerial suspension in general use were by rawhide suspenders or by cable rings. Among the disadvantages of the former type were tendency to creep, cost of erection and poor appearance. In the second system, galvanised steel clips, known as cable rings, were attached by hand to the catenary wire before the cable was installed. When in position, they formed a cable duct through which the cable was drawn into position by means of a winch and flexible steel hawser. The tendency of the cable to tighten locally could be largely overcome by providing anchorages at suitable points and by making use of cable rings fitted with steel pressings, which increased the area of contact.

A method of cable suspension that was both neat and unobtrusive, Mr. Harding went on, was by open wire binding, in which cable rings were replaced by a continuous open helical binding of galvanised soft iron wire. There were two methods of installing cables of this type, one by manufacture of the complete catenary cable in the works, followed by erection on site, and the other by binding the cable to the catenary wire after the erection of the latter, by means of a machine known as a spinner. The author had been associated, he said, with the development of the former method about 12 years ago. An interesting feature in American developments of this type was that the catenary wire and bindings were of copper, and served as the neutral conductor of a three-phase system, in conjunction with a three-core cable.

Self-supporting aerial cables were next described, and Mr. Harding said that the utilization of the tensile strength of the wire armouring had proved satisfactory in the case of certain types of pilot and telephone cables. Details were given of commonly employed fittings.

NEW RUBBER SUBSTITUTES

The severe curtailment of rubber supplies during the war had resulted in the development, at a high rate, of new materials and substitutes for rubber. It had already been established that P.V.C. and some of the synthetic rubbers had definite advantages over the natural product when special conditions, such as non-inflammability, and resistance to oils, chemicals and solvents had to be met. To that extent, at least, war-time necessity had led to an advance in peace-time practice. Plastics could not be used to any great extent for dielectrics and sheathings for flexible leads connected to socket outlets, where there was frequently some risk of temperature rise due to a high resistance connection. Even where no temperature

rise was likely to occur, it was necessary to avoid undue pressure at points where cleats or clips were used. With normal care in those respects, however, a satisfactory installation could be obtained.

Among other synthetic war time productions were Neoprene, developed in America in 1933, which, although unsuitable as a dielectric, was successfully applied to the sheathing of cables during the war period. Because of its oil, weather and fire resisting properties, it was widely employed both for colliery and Admiralty service. It was processed similarly to the normal methods used with natural rubber and was capable of reinforcement by carbon blacks to a degree comparable with the high physical characteristics of resilient sheathings. Many new substances were also developed for radar and radio cables, and for conditions where moisture was a deteriorating factor, new synthetic fibres, such as acetylated cellulose, nylon and glass were produced.

HIGH VOLTAGE TRAILING CABLES

It was well known, Mr. Harding continued, that extremely tough and resilient types of sheathing were available before the war, which possessed outstanding merits for trailing cables, owing to the amount of rough handling which they could withstand. This type of sheathing, consisting of a compound based on natural rubber, was again available for certain types of trailing cable. It was worthy of note that, whereas the normal maximum voltage used for flexible trailing cables in this country was 3.3 kV, with exceptions up to 6.6 kV, it was the common practice, for power supplies to heavy dredge mining equipments in Malaya and Australia, to employ heavy trailing cables with tough rubber sheaths at 6.6 kV and even 11 kV.

The use of Polychloroprene was, at the moment, restricted to special cases where there was a particular need for fire resisting insulation, or fire, oil and weather resisting sheathings. Consistent with the recommendations of the Mines Department, it was employed as a protective sheathing on trailing cables used in mines, again because of its fire resisting properties. It was interesting to note that this type of sheathing gave the best service of all materials when contaminated with human perspiration, even better than that of P.V.C.

At the conclusion of the paper, the meeting was thrown open to discussion, and Mr. Harding answered several questions from members of the audience. Mr. Nimmo, after congratulating the author on a well written paper, referred to the very severe shortage of lead and other materials which, he said, was holding up electrification schemes.

Equipment and Appliances

New Silent Refrigerator—Multi-Range Test Set

THE accompanying illustration shows the latest design of Electrolux domestic refrigerator, the model L. 150, to go



The Electrolux L. 150, showing the ample food space

into production. The continuous absorption method of refrigeration with a consequent absence of moving parts and vibration is employed, and automatic "cold control" is provided. The interior capacity, 1.6 cu. ft., is designed to provide ample storage for the normal rations of four people. A high gloss enamel finish, with chromium plated and black ornament, is used on the exterior, and the inside, which has two removable shelves and one ice tray, is porcelain enamelled. The overall dimensions are 2 ft. 11½ in. high, 1 ft. 8½ in. wide and 1 ft. 9½ in. deep.

The concentrated-arc lamp, developed by the Western Union Telegraph Co. electronic research laboratories at Water Mill, Long Island, New York, during the war, has now been released for general sale. Basically, it is an arc lamp provided with permanent electrodes sealed into a glass bulb filled with an inert gas. The source of light is a small incandescent spot, which forms on a specially-prepared refractory oxide cathode. When the arc is established, the oxide surface is raised to its melting temperature and a brilliant white light is emitted by the molten surface, together with a cloud of vapourised material which extends for a few thousandths of an inch from the cathode. This vapour returns to the cathode, thus renewing the surface and giving the lamp a life of several hundred hours. The lamps are made in various sizes, and the light-emitting spot may be as small as 0.003 in., or as large as one-tenth of an inch, with brightness up to 65 000 candles per sq. in. These properties make the lamp useful for narrow-beam and high-intensity projection applications. In small sizes, the lamps are a close approach to a point source and have applications in optical

testing and demonstrating, lensless projection and enlargement, photography, and in many new devices which a brilliant point source will make possible. Concentrated-arc lamps may be burned in any position. They are reasonably robust and normally are unaffected by shocks, blows or vibrations which do not actually break the glass of the bulbs. These lamps operate on d.c. and require special power supplies and circuits designed to meet their peculiar requirements. They are started with a high voltage which breaks down the gap in the lamps, and are run from well-filtered rectifiers, or d.c. generators, or batteries with sufficient ballast resistance in series to limit the current to its normal value. This resistance always must be included, for the lamps have a negative volt-ampere characteristic and would otherwise draw currents which might destroy them. The two-watt lamps require 1 000 V for starting and 130 V or more for running. Larger lamps need up to 2 000 V for starting and may be run from sources supplying from 24 V up, higher supply voltages resulting in more stable operation.

Designed especially for the service engineer requiring an accurate multi-range instrument in compact form is the universal test set produced by B.P.L. (Instruments) Ltd., Quadrant Works, Finchley Lane, London, N.W.4.

The instrument is housed in a shock-resisting plastic case, fitted with a detachable leather carrying strap. To give additional protection against accidental damage, the meter scale is provided with a toughened glass cover. The test leads are connected to two screw terminals on all but the 1 000 V range, in which case the positive lead is placed in a separate



The B.P.L. test set

socket. By movement of one rotary switch, the following ranges are available: d.c. volts, 75 mV, 10, 50, 100, 500 and 1 000 V; d.c. milliamperes, 1, 10, 100, 500 mA; a.c. volts, 10, 50, 100, 500, 1 000 V. Using an internal U2 battery, two resistance ranges, 1 000 ohms and 100 000 ohms, are available. With an external battery, readings can be made up to 1 megohm. A current transformer, which is supplied as an extra, extends the range to 10 A. The meter sensitivity is 1 000 ohms per volt on all ranges, with an accuracy of 2 per cent. The accompanying illustration is approximately one-third actual size.

The "Powquip" heat-controlled electric iron is among the new products of The Power Equipment Co., Ltd., of Kingsbury Works, The Hyde, London,



"Powquip" electric iron

N.W. 9. An unusual structural feature is the open fronted spade-grip handle, which has been designed to give the user an unobstructed view of the toe when ironing into the insides of pleats and similar positions difficult of access in the ordinary way: it is also possible to pass the iron further into sleeves, etc., than would otherwise be possible. The handle itself is moulded in heat-resisting Bakelite and the body is an aluminium die-casting finished in a range of pastel colours. The sole-plate is nickel-plated. Rapid initial heating is ensured by a 750 W element, and the thermostat is designed to give a temperature control of ± 5 per cent. through the working range. Heat deterioration of the flex at the point of entry into the iron has been reduced by the removal of the terminal points away from the source of heat. A flexible steel spring is fitted to prevent chafing and kinking.

The Precision Components Co., of Aller Langport, Dorset, are marketing a 12-way terminal block, which is available in ratings of 15 or 30 A. Made of Bakelite, with n.p. brass terminals and screws, the

blocks can be cut into sections, thus making them suitable for 12 one-way, 6 two-

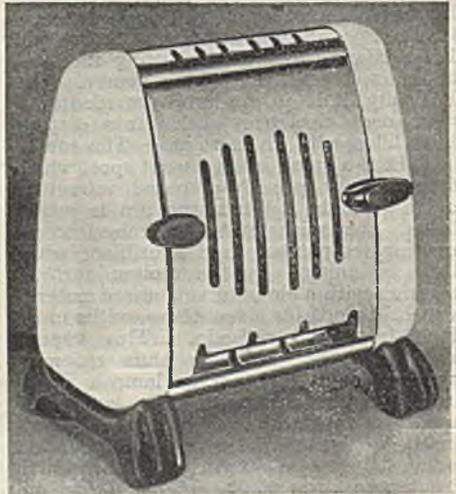


Twelve-way terminal block

way, 4 three way, etc., connections. Fixing holes are provided between each pair of terminals.

Harmonious lines are a feature of a new fluorescent lighting fixture, for single 5 ft. tubes, which has been designed by Saxon Components, Ltd., of Victoria Street, London. By placing all the auxiliary gear within the body of the reflector, the outline of the fitting remains clear, yet the starting gear is readily accessible to the installation engineer through a hinged door in the top of the fitting. The Saxon choke, installed in all fittings, is claimed to be completely free from noise and thus suitable for domestic and office use.

Details have been announced of the new "Clem" electric toaster, made by Clayton, Lewis and Miller, Ltd., of Southend-on-Sea. The body is of die-cast aluminium, finished in a new non-chipping enamel in pastel shades. The doors and other parts are mirror finished in chromium plate. The toaster is described as being scientifically designed to make crisp,



The "Clem" toaster

even toast, and to incorporate an effective reversing device. Two ranges are available, for 200/220 V and 230/250 V.

Protective Gear Transformers

I.E.E. Discussion on Dual Purpose Designs

THE I.E.E. Measurements Section held a discussion meeting on November 8. The subject being "Current and Voltage Transformers for Protective-Gear Purposes." The proceedings were opened by Messrs. J. G. Wellings and F. J. Lane.

The simplest form of protection by relays, they said, was over-current protection, employing a relay which was inoperative until the current through it exceeded the relay setting. A current transformer error of 10 per cent. might be quite acceptable, but if the relay were of the "instantaneous" type, it was important that the transformer accuracy should be maintained up to three times the maximum-current setting, or about six times the rated current for the relay.

MAXIMUM ERROR LIMITS

The transformer requirements for earth-fault protection and directional relays were then outlined, and it was stated that for impedance and reactance types of protection, it might be considered desirable to limit the current transformer error to 5 per cent. up to at least 15 times the setting current. The associated voltage transformers would need special consideration to ensure accuracy at lower voltages, and phase-angle error would be important.

Dealing with technical problems, the speakers stressed the desirability of providing designs which would deal with a range of conditions, in preference to special applications only. More economic and wider use of transformers would be possible if they could be specified and designed to deal with both instruments and protective relays. The expense of works tests under heavy-current conditions was an additional argument for restricting designs.

In the discussion which followed, most speakers deprecated attempts to cover both instrument and relay transformers by the same specifications and called for a separate standard for relay current transformers, in which there should be insistence on the maintenance of waveform, ratio and phase-angle up to much higher currents. Time delay curves should be correlated with primary current.

Whilst it was desirable that transformer manufacturers should provide as much data as possible on each transformer, in order that its possible suitability for other applications, under rapidly changing conditions on the site, could be seen at a glance, it was not entirely satisfactory to divorce the transformer from the pro-

TECTIVE system as a whole. The performance of the transformer-relay combination under transient conditions could be found only by site tests or works tests simulating site conditions. It was thought that reproducible works tests were essential for collecting data, and that random faults on the system, or primary or secondary injection tests should be regarded only as checks on correct connections.

Methods of dealing with transient unbalance were discussed at some length. Certain speakers were willing to accept a small time delay as a safeguard against false tripping, but others thought that the effort to maintain instantaneous relay action was worth-while to prevent spread of the fault. This could be achieved with proper design of the current transformers and selection of suitable "stabilising" resistors. Linear couplers (coreless toroidal transformers) had been exploited for this purpose in the U.S.A.

Current transformers were often blamed when the fault lay rather with the method of installation. A case of faulty ratio was mentioned in which the symptoms of a short-circuited turn were traced to the addition of a metal casing, another in which gland flash-over was the trouble in a slip-on transformer. Balancing of secondary burdens was also important and attention should be given to the length of leads to control panels.

METHODS OF RATING

Speakers agreed that a statement of the burden in volt-amperes was incomplete. Some favoured a rating in terms of the voltage available to operate the relay, while others thought that a statement of impedance in ohms would be preferable, provided that this could be standardised for motor transformers as well.

To obtain optimum performance it was desirable to use separate transformers for each function, but where considerations of space in the switch gear, or economy in expenditure, dictated a duplication of function it should be realised that a compromise with attainable performance would generally have to be accepted.

The meeting was in agreement that in ordering protective gear the system should be treated as a whole, and not as a collection of components to be assembled by the user. He should not be called upon to state transformer characteristics but should pass the protective gear designer's requirements direct to the transformer manufacturers.

Industrial Information

A Blackpool Exhibition

The Blackpool Electricity Committee is to arrange an exhibition confined entirely to heavy duty catering and industrial equipment, and manufacturers are being invited to co-operate.

German Patent Specifications

Over 70 000 German civil patent specifications, covering war-time developments in German industry and research, have been brought to Britain from the Berlin Patent Office and are open to inspection at the Patent Office Library, 25, Southampton Buildings, Chancery Lane, London, W.C.2. The specifications are in German.

Engineers and Mathematicians

At a meeting of the Scottish Engineering Students' Association, in the Royal Technical College, Glasgow, on November 13, Mr. R. M. Kenedi, of the engineering staff of the college, gave an address on the technical approach to mathematics. He referred to the establishment of a new class in the diploma courses, in which mathematical method was studied by engineering students through the medium of analogy and interpretation, rather than by symbolical manipulation.

Dealer Sales Convention

The first post-war dealer convention has been organised by Hoover, Ltd. It is taking the form of a series of one-day dealer meetings at various centres throughout the United Kingdom, which commenced last Monday, November 18, and will continue until December 4. Executives from the company's headquarters are conducting the meetings, assisted by branch and technical managers in the areas concerned. Instructional demonstrations are being given, and a film, entitled "Your Obedient Servant," is being shown.

Static Electricity Danger

In the course of a lecture on "Methods of Minimising the Results of Explosion," at a recent meeting of the London Section of the British Association of Chemists, Dr. D. Matheson, one of H.M. inspectors of factories, said that static electricity was a serious source of ignition. It was produced by the friction of belts on pulleys, the friction of solids in cyclones, the friction of liquids on solids, etc. Ethylene oxide passing along glass tubes could produce static electricity. No static occurred, the lecturer stated, if the relative humidity exceeded 75 per cent. and this method was extensively employed in the U.S.A. In England, the emphasis was almost entirely on earthing, although even a very

efficiently earthed vessel might still suffer. In the dry-cleaning industry a fire had occurred by sparking when a dress covered with tinsel was being removed from the cleaning vessel. Bolted flanges on metal pipes should be provided with a bonding strip; the latter must make a good electrical contact. Belts and pulleys were sometimes protected by earthed brushes and combs, but even so it was claimed that half the static could be missed. The most efficient method of earthing was the use of conducting belts.

"Design '46"

A publication bearing the above title has been sent to us by the Council of Industrial Design, the contents of which, including some twenty articles by leading experts in their fields, deal with the goods displayed at the "Britain Can Make It" Exhibition. The publication is illustrated by some 350 pictures and includes an epilogue by Mr. George Bernard Shaw. A chapter dealing with the electrical exhibits is contributed by Jane B. Drew, and most of the appliances are illustrated. The price of the publication is 6s. net and copies may be obtained at the Stationery Office.

Marine Radar Installations

We are informed that Siemens Brothers and Co., Ltd., who are co-operating with Metropolitan-Vickers Electrical Co., Ltd., in the supply and servicing of marine radar equipment, have in hand installations on the following ships: "Highland Chieftain," for Royal Mail Lines, Ltd.; "Sacramento," for the Ellerman Wilson Line; "Marie Louise Mackay," a cable ship for the Commercial Cable Co.; and "Clan MacClachlan," now under construction for the Clan Line Steamers, Ltd. In addition, orders have been received for merchant ships under construction for the French and Belgian Governments. Installations have already been completed by the Metropolitan-Vickers Electrical Co., Ltd., on the "Kronprins Frederik," "Crane" and "Manchester Shipper."

Token Imports

Among further goods to be allowed into the United Kingdom under the "token imports" scheme are electric fans, complete with motors, for domestic use; domestic electrically operated washing machines, electric light bulbs, electric switches, lamp globes and lamp glasses. Until the end of 1946 the individual overseas manufacturer will be able to ship to this country the goods in the lists issued by the Board of Trade to the extent of one-half of the quota of 20 per cent. for

the calendar year, i.e., 10 per cent. of the value of his average annual pre-war trade in those goods with the U.K.

The U.N.E.S.C.O. Exhibition

In the field of science the main British contribution to the international exhibitions being held in connection with the first general conference of the United Nations Educational, Scientific and Cultural Organisation, meeting in Paris from November 19 to December 10, is the radar section, where there are being displayed a selection of pre-war and war-time Service equipment, with two post-war developments of this new art for civil use.

Reports from Germany

Among further reports containing scientific and technical intelligence collected by industrial experts from German industry, and now available at the Stationery Office, are the following: F.I.A.T. 376, Quadrant Type Electric Steering Gear for the German 5 000-ton and 9 000-ton Hansa Ship Programme; also other Electric Steering Gear (1s. 6d.);

F.I.A.T. 397, Survey of the Carbon and Graphite Electrode Industry in Germany (2s. 6d.); F.I.A.T. 512, Survey of Low Voltage, Air Circuit-Breaker Practice, Germany (3s.); F.I.A.T. 786, The Lithium Electrolytic Cell (Degussa, Rhein-felden) (1s.).

Electric Fires

Brooks and Bohm, Ltd., of 90, Victoria Street, Westminster, S.W.1, announce that after long delay, due to shortage of raw material, they are now in a position to commence deliveries of their 2 kW artificial coal electric reflector fires.

Advance In Prices

The Airedale Electrical and Manufacturing Co., Ltd., announce that in order to meet further increases in costs of production it has been found necessary to advance the increase on their catalogue prices from 70 per cent. to 80 per cent. as and from November 18. Discounts will remain as heretofore. Quotations dated before November 18 will hold good until November 30. The address of the



THE ELECTRICIAN stand at the Technical Exhibition, the Kelvin Hall, Glasgow. The exhibition will remain open until November 27, and visitors are cordially invited to make full use of the services available on Stand DD. There is in the exhibition much of electrical interest to be seen, as indicated in our brief review last week

company has been changed to Harrogate Road, Apperley Bridge, Bradford, Yorks. (Telephone: Idle 686). Following the introduction of a five-day week, the offices and works are closed from Friday evening to Monday morning.

New Belfast Branch

A new branch at Ulster Bank Chambers, 4-6, Ann Street, Belfast (Telephone: Belfast 24447), has been opened by Brooks and Bohm, Ltd., 90, Victoria Street, Westminster, London, S.W.1

Concerts for Charity

Employees at the New Town works of A. Reyrolle and Co., Ltd., Hebburn-on-Tyne, have raised £3 000 for local charities by means of concerts. Efforts are being made to raise a total of £5 000.

Fuel Economy

Reports on fuel economy in their respective countries since 1939, prepared by the Swedish National Committee and the Netherlands National Committee, have been published by the Central Office of the World Power Conference, 36, Kingsway, London, W.C.

Change of Name

The business of Hartley and Co., owned by Mr. A. W. M. Hartley, has now been transferred by him to Hartley Electromotives Ltd. Mr. Hartley holds a majority of the ordinary shares of Hartley Electromotives Ltd., and as its managing director, is in control of the company's activities.

Export Quiz Display Unit

To meet the increasing requests from factories and shops for the electrical Export Quiz Display, the Board of Trade have decided to build an additional 20 units. Applications for the loan of one of these units for one week should be sent to Public Relations Department, Board of Trade, Millbank, London, S.W.1. Leaflets and posters are also available.

Rural Electrification

The British Electrical Development Association have invited the Central Landowners' Association, the National Farmers' Union and Chamber of Agriculture for Scotland, the Highland and Agricultural Society of Scotland, the National Union of Agricultural Workers and the National Federation of Women's Institutes to nominate a representative to serve on the association's Rural Electrification Advisory Committee. Mr. E. E. Hoadley, borough electrical engineer and manager, Maidstone, has been appointed chairman of the Committee, and Mr. H. G. Robinson, principal of the Midland Agricultural College, Sutton Bonington, is vice-chairman. The present

Committee consists of representatives of electricity supply undertakings, the C.E.B., the Ministry of Agriculture and Fisheries, the Royal Agricultural Society of England, the National Farmers' Union, the British Dairy Farmers' Association, the Milk Marketing Board, the National Poultry Farmers' Association, the Institution of British Agricultural Engineers, and the Electrical Contractors' Association.

Proposed Works Transfer

So that the Loughborough works of the Brush Electrical Engineering Co., Ltd., will have more space for the manufacture of electrical goods, arrangements are being made for the transfer of the section of the works which has been manufacturing small Diesel engines to a new factory at Wishaw, Lanarkshire. The section dealing with large Diesel engines is to be moved to Leeds, but it is unlikely that the transfers will be carried out before the end of next year. The provision of houses for the transferred workers is one of the biggest problems to be dealt with.

Trade Publications Received

Price variations for conduit and conduit fittings, as from November 1, issued by the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

"Electric Control Gear," by William Geipel, Ltd., 156-170, Bermondsey Street, London, S.E.1, giving details of their starters, contactors, resistances, theatre dimmers, and special control gear, including a process timing device.

A new illustrated catalogue giving details of Dominion Bridge Scotch dry back boilers, which has been published in four languages by the Dominion Bridge Co., Ltd., Lachine, Quebec, Canada.

An attractive publication entitled "Lights On, Lights Off: The Modern Lamplighter," issued by Standard Telephones and Cables, Ltd., Connaught House, Aldwych, London, describing the Standard street lighting control system incorporating the d.c. bias injection panel.

A complete range of valves suitable for modern low power transmitters is described in a new publication, "Mullard Valves for Amateur Communications," issued by the publications department of the Mullard Wireless Service Co., Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

Small Hammer Mills

The British Electrical and Allied Industries Research Association has published Report Ref. W/T 10, entitled "Application of Small Automatic Hammer Mills," by C. A. Cameron Brown, describing the practical development of the principal of the small automatically controlled hammer

mill established as practicable in earlier work, details of which are given in E.R.A. Report W/T 4. The present work deals mainly with the general principles of application of an automatic mill to meet different farming requirements and conditions. The methods of installation out-

lined are illustrated by detailed reference to actual installations. The report should be of interest to supply authorities with rural areas of supply, and to agriculturists generally. Copies may be obtained from the association at 15, Savoy Street, London, W.C.2, price 3s. 6d., postage 3d.

Nationalisation Condemned

FOLLOWING the announcement of the Government's proposals to nationalise electricity, the Electricity Supply Companies of Great Britain, last week issued a statement to the effect that nationalisation, with its inevitable uncertainties, will seriously dislocate our whole industrial system. The substitution of State monopoly for competitive enterprise will result in management becoming increasingly centralised and stereotyped, entailing increased prices and inefficient service.

The United States has already embarked on gigantic electricity expansion schemes. Interference with development in this country, particularly at the present juncture, would be an economic disaster of the first magnitude.

"The Government has stated that for many years to come, man-power will be inadequate for the nation's industrial needs. The expansion of the use of electricity is the best way of compensating for the shortage of man-power in factory and farm, and of reducing needless toil for the housewife in the home.

"The history of the electricity supply industry is one of reducing prices and increasing efficiency. In the past 15 years, despite the incidence of war, the average cost of electricity has fallen by over 22 per cent. to all users and in the same period domestic rates fell by over 41 per cent. The reduction in electricity prices has been achieved by constant technical improvements and commercial efficiency, despite an immense average increase in the cost of coal—the basic raw material of the industry—and despite the failure, particularly in the past year, of the Ministry of Fuel to provide the correct grades of coal. The price of coal of suitable grades for the industry has risen by more than 125 per cent. between the years 1939 and 1945.

Since VJ-Day, in face of every difficulty, electricity has been supplied to nearly 200 000 new consumers.

"Nationalisation will drive the best brains and hands out of the industry, nor can it fail to slow down, if not to stifle, its development at a time when the nation is engaged in a life and death struggle for an expanding economy.

"Given the necessary priorities and freedom of action, the companies re-affirm their

ability to carry out their five year programme of general development—at a cost of £150 000 000—and the proposals to expand electricity supply in the rural areas—at a cost of £72 000 000, of which £45 000 000 will be found by the companies and £27 000 000 by the agricultural industry.

The companies, it is stated, do not base their opposition to nationalisation on political but on economic and practical grounds. They are certain that the Government's proposals, if adopted, will vitally damage the interests of the community.

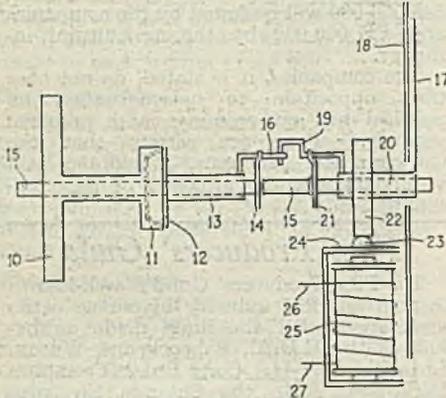
Film Producers' Guild

The Film Producers' Guild is well-known to the electrical industry by virtue of its association with the films made on behalf of the E.D.A., Babcock and Wilcox, Ltd., the B.T.H. Co., Ltd., Crompton Parkinson, Ltd., the Chloride Electrical Storage Co., Ltd., the E. A. W., Hoover Ltd., Kelvin, Bottomley and Baird, Ltd., Joseph Lucas Ltd., Bakelite Ltd., the Metropolitan Vickers Electrical Co., Ltd., and others. For this reason we were particularly pleased to be invited to a luncheon held at Guild House, London, last week, whereat were shown a number of documentary films with which the Guild is associated. Among the films shown was one "Can We be Rich," in which there is a considerable amount of electrical interest, in that the electrical method is shown to be bound up in various ways with the standard of living. Designed for showing to audiences of the general public, the film demonstrates the need for increased industrial productivity and has a distinct electrical bias. Those present included a number of personalities in the electrical industry, but more pleasing was the fact that the audience included among its numbers others who could usefully adopt the electrical method in many of the manufacturing processes with which they are associated. The Guild would seem to be a very useful ally of the electrical industry, able to contact fields of industrial enterprise with that freedom of action which the industry, for obvious reasons, is not always able to establish.

Electrical Inventions

Remote Circuit Metering

A "telemetering" receiver, suitable for giving remote indications of power readings in generating and distributing circuits, is described. An energy meter is connected in the power circuits, and its moving spindle transmits impulses, at a rate directly proportional to the average power in the circuit, to the receiver. The received impulses rotate the driving wheel (10) on a step-by-step basis and, if the magnetic clutch (11,12) is energised, the sleeve (13) is carried round against the



restoring force of the spiral spring (14). If the pointer (17) has previously occupied a low position on the scale (18), the sleeve (13) will carry the pointer round with it.

At the end of each summation period, the electro-magnet (25) is energised, thus removing the brake (23) from the disc (22) and allowing the sleeve (20) to rotate backwards until the arm (19) engages with arm (16). If, however, the two arms have already engaged during rotation, no restoring movement will take place.

In either event, the reading of the pointer at this time will be proportional to the average rate of impulse transmission during the previous summation period.

After a short time interval, the magnet releases the brake to clamp the pointer and the clutch (11, 12) is de-energised, so permitting the sleeve to return.

Automatic Telephone and Electric Co., Ltd., and C. R. P. Stonor. Application date, September 13, 1944. No. 581 233.

Cable Jointing

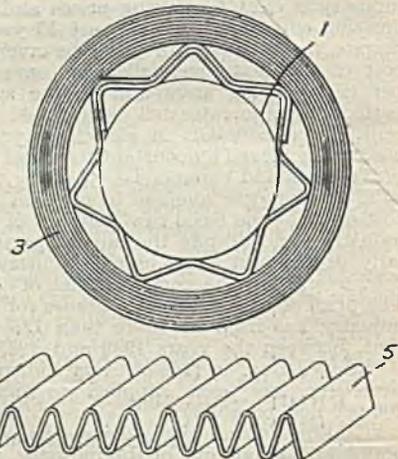
In some forms of high tension cable joints, it is stated, the conductor ends, with the factory-made insulation on them, are located within tubes of impregnated

We give on this page abstracts of some recent electrical patents, which are prepared with the permission of the Controller of H.M. Stationery Office. These abstracts are written from the viewpoint of general interest and do not attempt to define the scope of the inventions, nor indicate in which features the novelty lies. Complete specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each inland or 1s. 1d. each abroad.

material, the spaces in which are later filled with an insulating compound.

In the invention, a strip of corrugated material (5) of appropriate dimensions, which can be used for a large range of core and tube sizes, is wound around the core (1), with its ends overlapping and interlocking. The tops and bottoms of the corrugations fit against the inside of the insulating tube (3) and the outside of the core, respectively.

The strip itself may be of presspahn, about 40 mils. thick, bent into closed straight-sided corrugations with a depth of 0.35 in. When the radial clearance between the insulating tube and the core is small, the strip may be pulled longitudinally to reduce the height of the corrugations. When this distance is great, several turns of corrugated strip, formed with the distance between successive bends



increasing outwardly, may be wound one above the other.

W. T. Henley's Telegraph Works Co., Ltd., and H. S. Wheeler. Application date, August 16, 1944. No. 581 263.

Electricity Supply

St. Marylebone.—Improvements to the distribution system and the erection of four new sub-stations will cost £55 000.

Accrington.—Cable extensions have been recommended on two local housing estates, at a cost of £1 458.

Rotherham.—An additional feeder, costing £14 000, will be provided to the Wincobank area.

Swindon.—Of a trading surplus for the year of £26 615, £13 150 is to be allocated to rate relief.

Barrow-in-Furness.—Supply extensions to Outgate, Marton, Newlands and Tower Wood will be carried out at a cost of £11 130.

Hastings.—Schemes for extensions and developments have been approved, at a cost of £70 913, and £1 180 has been allocated for supply to council houses.

Eccles.—The provision of additional supply to the Royal Ordnance factory, Patricroft, will cost £30 794. Sanction is being sought to loans of £15 000 for mains and £10 000 for sub-stations.

Exeter.—In connection with the increased bulk supply demands required by the Exe Valley Electricity Co., Ltd., the Electricity Committee is seeking sanction to borrow £47 000 for cables and plant.

Finchley.—The Electricity Commissioners have asked for details of the proposals of the Electricity Committee for extensions, at a cost of £118 857, for which loan application had been made. Forthcoming mains extensions will cost £2 506.

Scotland.—The North of Scotland Hydro-Electric Board have engaged the firm of Sir Murdoch Macdonald and Partners, engineering consultants, to carry out a preliminary survey of the Loch Shin catchment area in Sutherland. This is the first step towards the development by the board of the water-power resources of the county. The catchment area of Loch Shin, 270 ft. above sea level, has been estimated to have a potential annual output of approximately 140 million kWh. The board has also announced that contracts valued altogether at nearly £3 000 000 with more than 50 firms have been placed for work on the Loch Sloy scheme.

Burnley.—Discussing the forthcoming change-over to 240 V, the Electrical Engineer said that as a start they would go up to 225 V, which would not be enough to be noticed. Due notice would be given of the change-over date.

Belfast.—By 26 votes to 23, the Corporation have deleted from a proposed Parliamentary Bill a clause which would have given wider trading powers to the

electricity department in the sale of appliances, fittings, etc. Moving the amendment to delete the clause, Councilor Mitchell said that if the electricity department were worried about shoddy equipment they should issue specifications and let the public know what was safe and what was not. Alderman M'Kee, chairman of the Electricity Committee, said that the Belfast undertaking was the only one in the United Kingdom that had



As we announced last week, Manchester's 200 000th consumer, MRS. A. R. WHITE, of Wythenshaw, was recently presented with a souvenir of the occasion. Here, MRS. WHITE is seen accepting a presentation set of saucepans, from SIR WILLIAM WALKER

not got the powers that were now being sought. In all sorts of huckster shops they saw electrical equipment which was dangerous and might be a lethal weapon in the hands of children. At present, the committee had full powers to sell by hire purchase electrical equipment, but not to sell it outright to those who wanted to buy it. All articles sold to the public would be at the recognised retail prices. The Corporation was not going to do wiring by direct labour. It was their policy to improve the standard of apparatus offered for sale. Alderman Cole said that the prospects would be poor for a young man starting up in the electrical business against the Corporation, who could get their capital for about 2½ per cent. There would be no objection to the Corporation having showrooms and displaying what they regarded as the best equipment, but they should not be allowed to enter into competition against the small merchant.

Islington.—On the grounds that the minimum charges imposed as a condi-

tion of supply of electricity for lighting purposes amount to only 0.082 per cent. (£828) of the total revenue, and do not, therefore, justify the costs incurred in their collection, the Electricity and Lighting Committee has decided to suspend the 10s. per annum charge for electricity for all purposes as from and including the year ending December 31, 1946. The present necessity for fuel economy is regarded as a contributory reason for the decision. At a later date, however, when the fuel situation no longer calls for economies, the question may be reviewed. The Council has approved a suggestion by the Committee that the rental already paid by consumers should be taken into account when calculating the purchase price of wiring installations. The amount to be paid will be computed on a basis of the original cost of the installation, plus 4 per cent. per annum to cover interest, repairs, etc., less the amount of rental paid at the rate of 1d. per unit consumed. Where there has been war damage, half the cost of the repair is to be added before arriving at the cost of the installation. Rental wiring consumers are at present charged 3d. per unit for current supplied and 2d. per unit rental.

The approval of the Electricity Commissioners is to be asked for a proposed revision, under which consumers will pay 4d. per unit for electricity consumed and 1d. for the installation rental.

Electricity Generation. — The official returns rendered to the Electricity Commissioners show that 3 733 million units of electricity were generated by authorised undertakers in Great Britain during the month of October, 1946, as compared with the revised figure of 3 179 million units in the corresponding month of 1945, representing an increase of 554 million units, or 17.4 per cent. During the past ten months of 1946 (i.e., up to the end of October) the total number of units generated by authorised undertakers was 32 930 million, as compared with the revised figure of 30 145 million for the corresponding period of 1945, an increase of 2 785 million, or 9.2 per cent. The total number of units sent out from the generating stations of authorised undertakers during the month of October, 1946, (i.e., units generated, less units consumed in the stations by auxiliary plant and for lighting, etc.) was 3 526 million. The total sent out from these stations during the past ten months of 1946 was 31 060 million units.

Steel Works Lighting Installation

THE task of redesigning the lighting installation at the Park Gate Iron and Steel Works, Rotherham, was recently completed by Messrs. Lilleker Bros., Ltd., working to plans prepared by B.T.H. lighting engineers. The existing installation had service intensities as low as 0.56 foot-candles. The intensities in the new scheme range between 8 foot-candles, in the cogg-ing mill shop, where 500 W Mazda lamps are employed, to 12 foot-candles in the foundry, provided by 400 W mercury-vapour lamps. In the analysts' laboratory, 80 W fluorescent lamps are installed in trough reflectors, to give continuous lines of light 5 ft. above bench level. This scheme has been adopted to facilitate the visual examination of samples, and was considered better than general illumination of the room itself. Wherever it was found necessary to mount

the reflectors high above the floor, 5 A fuse plugs were wired in circuit, to enable each lamp to be switched off individually for



A view of the analysts' laboratory. Above the benches can be seen the continuous lines of fluorescent fittings

cleaning, replacement and other general maintenance purposes.

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:—

Wallasey, November 23.—Supply and installation of 500 A, three-phase, meter testing set. Specification from Borough Electrical Engineer, Wallasey Road, Wallasey.

Littleborough, November 25.—Supply and delivery of one 350 kVA transformer, e.h.t. and l.t. underground cables, e.h.t. and l.t. switchgear. Particulars from Electrical Engineer and Manager, Council Offices, Littleborough.

N.W. Midlands J.E.A., November 25.—Supply of outdoor type static transformers. Particulars from Chief Engineer and Manager, York Chambers, Kingsway, Stoke-on-Trent.

Birmingham, November 25.—Delivery of following domestic electrical apparatus as required during period of 12 months from date of contract: Kettles, aluminium saucepans, cookers, wash-boilers, water circulators, storage water heaters, cooker control units, circulator control panels. Specifications from Chief Engineer and Manager, Electric Supply Department, 14, Dale End, Birmingham, 4.

Gairloch, November 25.—Supply, delivery and erection of h.t. and l.t. distribution lines for North of Scotland Hydro-Electric Board. Tender documents from the Engineers, Messrs. Strain and Robertson, 154, West George Street, Glasgow, C.2. Deposit, £1 ls.

Glasgow, November 26.—Supply of five electric vehicles. Particulars from General Manager, Corporation Electricity Department, 75, Waterloo Street, Glasgow, C.2.

Royton, November 26.—Electrical installation in 50 houses at Haggate site. Particulars from Engineer and Surveyor, Town Hall, Royton, Lanes.

Aberdeen, November 27.—Electrical work in 30 houses at various sites. Particulars from County Architect's Office, 22, Union Street, Aberdeen.

Woolwich, November 27.—Supply of electricity meters, h.v. and m.v. cables and transformers during year beginning January 1, 1947. Specifications from Borough Electrical Engineer, Electric House, Powis Street, Woolwich, S.E.18.

Great Yarmouth, November 29.—Supply and delivery of domestic appliances during the period of 12 months ending March 31, 1948 (breakfast cookers, boiling rings,

toasters, electric kettles, percolators, water heaters, wash-boilers, refrigerators, washing machines, irons, vacuum cleaners, fires, clocks, towel rails). Particulars for all or any items as listed from Chief Engineer and Manager, Yarmouth.

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 County Architect, Shire Hall, Warwick, giving details of recent contracts and names, etc., of persons to whom reference can be made.

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 ls.

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

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 ls. 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 ls.

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.

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

Company News

STRAND ELECTRIC HOLDINGS, LTD.—Rept. for yr. ended July 11, shows income less exes. £16 154 (£16 752); inc.-tax £7 216 (£7 882); div. 10% (same), plus bonus 2½% (same); fwd. £3 549 (£2 518). Gross trading prft. of sub. Strand Electric and Engineering for yr. ended April 30, £123 183 (£125 972); prft., after exes., etc., £37 064 (£38 313); E.P.T. and inc.-tax £26 851 (£30 197).

ASSOCIATED INSULATION PRODUCTS, LTD.—Surplus for 1945, £15 985 (£16 976), plus £20 257 (£19 549) brot. in, mkg. £36 242 (£36 525). To prof. div. £8 563 (£9 258), ord. div. 7% (5%) £8 996 (£7 010), fwd. £18 683. Combined prft. and loss acct. shows trdg. prft. before depreciation £148 150 (£479 390). After deprecn. £61 903 (£61 643), defd. repairs nil (£30 000), taxn., etc., net prft. £15 985 (£16 976). Current assets £1 869 067 (£1 667 994), against current liab. and provs. £1 033 534 (£1 236 853).

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.—The Chairman's statement, circulated with the report and accounts, stated that up to the present the sales of power during the year had continued satisfactorily and with a rising tendency, which was also apparent in the costs. As was well known, the company's undertaking on the Witwatersrand could be taken over two years after an official notice had been served, and this notice could be given at the end of 1948. So far, the company had had no authoritative intimation of the present intention of the South African Government on this subject.

CAPE ELECTRIC TRAMWAYS, LTD.—Rept. and accts. for the yr. to June 30 posted shareholders on London reg. from Cape Town on Nov. 1. Inc. in gross rev. shown of £181 500, but this inc. has been accompanied by an inc. in workg. costs. Cap. expend. for yr. £21 367. Paymts. on acct. of vehicles to be delivered £51 537. Replacemts. res. incrsd. by further £20 000. Net prft. shows an inc. of £36 550 after incrsg. reserves by £40 000 in three of the subsid. cos.' accts. towards cost of improvemts., and additions and writg. off of obsolete assets. Prof. for yr. £91 758 (£55 208), to replacemts. res. £20 000 (same), div. 6% (same).

HOLOPHANE, LTD.—In his statement at the annual meeting, the Chairman (Mr. H. Guy Campbell) said that the company already had a very substantial order book, but its possible progress was still restricted by the prevailing conditions of supplies of materials, etc., which, it was hoped, would improve during the forthcoming year.

Cordial relations were being maintained with the Holophane companies operating in the U.S.A. and France, the long-standing interchange of patents and technical developments was again in full force and the benefits of the same, as well as their own researches, would be put into effect as soon as circumstances permitted. It was interesting to record, the Chairman said, that it was just over 50 years since the Holophane system of illumination was introduced in Britain, and over this long period of time their pioneering work in the scientific application and precision control of artificial lighting had been of outstanding importance. Their particular spheres of usefulness were well recognised by lighting engineers and others responsible for good illumination, with the result that Holophane products, in combination with all modern forms of illumination, were employed in every part of the world.

FERRANTI, LTD.—After reviewing the balance sheet, Mr. V. Z. de Ferranti (chairman and managing director) said that the accounts covered a year of transition, and during that year a great deal of rearrangement and adaptation to peace conditions had been accomplished. One major operation, involving the move of their instrument department from a requisitioned building in Bury to the factory in Moston, had been completed. The total number employed, after falling rapidly from the war-time peak of 12 000, had now steadied and showed an upward tendency, the present figures being 7 000. The use of electricity, which had been increasing for a number of years at approximately 10 per cent. per annum, was effecting a great saving in coal, and its use in the present year would probably save 30 million tons of coal, compared with the quantity which was required to give equivalent amounts of heat, light and power at the beginning of the century. It was very desirable that the progress now being made should be continued by an adequate supply of electrical plant and appliances. The company, whose activities covered the field of manufacture of equipment for the supply industry as well as domestic equipment for the public, had a part to play in this progress. In the export field, Mr. de Ferranti continued, orders had been obtained from Finland for £250 000-worth of transformers, which included several 64 000 kVA, 230 kV three-phase units.

ERINOID, LTD.—At the annual general meeting, the address by the Chairman (Mr. W. G. Waldron), was taken as read. It began by pointing out that, in view of the

recommendations of the Cohen Committee, the accounts had been presented in a somewhat modified form. The trading profit for the year, at £133 020, was more than double that of the previous year, and the value of sales constituted a record for the company. During the year, they had experienced a considerable increase in the rate of wages and the cost of raw materials, but the profit margin had been maintained, although in some cases the selling prices had actually been lowered.

ANGLO-ARGENTINE TRAMWAYS Co., LTD.
—In the course of his speech to the shareholders, Sir Bernard Docker (chairman) said that the amount of the company's loss for 1945, that was to say, £197 284, compared with £11 172 in 1944, when no debenture interest was chargeable, constituted but another forceful reminder of the lack of goodwill to which the company had for so long been subjected by the responsible authorities in Argentina. It was unnecessary for him to recount all the antecedents of the worsened situation, but he

thought it desirable to stress the extent to which the causes of that situation had been added to since he addressed them 12 months ago, particularly the further uncompensated burdens that had been imposed upon the Buenos Aires Transport Corporation by order or approval of the Argentine Government. He would refer especially to the new decrees relating to wage increases, bonuses and social benefits, following up the substantial increases ordered in 1939 and 1944, and to the Government's loaning of money to the corporation for extensive rolling stock purchases, on conditions which amounted to an indefinite mortgaging of the corporation's future revenue, and therefore an equally indefinite postponement of any dividend payments to its shareholders. An undertaking which transported something like four million passengers daily and which paid out in wages and social benefits some 80 per cent. of the fares it collected was, he would venture to assert, worthy of some better treatment than it was at present receiving.

Coming Events

Friday, November 22 (To-day)

I.E.E.—London. Measurements Section. "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," F. M. Bruce. 5.30 p.m.

ELECTRICAL ENGINEERING SOCIETY.—London. Visit to C.E.R. Central Control Room, South-wark. 7 p.m.

ILLUMINATING ENGINEERING SOCIETY.—Birmingham. "Lighting for Photography," G. A. Jones.

Saturday, November 23

I.E.E., N. WESTERN STUDENTS' SECTION.—Manchester. Afternoon Visit to Metropolitan-Vickers Electrical Co., Ltd.

I.E.E., N. MID. STUDENTS' SECTION.—Leeds. "Vibration Demonstration," Mr. Foster. 2.30 p.m.

I.E.E., N. EASTERN STUDENTS' SECTION.—Visit to Bushing Co., Hebburn. 2.30 p.m.

ASSOCIATION OF MINING, ELECTRICAL AND MECHANICAL ENGINEERS, S. WALES BRANCH.—Pontypridd. "Electricity in Mines During the Year 1945," discussion opened by G. M. Harvey. 6 p.m.

INSTITUTE OF PHYSICS.—Sheffield. "The Development of the Metro-Vick Spark Unit," Messrs. Braudo and Clayton. 2 p.m.

Monday, November 25

I.E.E., S. MIDLAND CENTRE.—Birmingham. Summary of papers and lectures at the Radio-location Convention, 1946, by R. A. Smith. 6 p.m.

I.E.E., N.E. CENTRE.—Newcastle-on-Tyne. Talk on the development of the I.E.E. Benevolent Fund's first residential estate, by E. Leete. "Rural Electrification: The Use of the Single-Phase System of Supply, J. S. Pickles and W. H. Wills. 6 p.m.

I.E.E.—London. Discussion on "The Heat Pump," opened by J. A. Sumner. 5.30 p.m.

I.E.E., WESTERN CENTRE.—Bristol. Installations Group. Engineering Principles Applied to the Design of Domestic Water Heating Installations of the Solid Fuel/Electric Type," R. Grierson and Forbes Jackson.

Tuesday, November 26

I.E.E., S. MIDLAND CENTRE, RUGBY SUB-CENTRE.—"The Evaluation of Restricting Voltages," J. R. Mortlock. 6.45 p.m.

I.E.E., S. MIDLAND CENTRE.—Loughborough. "Influence of Resistance Switching on the Design of High Voltage Oil Circuit Breakers," H. E. Cox and T. W. Wilcox.

I.E.E.—London. Radio Section. Discussion. "The Economics and Subjective Requirements of Television Picture Sizes," opened by D. C. Birkinshaw. 5.30 p.m.

I.E.E., N.W. CENTRE.—Manchester. "The Electrical Engineering Industry in the Post-War Economy," G. L. E. Metz and R. L. Davies. 6 p.m.

COVENTRY ELECTRIC CLUB.—Film Show. 6.30 p.m.

Wednesday, November 27

I.E.E., SCOTTISH CENTRE.—Edinburgh. "Theory of Servo Systems, with Particular Reference to Stabilisation," A. L. Whiteley. 6 p.m.

INSTITUTE OF WELDING.—London. "The Inspector's Approach to Radiographs of M.S. Butt Welds," E. Fuchs, L. Mullins and S. H. Smith. 6 p.m.

Friday, November 29

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. E. Davy. 7.30 p.m.

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

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.

WEST LONDON AND PROVINCIAL ELECTRIC AND GENERAL TRUST, LTD. London, E.C.—October 15, Trust Deed dated September 30, 1946, securing £190 000 deb. stock, present issue £40 000; general charge. *£200 000. June 13, 1946.

UNIVERSAL ELECTRIC TIME AND TELEPHONE SYSTEMS, LTD. Liverpool.—October 23, Trust Deed dated October 15, 1946, securing £50 000 (not ex.) Registered Notes, present issue £30 000; charged on sufficient rental contracts to produce annual rental income of £10 000 for next six years after charge arising. *£4 525. March 5, 1945.

BENTON RADIO AND CYCLE CO., LTD. Newcastle-on-Tyne.—October 26, by order on terms, mort., to Walker Wallsend and Willington Permanent Benefit Bldg. Soc. securing £2 600 and further advances; charged on shop and premises at Four Lane Ends, Longbenton.

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.

PASKELL, F. C. (male), 68, Sutton Road, Southend-on-Sea, radio dealer. £15 1s. 2d. September 18.

NORTON, J. (male), 111, Northgate Street, Canterbury, radio dealer. £12 16s. 7d. October 18.

CONNETT, W. (male), 175, Ellon Street, Pendleton, Salford, radio dealer. £37 3s. 5d. September 18.

BRITTON, A. J. (male), trading as MOOR RADIO, 9, Moorside Road, Heaton Moor, Lanes, radio dealer. £172 17s. September 18.

WHEATLEY, R. B. (male), 12, Lower Bristol Road, Bridgwater, Somerset, electrical engineer. £65 12s. 2d. September 23.

STREETER, S. (male), Auto Electric Services, East Street, Petworth, Sussex, electrical engineer. £11 11s. 6d. September 30.

GIBSON, F. W. (male), 54, Thornhill

Road, Handsworth, Warwick, radio dealer. £15 1s. September 9.

Orders for Discharge

BARBER, 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, York. Wireless dealer. Court—Wakefield. Date of Order—October 15, 1946. Discharge granted subject to bankrupt's consent to judgment being entered against him in the Wakefield County Court by the Official Receiver for £20 and £1 10s. for costs. (The amount has been paid to the Official Receiver.)

Dividends

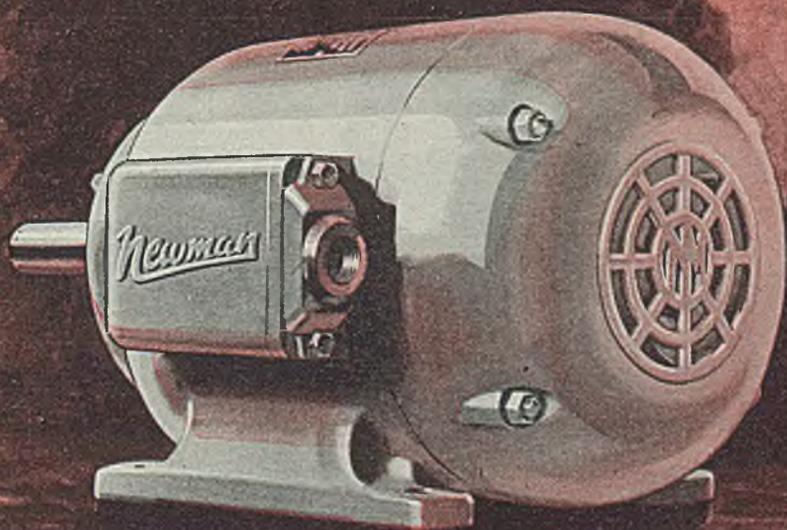
SUTCLIFFE, John Anthony, residing at 20, Sandylands, Promenade, Morecambe and Heysham, Lanes., and carrying on business at Main Street, Bolton-le-Sands, plumber and electrician. Court—Preston. Amount per £—1s. 2½d. Payable—November 27, 1946, at The Official Receiver's Office, 7, Lord Street West, Blackburn.

Metal Prices

	Monday, Price	November 18 Inc. Dec.
Copper—		
Best Selected (nom.)...per ton	£96 10 0	£14 0 0 —
Electro Wire bars	£98 0 0	£14 0 0 —
H.C. Wires, basis	£112 5 0	£15 10 0 —
Sheet	£138 10 0	£14 0 0 —
Bronze Electrical quality		
1% Tin—		
Wire (Telephone) basis per ton	£134 0 0	£15 10 0 —
Brass (60/40)—		
Rod basis	10¾d.	1¼d. —
Wire	13¾d.	1¼d. —
Iron and Steel—		
Pig Iron (E. Coast Hematite No. 1) ...per ton	£8 19 0	— —
Galvanised Steel Wire (Cable Armouring) basis 0.104 in.	£32 10 0	— —
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)	£334 0 0	— —
Wire, basis	per lb. 4s. 10½d.	— —
Aluminium Ingots ...per ton		
Spelter	£55 0 0	£5 0 0 —
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Prices of galvanised steel wire and steel tape supplied by O.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.

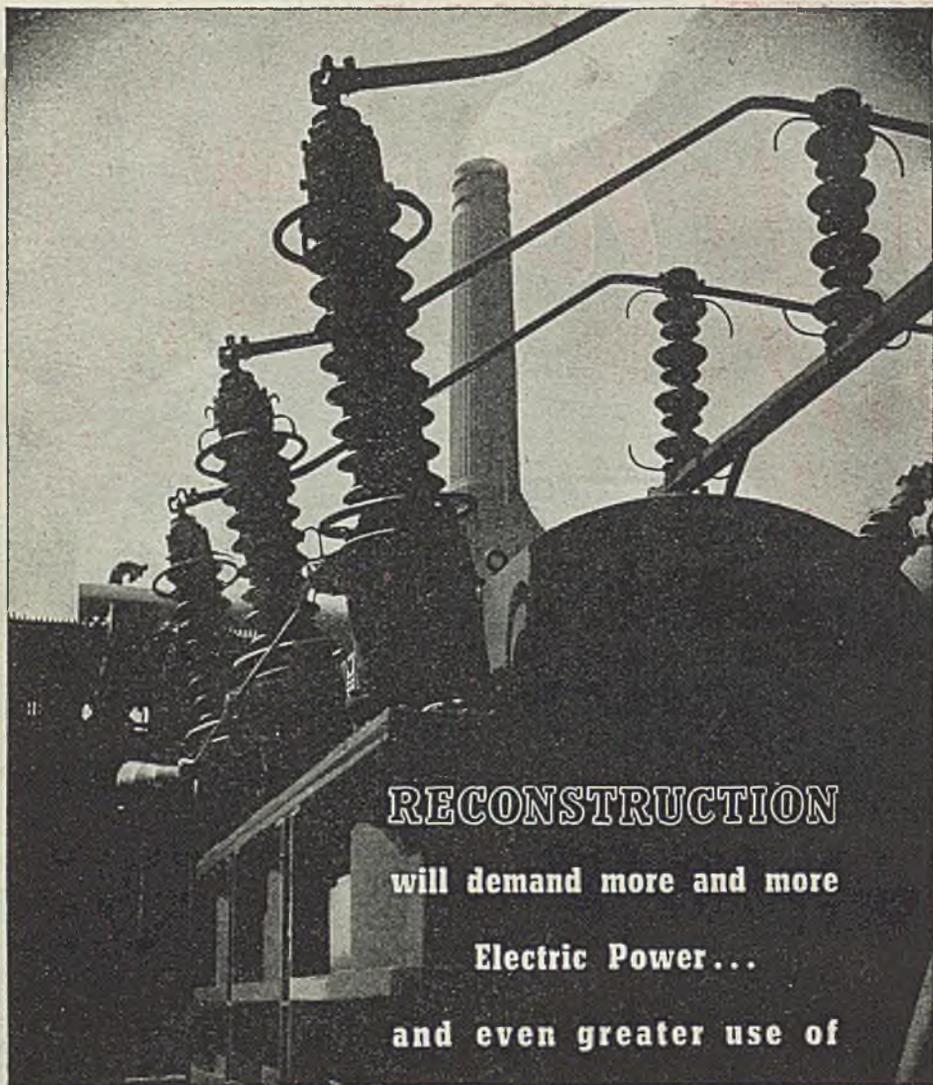
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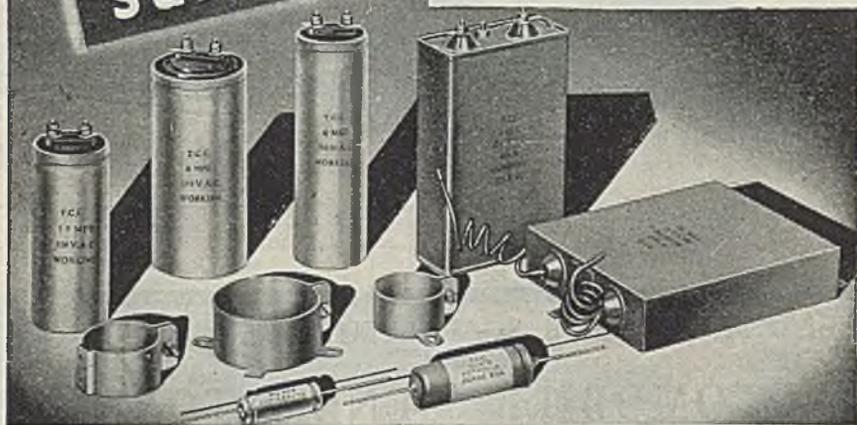
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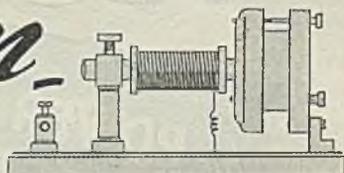
Illustrated above is a small selection of our comprehensive range of special types designed for the Continuous A.C. Working conditions encountered in this sphere. The compact cylindrical types for Power Factor Correction are housed in Aluminium containers, completely hermetically sealed, with the condenser element impregnated in petroleum jelly under a high vacuum process. The more familiar rectangular tin box patterns are similarly treated and can be supplied in an infinite variety of shapes and sizes, with convenient methods of mounting to suit designers' requirements. The "streamlining" of fittings calls for co-operation from the condenser maker, and T.C.C. Engineers are ready and willing to work with you in such matters.

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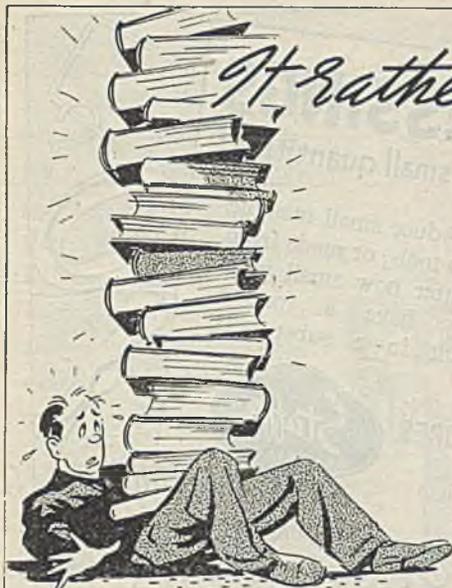
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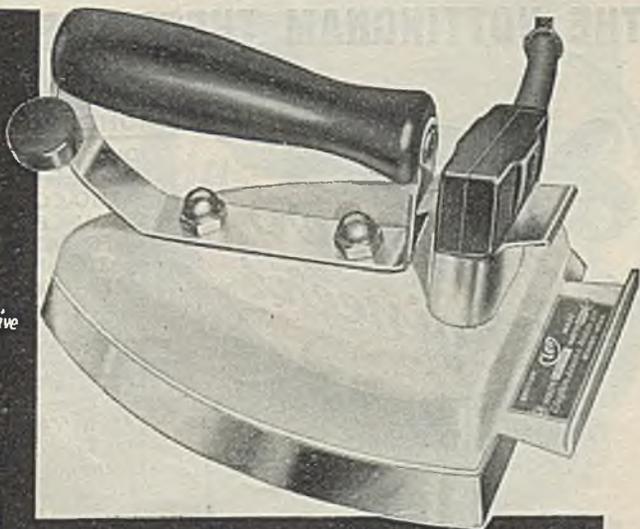
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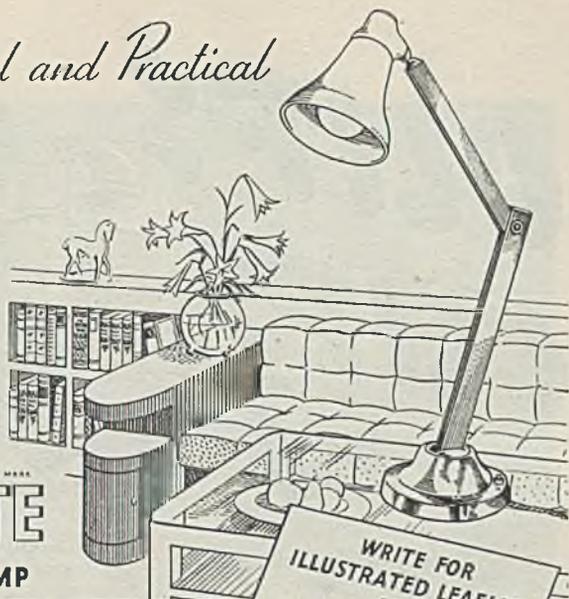
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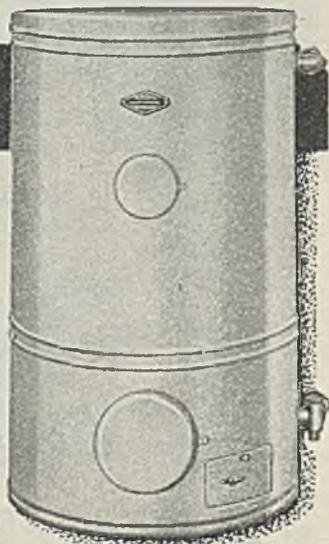
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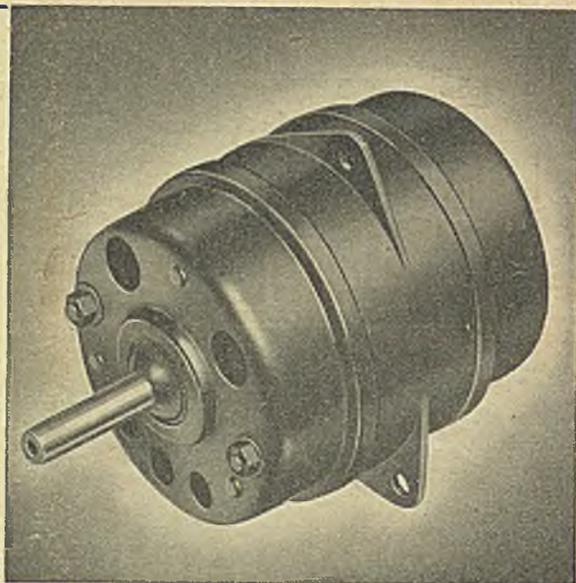
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