

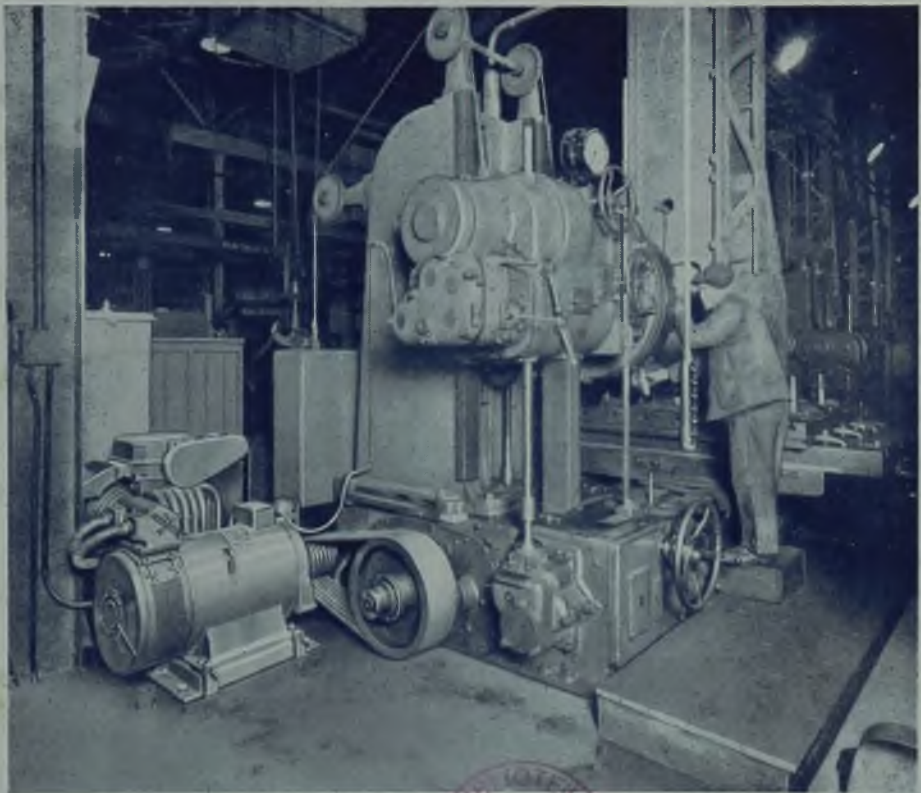
ELECTRICAL REVIEW

FOUNDED
1872

Vol. CXXXVI. No. 3505

JANUARY 26, 1945

9d. WEEKLY



PRODUCTION BOOSTER

BIBLIOTECA
POLITECNICA

An 'N-S' variable speed A.C. motor, 1450/480 R.P.M., driving Richards Horizontal Borer.

It is a fact that in numerous instances the application of an 'N.S.' variable speed A.C. motor, by enabling the speed to be adjusted instantly and exactly to the best value, has greatly improved the performance of machines of many kinds, as discerning designers and users are quick to appreciate.

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Electrical Engineers since 1883

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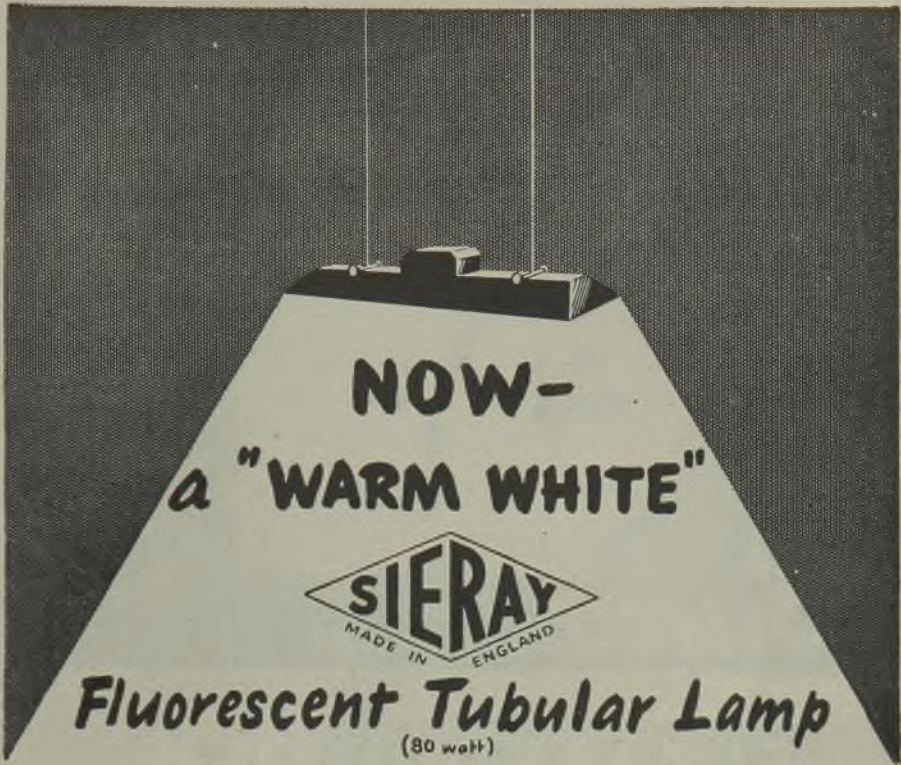
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CABLE INSULATING PAPER

The reliability of the generating plant is the same as that of its distributive cable. And the reliability of the cable is that of its insulation! That is why leading cable manufacturers use Tullis Russell Rothmill Cable Insulating Papers. Rothmill is renowned for its uniformly high quality, and is guaranteed free from metals and grit. A complete range is manufactured. Write for details.

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The two lamps are electrically interchangeable so that existing installations of Daylight Lamps can be changed over to Warm White without difficulty.

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Siemens lighting engineers are at your service, without obligation.

You are invited to send for descriptive leaflet.



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she's doing—in unusual surroundings. If, and when, the time comes to set up home she'll deserve everything that makes life easier—including a Burco, of course.

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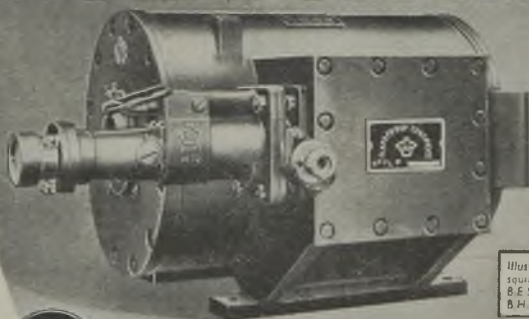
BURCO LTD.
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Burco ELECTRIC WASH BOILERS

FLAMEPROOF

MOTORS



BUXTON CERTIFIED

Illustration shows a typical flameproof squirrel cage induction motor fitted with B.E.S.A. plug & socket & I.P.C. adaptor. 1.5 B.H.P. 3-phase 50 cycle 600 volt 975 r.p.m.

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Peebles Flameproof Motors are playing an important part in the battle for fuel in a great number of mines, and are maintaining a high standard of reliability and efficiency under the most exacting conditions.

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DESIGNED FOR EFFICIENCY

BRUCE PEEBLES & CO. LTD., ENGINEERS, EDINBURGH.

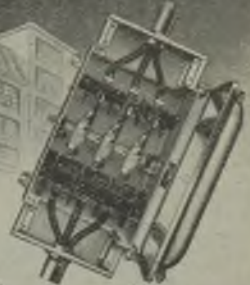
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for all factories

Bill "H.R.C." Fuse Switches
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Made for 30, 60, 100, 160, 200, 300
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Fitted for Conduit, busbar chamber
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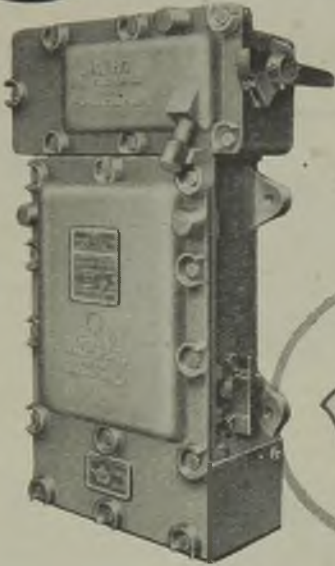
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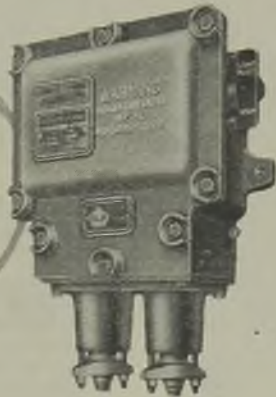


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DIRECT-ON-LINE

for motors up to
10 Horsepower
at 400/550 volts.



STARTER, with mechanically and electrically interlocked isolator, for motors up to 10 Horsepower.

Cover cannot be removed unless isolator is open.

Isolator:—

In separate flameproof chamber.

Starter can be examined with isolator open in perfect safety, and complies with Coal Mines Draft Regulation 14(iii).

STARTER (without Isolator) for motors up to 7½ Horsepower.

Flameproof Reversing Starters up to 6 Horsepower at 400/550 volts.

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A 3501

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Solve all your Fixing Problems



RAWLPLUGS

There is a RAWLPLUG for every size of screw and coach screw, from the tiny No. 3 for light wiring to the large No. 28 which will with-

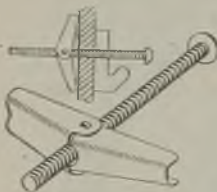
stand a direct pull of over 4 tons. Rawlplug fixing is safer, quicker and neater than any other method.



RAWLPLUG METAL PLUGS (Screw Anchors)

Specially suited for use where the plug is likely to be subjected to extreme climatic conditions. Made in sizes to take screws from No. 8

to No. 14 and lengths from 1 in. to 2 in. Designed with flange for hollow brick work and to stop plug being inserted too far in hole,



TOGGLE BOLTS

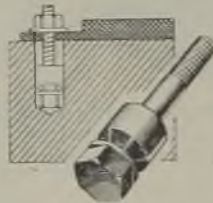
Toggle Bolts provide an ideal means of making secure fixings to hollow partition walls or ceilings, i.e. lath and plaster, asbestos board, etc., as they distribute the strain over a wide area.



RAWLBOLTS

The use of RAWLBOLTS requires the minimum of time, labour and tools. No grouting is needed. No time-lag waiting for cement to dry. Made in two types—bolt

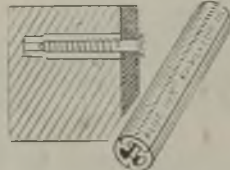
projecting and loose bolt type—they solve every bolt-fixing problem. Available with pipe clips, round and square hooks and eye bolts. Size $\frac{1}{4}$ in. to $\frac{3}{2}$ in. diameter. Standard Whitworth thread.



BOLT ANCHORS

The RAWLPLUG BOLT ANCHOR is especially designed for fixings of a specialised nature. Unaffected by atmospheric conditions it can be fixed below water if necessary. Full range of

sizes available and the anchors will take bolts from $\frac{1}{2}$ in. to $1\frac{1}{4}$ in. diameter.



WHITE BRONZE PLUGS

Specially designed for outdoor jobs where a metal plug is specified or preferred. One end of the plug is "coned" to facilitate

the entrance of the screw when it is first inserted.

B311

WRITE FOR TECHNICAL LITERATURE TO:
THE RAWLPLUG CO., LTD., LONDON, S.W.7

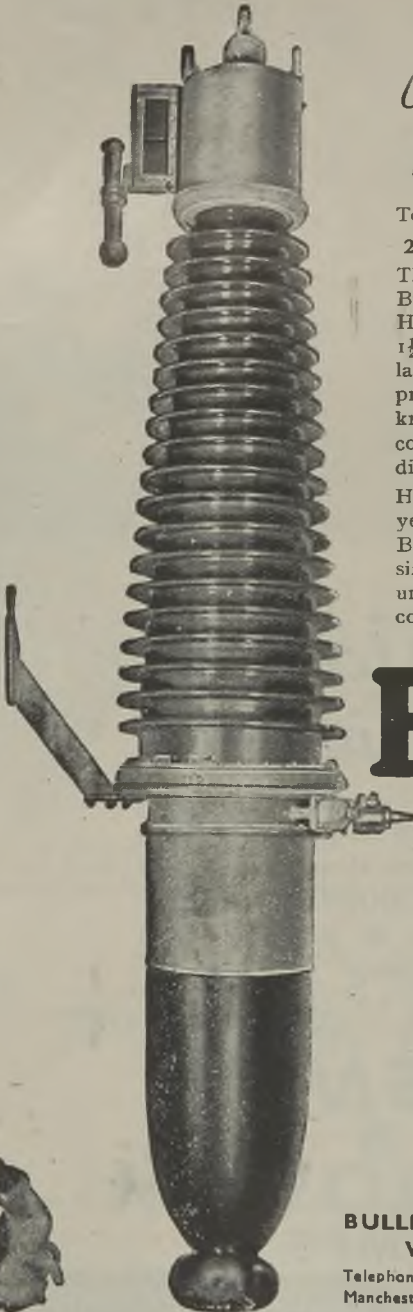


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The clear and shadowless lighting of the machine shop illustrated is provided by COSMOS LAMPS—the height of perfection in industrial lighting.

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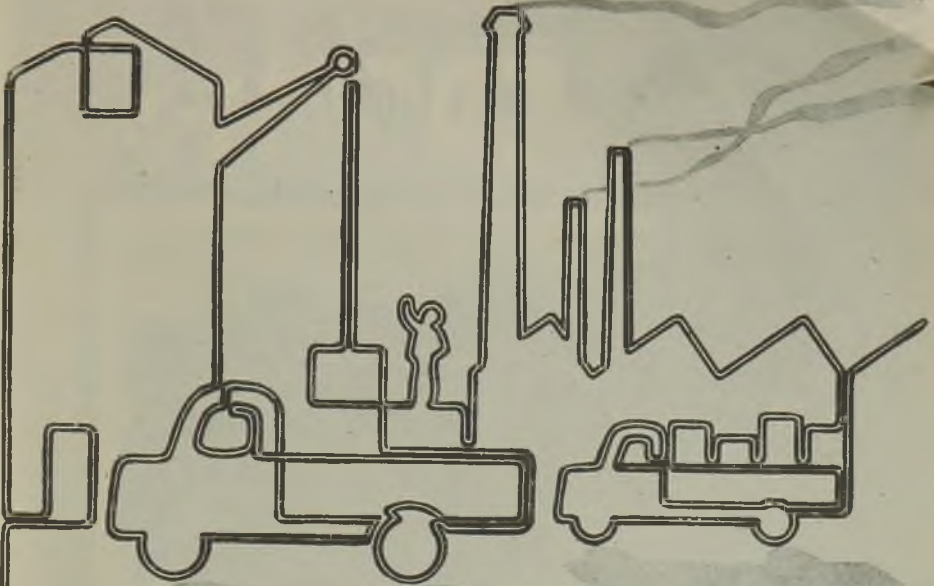
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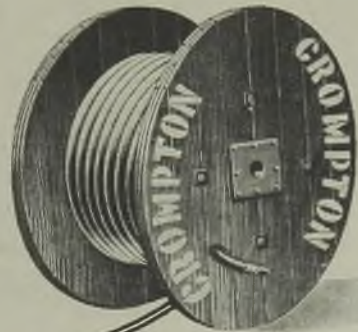
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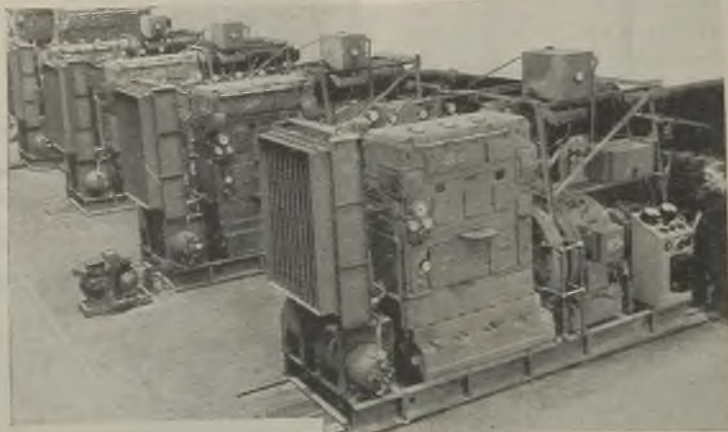
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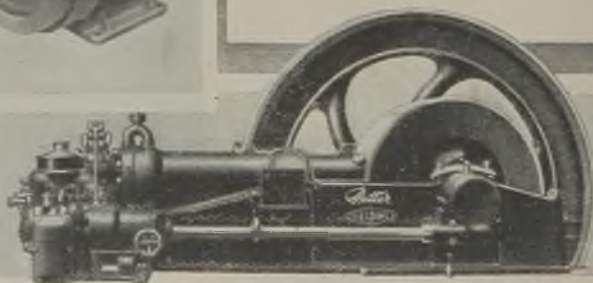


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Many municipalities and industrial concerns have adopted Petter Engines for power and electricity generation because of their proved reliability, the result of sound design and the high standard of materials and craftsmanship used in their construction.

Sizes up to 540 B.H.P.



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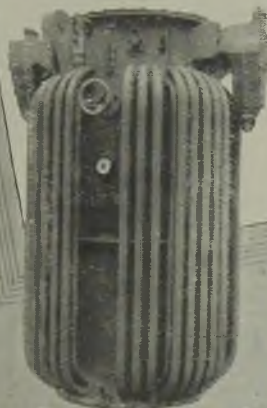
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FERRANTI Moving Coil Voltage Regulators will simplify the control of your industrial processes. Is your problem in this list or is it new?

- Voltage Stabilisation,
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Deposits of reasonable thickness may be built up, which are not possible with a tin chloride bath.

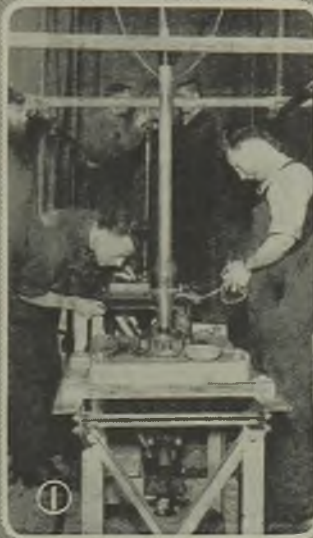
The solution also permits of a faster speed of deposition.

W. **CANNING** & CO. LTD

**GREAT HAMPTON STREET
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TERMINATIONS FOR 132 KV. GAS CUSHION CABLES

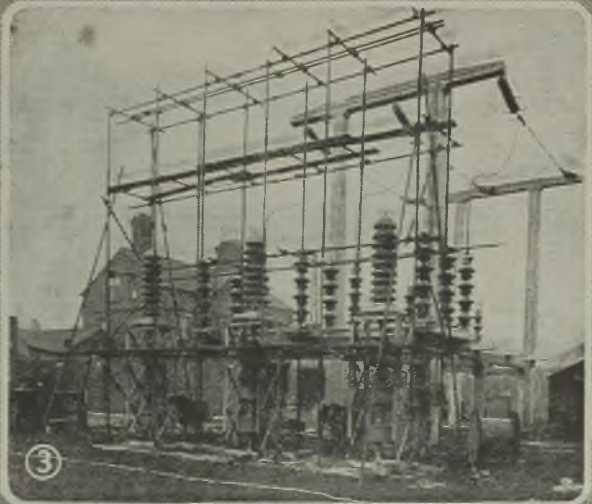
- (1) Applying lead wire to the paper stress cone.
- (2) Lowering the internal pressure assembly into position.
- (3) A circuit termination prior to removal of the shelter scaffolding.



These terminations are part of a HENLEY 132 kV. Gas Cushion Cable contract recently completed. The contract included the manufacture and laying of 6,760 yards of 132 kV. single-core cable, also the construction and installation of all joints, terminations, etc. The complete transmission system is now in commission.



HENLEY
SUPER-TENSION
CABLE
INSTALLATIONS



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FOR EVERY
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L.D.C. Weather-proof Motors, operating in the open, driving Sludge Pits.

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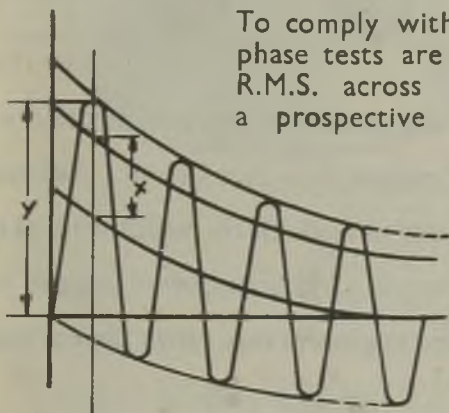
and be Safe

Illustration shows a 20-amp Type 'NS' Cartridge-fuse Link (actual size $\frac{5}{8}$ " dia.)
Type 'T' range available up to 800 amps

**'ENGLISH ELECTRIC'
TYPES 'NS' and 'T'**

**INDICATING
CARTRIDGE-FUSE LINKS**

possess a rupturing capacity of 25,000 kVA at 440 volts 3-phase, i.e. they comply with BSS88/1939 category of duty 440AC4 (A.S.T.A. certified)



To comply with category 440AC4 three single-phase tests are required each with 440 volts R.M.S. across the fuse terminals and with a prospective current of 33,000 amps

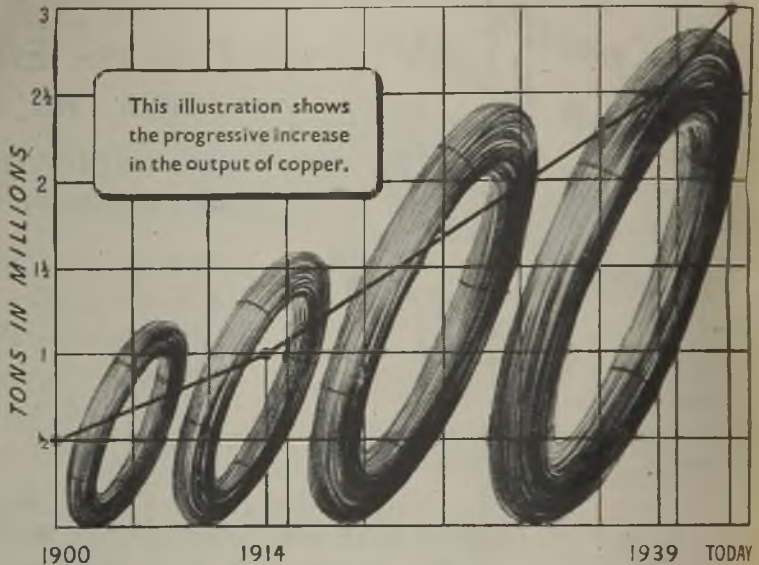
It should be particularly noted that the 33,000 amps specified is the R.M.S. symmetrical prospective current (X) not the peak asymmetrical prospective current (Y)

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and Performance the World Over*

THE ENGLISH ELECTRIC COMPANY LTD.
— STAFFORD —

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Post-war development of electrical services of every description will doubtless call for a greater use of copper than ever before. Although it may take a little time after the war to re-stock the world with all the many types of copper products required, the supply of copper will certainly be adequate, and electrical engineers may safely plan to make use of it to the fullest extent.

If technical advice or assistance is required the services of the Copper Development Association are available, free of charge.



COPPER DEVELOPMENT ASSOCIATION

A non-trading organization maintained by the British copper industry, to supply information and advice, free to all users of copper

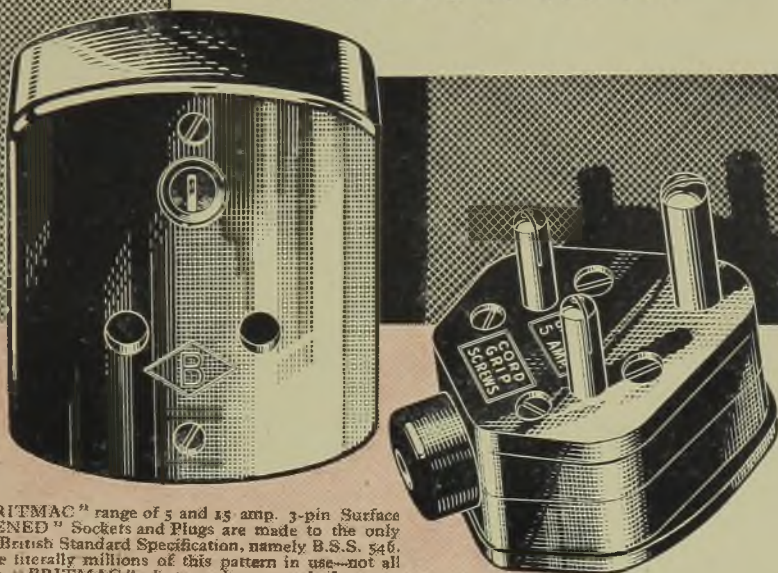
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5 & 15 AMP. 3-PIN B.S.S. 546



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Various types of Plastic Cables and Tubing available for all purposes.
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The Jackson

COOKING CABINET

Almond Slices

Ingredients.

- 4 ozs. Margarine.
- 3 ozs. Sugar.
- $\frac{1}{2}$ lb. Rolled Oats.
- 3 Teaspoonsful Milk.
- $\frac{1}{2}$ Teaspoonful Almond Essence.
- Some short crust pastry.
- Jam.

Method.

Cream the margarine and sugar. Add the oats, milk and essence.

Roll out the pastry in a long, narrow strip. Spread with jam and put the mixture on the top. Bake at 450° for about 20 minutes.

Make War Savings - at least a 800 in the £



Cat. No. 192J.

The Jackson

ELECTRIC STOVE Co. Ltd.

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great **TIMESAVER**
by **FRY'S**

Fryolux
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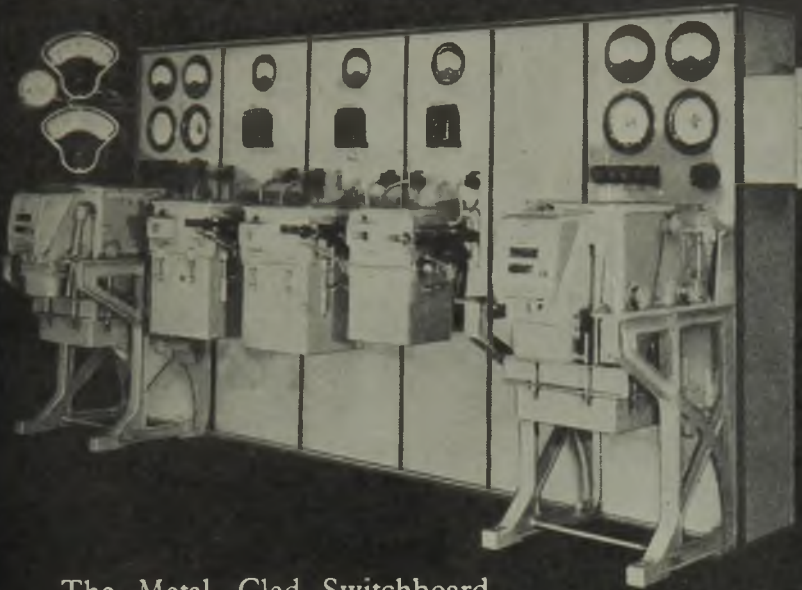
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The Metal-Clad Switchboard illustrated is a typical example of a large number supplied to Government Departments for service in Ordnance and kindred factories and for many industrial applications at home and abroad. Our Oil Circuit Breakers, which are manufactured in a range of sizes from 30 to 1600 amps. capacity, have earned a reputation for reliability and service.

Descriptive literature will be sent on request.



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STARTERS

for SLIP RING
INDUCTION
MOTORS

The sound design, good workmanship and robust construction of Ellison Starters ensure trouble-free service; freedom from break-down and give protection to plant and operators.

Many Ellison Starters have been in constant use for over 20 years and are still giving reliable service.

Learn more about these Starters
—Write for Descriptive List No. 8 r.

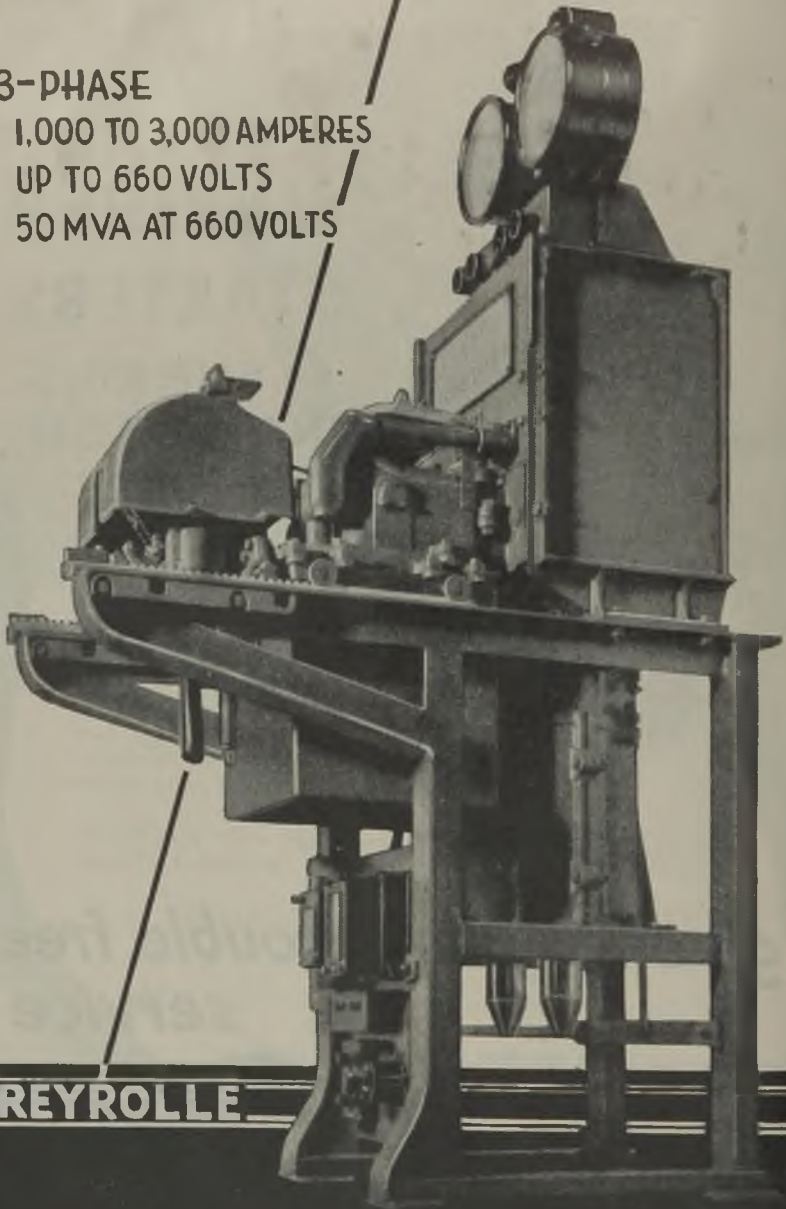
give long and trouble free service

Made for motors of up to 1,000 H.P. and possessing all the advantages of separate oil-break circuit breaker and oil-cooled rotor starter.



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1,000 TO 3,000 AMPERES
UP TO 660 VOLTS
50 MVA AT 660 VOLTS**



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Perkins Diesels demand little maintenance throughout their long life of service. Nevertheless, clean and efficient design together with accessibility are characteristics of all Perkins Diesel Units, making maintenance a simple routine matter. Reliable, economical and instantly responsive, they are to-day serving the country in a hundred different ways.

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The post-war demand will be for good houses in large numbers at reasonably low prices. How is the building industry to meet it? One thing is clear. As many components as possible will have to be factory-made on the most efficient and highly mechanised lines.

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'Meminx' Switch Splitter



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Write to us for working samples and remember: Distrene is made in sheets, rods and tubes, and in powder form for injection moulding.

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SPECIFIC GRAVITY	1.06
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COEFFICIENT OF LINEAR EXPANSION	0.001
SURFACE RESISTIVITY (24 hours in water)	3×10^8 megohms
DIELECTRIC CONSTANT 60—10 ⁶ CYCLES	2.60—2.70
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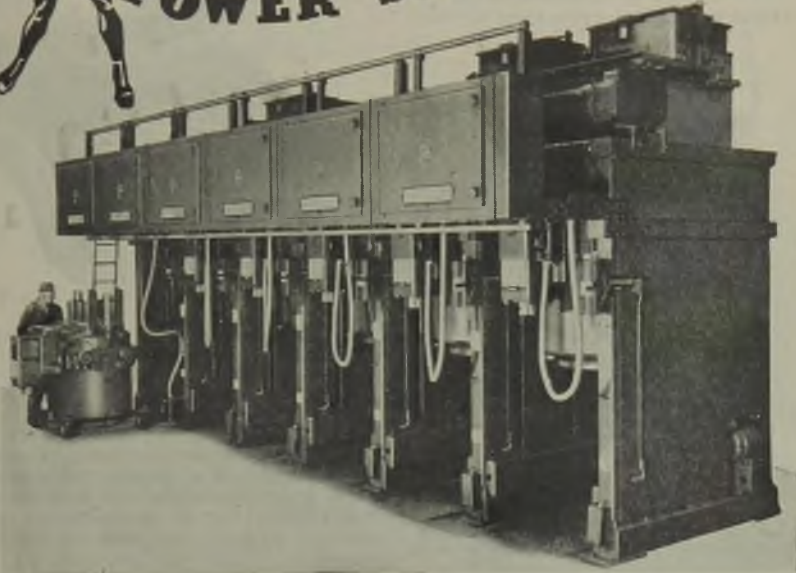
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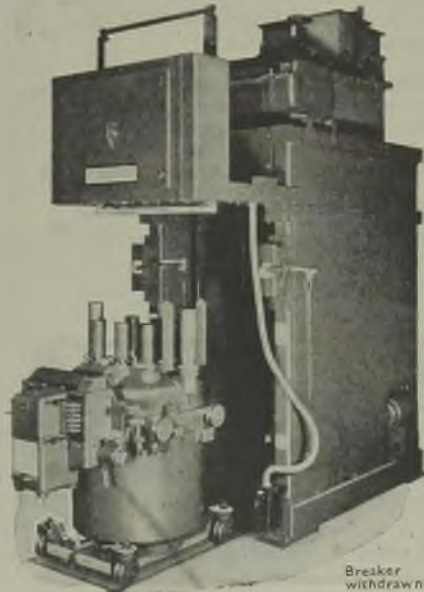
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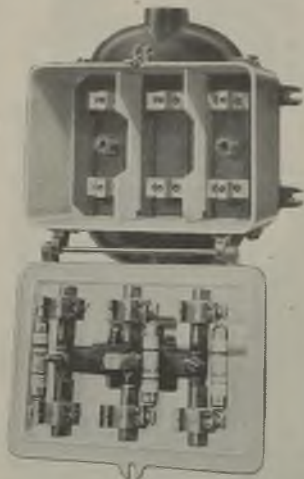
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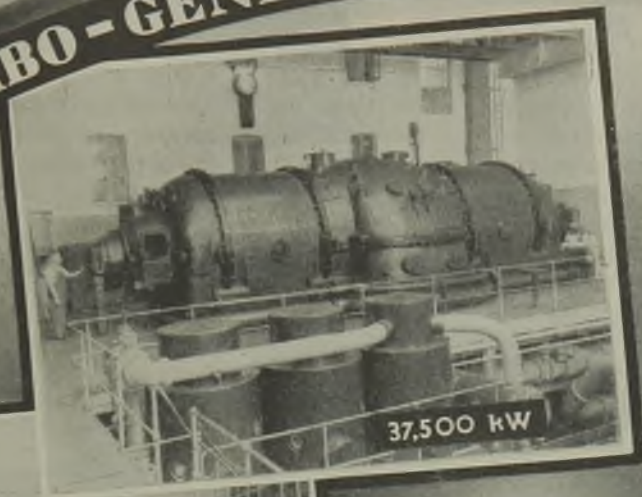
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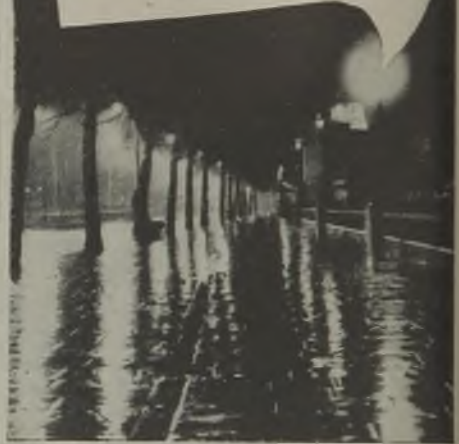
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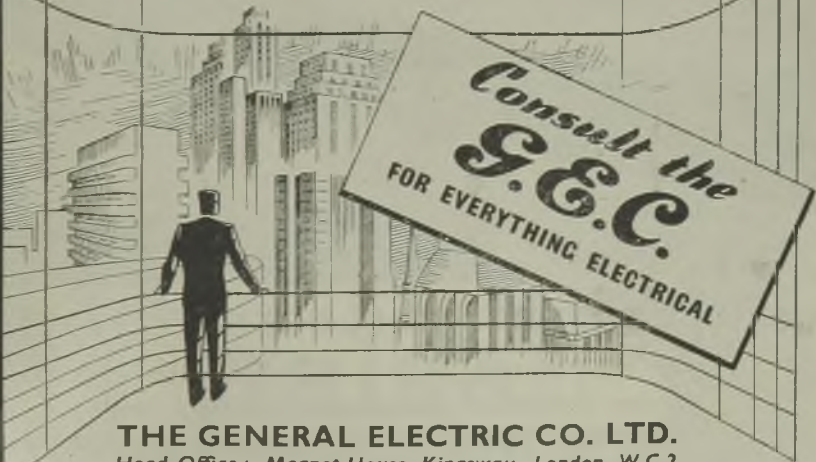
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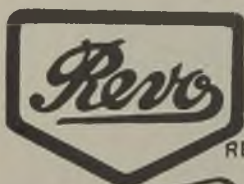
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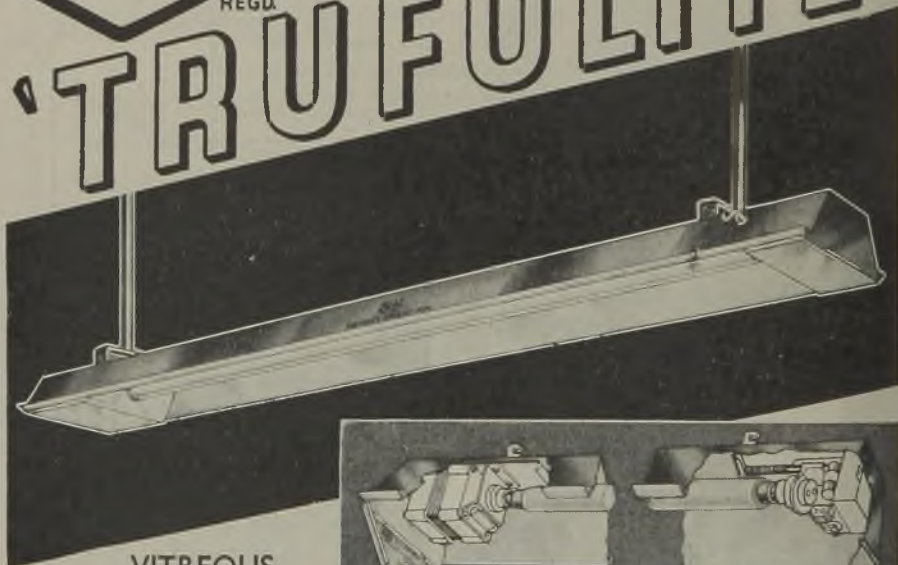
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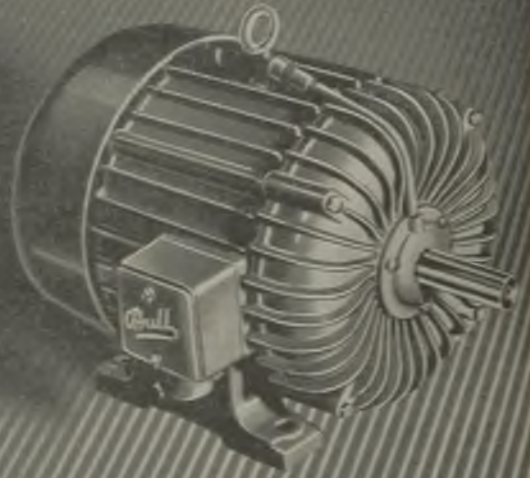
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January 26, 1945

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872



Vol. CXXXVI. No. 3505.

JANUARY 26, 1945

9d. WEEKLY

Electricity's Raw Material

Coal Quality and Prices

ADDRESSING the British Association the other day, Lord Woolton made an estimate of the vast savings that would accrue from expenditure on research into the better use of coal. Such savings cannot, however, be expected materially to affect the generation of electricity, in which progressive reductions in the amount of coal burned per kWh produced are the direct result of well-established research into combustion problems.

From this angle the most profitable form of research concerns methods not of use but of production, especially coal preparation, on the lines discussed by Dr. R. Lessing in an analysis presented before the Institute of Fuel last session. Small coals naturally provide the greatest scope for investigation.

Big Cost of Small Coals

It may be considered a fortunate chance that the electricity supply industry not only is the largest purchaser of industrial coal, as Mr. Harold Hobson stated at the Fuel Luncheon Club last week, but also has devised a technique for burning coal of a type that once had negligible commercial value. Had the original pit-head prices merely followed the upward trend of commodity prices generally, much less would have been heard, we believe, of the manufacturing advantages possessed by countries having greater water-power resources.

As matters stood at the outbreak of war, the rise in price of coal was appreciably greater to public generating stations than it was to the domestic market and it was more

than enough to nullify the benefits derived from improvements in design and operating technique, from which electricity consumers would have benefited. Since then flat-rate increases per ton have penalised users of low-grade fuels (and very low-grade they are) by reducing the price margin between them and coals of better quality.

Purchase by Specification

The main concern of the electricity supply industry is how far present anomalies will persist in the future. Gallant as is the record of war achievements of the Central Electricity Board and its partners in the grid—the supply undertakings—that Mr. Hobson presented, the part of his address to be regarded as the most momentous by our forward-looking industry relates to the fuel situation after the war. Attention is more particularly directed to his cogent plea, reported elsewhere in this issue, for a rational scheme under which coal would be purchased to specification and at prices closely connected with its BThU value. Detailed designs for generating plant required to meet the load three to five years hence must be settled now; hence the urgency.

Mr. Hobson showed himself not unappreciative of the difficulties of the coal industry, and it is to be hoped that the kind of experiences related by Dr. E. S. Grumell at the previous Club meeting are matters of the past. He told how the immense resources of the I.C.I. were to be used to back investigations into the combustion of slacks of high-ash-content, coke

breeze, slurry and dry fines—all waste or near-waste products. As a consequence of stiff increases in prices, however, it paid his concern handsomely to revert to washed graded fuel. Research, if it is to become more than a catchword leading to disillusion and apathy, must be directed into the most gainful channels and implemented by the will and organised ability to make the utmost use of its results.

The Last Straw

WE reported last week Sir John Dalton's reference to the loyal co-operation of electricity undertakings in accepting inferior fuel. Some measure of the cost they incurred in doing so was indicated by the 300,000 kW mentioned last week by Mr. Harold Hobson as the resulting deficiency in generating capacity during this winter's cold spell. This means that the costs per kWh are inflated on account not only of the paucity of heat units to the pound but also of the capital charges on additional plant that will be necessary to provide against recurrent anxiety of this kind. On top of this there are the much heavier maintenance and operating costs entailed in greater wear and reduction in efficiency of the larger number of boilers required to steam.

More Light

IN its Lighting Service Bureau E.L.M.A. has managed cleverly to avoid

the glare of naked publicity while still not hiding its light under a bushel. The way in which for many years past it has educated the industry and the public in correct lighting methods is a good example of enlightened self-interest. The Bureau sells light, not lamps; even if people outside the Association benefit it still thinks the work worth while. Some indications of its post-war aspirations are reported on another page.

Technicians and Craftsmen

THE liveliness of the interest that is being taken in the future of the electrical profession and industry is demonstrated by the keenness of the discussion on further education which was opened by Sir Arthur Fleming at the Institution of Electrical Engineers last week and by the need to allocate a second evening to the subject. It was truly stated that by far the most important raw material in industry is the human and that arrangements for the

further education of craftsmen in particular cannot be delayed without seriously prejudicing post-war industrial prospects. Yet delays are inevitable under the new Education Act, partly due to the difficulty, owing to a variety of causes unconnected with our industry, of settling the date for raising the school age. The feasibility of securing release for part-time study on one (or possibly two) days per week for technicians and craftsmen as an independent measure merits consideration.

Part-Time Education

THE division of students into three categories—professional men, technicians and craftsmen—is a realistic acceptance of existing conditions. It will probably be generally acceptable, provided full escalation facilities are given and due allowance is made for late development of good material. There is also the question as to whether part-time education alone is enough to produce engineers at the professional level, with which is wrapped up the need to provide full-time university education for suitable candidates, irrespective of individual financial circumstances. A final consideration is that the number of entrants desirable depends on the ability of the electrical industry to absorb them, but in this an optimistic outlook is likely to be warranted.

Rural Electricity

A MEMORANDUM which the Ulster Farmers' Union has submitted to the Government of Northern Ireland asks the Government to accept the principle of supplying electricity to the rural population on the same terms as to town dwellers. This policy has already been adopted in Tasmania with results that can hardly be described as encouraging. A report by the Hydro-electric Commission shows that even with a 75 per cent. grant extensions to supply the rest of the consumers in rural areas will entail a considerable drain on the Commission's resources. This is on the basis of past experience of the use which such consumers make of the supply when they get it. Given a willingness, and the necessary standard of living, to make full use of the service when it is provided, the result could be a much more attractive proposition from the supply authority's point of view.

Bombed Power Stations

Speedy Repairs Minimise Shut-downs

SO long ago do the days of the 1940-41 "blitz," with the subsequent minor and "hit-and-run" raids, now seem that, especially since the V-bomb attacks began, interest in happenings at that time has inevitably waned. Several articles on damage to electricity supply systems appeared in the *Electrical Review* while the raids were still a frequent occurrence, though at that time security reasons prevented our referring to specific undertakings. With the recent easing of the censorship restrictions, however, it occurs to us that a few of the most serious incidents affecting power stations may at least have some historical interest.

Considering the number of bombs dropped it is surprising how very few stations sustained damage of any very great severity and how little supplies have been interrupted. What shut-downs there were have been of remarkably short duration and, thanks to the exertions of all concerned, repairs have been effected in the minimum of time.

Some Londoners may possibly remember Monday, September 9th, 1940, as one of those extremely rare occasions during the "blitz" when the electricity failed. The failure affected a very wide area but, thanks to the grid system, supplies in most cases were

honour of being the first of the very few power stations to be completely "knocked out."

Four of the bombs, though unfortunately killing three men, did comparatively little damage to the station, falling in the river opposite the jetty, on the switch house (this one failed to explode), on the Home Guard room and on a five-ton hoist in the loading bay. The fifth and sixth, however, fell through the glass laylights in the roof of the turbine house and apparently, since there was no crater, exploded in mid-air between two sets. This put all of the turbo-alternator sets out of action, as well as the house set.

Taking stock that morning the picture was one of almost indescribable chaos. In those days no protection of any sort was provided for the turbines, and fragments of the bombs had rent and pitted the machines in hundreds of places. The steam pipes had been splintered with the consequent release of the steam and water, while the oil system had been damaged and the oil from it was ablaze. Cables had been cut, burnt and torn from their supports and there was a transformer alight. (Hoses had to be played on it for three days before the fire was put out.) Great damage was done by bomb fragments to the 120-ton overhead



How two of the turbines at Fulham looked when the debris had been cleared away after a bomb had exploded between them

restored in a very few minutes and practically everywhere within twenty-four hours. The cause of the breakdown of supplies was a "stick" of six bombs on Fulham power station, which thus claimed the doubtful

crane, as well as to the structure of the building generally. The roller steel gates of the turbine room were blown right across the street. There was debris everywhere.

The position looked rather hopeless, but

Mr. W. C. Parker, the borough electrical engineer, and his staff set to with a will to clear up the mess. With the oil fires under control (the power station's own fire pumps had had their petrol tanks punctured and were useless), the first step—and no simple one either—was the removal of the debris and the drying out of the building and plant so as to judge the actual extent of the damage. In those early days of repair, progress was much handicapped by the fact that there was no roof on so that night work had to be carried on with the aid of local lamps only. Soon, however, a concrete roof was provided.

Almost unbelievable jobs were done on site. Every piece of machinery had to be stripped right down. Thousands of electric welds were made: forty-four were required before the vitally-needed 120-ton overhead crane could be put into commission and there were over sixty in some of the stanchions. Scores of welds, too, including some very extensive ones, were carried out on the turbines themselves. Considerable repairs were needed to the alternator beds and to pipework, and large holes in the flooring had to be filled in. Pieces from one set were "borrowed" to complete another, while to

being bombed practically every night, came almost exactly two months after the incident, when on November 11th the first turbine was returned to service. Ten days later the house set was in use again, so that the station was well on the road to recovery when the late Duke of Kent paid a visit of inspection on December 5th. The



The l.p. cylinder of one of the Fulham sets

second turbine was in service by December 22nd and a machine being constructed at the time of the bombing was put on load on March 24th, 1941. With the completion of repairs on the last machine in September the station was operating to full capacity. Though a number of minor faults attributable to the bomb developed from time to time, some as long as two years after the bombing, the plant does not seem any the worse for its experiences and has been operating satisfactorily ever since.

The borough electrical engineer, Mr. W. C. Parker, in giving us the foregoing information, remarks upon the high endeavour and strong sense of duty of the whole of the undertaking's employees. He also commends the manufacturers for their help and speed in providing

material which made it possible to restore the station to service within a time that appeared at first to be an impossibility.

At Croydon

Croydon, the most flying-bombed borough, was also the first district in the London area



The damaged h.p. cylinder and governor gear of one of the Fulham turbines

avoid completely dismantling the turbine blading, bits of blade were carved off the ends to balance pieces chipped out by the bomb.

The first-fruits of the repair work, maintained for seven days a week, twenty-four hours a day, at a time when London was still

to receive the attention of the Luftwaffe in the 1940-41 raids. In one of these, on Saturday, October 26th, 1940, a high-explosive bomb fell on the power station, hitting a steam pipe in the steam receiver annexe between the turbine room and the boiler house.

Several of the ten-inch steam pipes were completely severed, resulting in the loss of the whole station's steam supply and shutting down the 25,000-kW, 30,000-kW and 7,000-kW sets which at the time were carrying a load of 20,000 kW (the 30,000-kW set was about to be taken off load). The Croydon load was taken up immediately by the grid with only a slight surge.

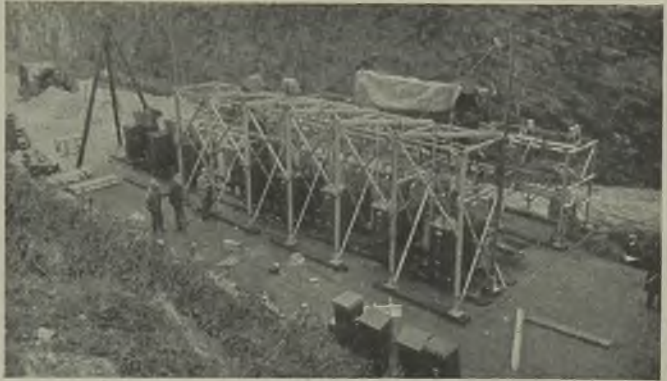
All hands were called out at dawn to clear away the debris and pump out the turbine-room basements, which were flooded owing to fractured water, condensate and other piping. By mid-day steam was raised on the four 50,000-lb. per hr. boilers and at 2 p.m. one 12,500-kW turbo-alternator was put on load. At 3.20 a second 12,500-kW set was in operation, followed soon afterwards by the 30,000-kW and 7,000-kW sets. The 25,000-kW set, however, needing the replacement of steam pipes, together with the making good of considerable other damage, was out of action for nearly three months.

Rapid Restoration at Plymouth

An example of the importance of planning ahead was provided at Plymouth when, during a heavy raid on the night of January 13th, 1941, a high-explosive bomb fell upon the main 6,600-V switchgear, totally wrecking most of it and starting a fire. This made the whole network "dead." Once the fires were under control, connections were made with a large private generating plant and soon after 10 p.m. the following day the most vital service supplies had been restored. Supplies to three hospitals and the telephone exchange given by the following morning absorbed the whole of the remaining available output of the private generating plant.

Since it was realised that the power station

could not be run for some time owing to the lack of auxiliary supplies and that supplies from the grid could not be utilised through the usual channels, steps were immediately taken to get to Plymouth the necessary "pool" gear and to carry out a pre-arranged plan to restore supplies pending completion of the "pool" gear. The plan was based on the fact that, whilst the city's e.h.v. network operated at 6,600 V, there was superimposed a 33,000-V system. This consisted of two step-up transformers fed from the 6,600-V switchgear and feeding through step-down transformers into the 6,600-V network at two substations in the centre of the area of supply. The procedure consisted of the direct connection of the 6,600-V cables feeding from the 33,000-V transformers forming part



Temporary "pool" gear set up adjacent to the Plymouth power station

of the above-mentioned superimposed system.

The amount of work involved will be realised when it is explained that each phase connection consisted of two cables, consequently necessitating twelve joints. Nevertheless, all the work, including phasing, for the energising of the first of the two circuits was completed exactly twenty-four hours after the damage occurred. The jointing of the second emergency connection was completed within another twenty-four hours, making it possible for the station to carry its maximum load.

This was, of course, only a temporary measure pending the commissioning of the "pool" gear, for the erection of which a road adjacent to the generating station was temporarily closed. Simultaneously arrangements were made for the carrying out of repairs to the switch-house. Much of the switchgear was usable after overhaul, but

some had to be replaced. The completion of the rebuilding work occupied several months and the gear was recommissioned in three sections, the corresponding sections of the "pool" gear being taken out of service.

Portsmouth's Worst Experience

At Portsmouth, of the fifty or so high-explosive bombs which fell in the immediate neighbourhood of the power station, six actually hit the plant. The worst damage occurred on January 10th, 1941, when there was a direct hit on the turbine house. This penetrated the concrete of the turbine house floor and exploded about 9 ft. in the ground beneath. The alternator foundations of the 30,000-kW set were shifted about 5 in. out of line, three turbine-house stanchions were shifted out of line and one 10,000-kW set was extensively damaged. Long lengths of circulating water piping were destroyed, leading to flooding and immersion in sea water of all the auxiliary condensing plant motors in the basement. The roof was blown off and windows were blown out and all the plant was covered with thick mud.

At the same time the 33-kV control room was badly damaged and completely put out of action. In spite of the extensive damage there was only one fatal casualty on this occasion.

Each of the three separate connections to the grid had received a direct hit, but there was a chance of getting some supply through an industrial establishment which had a connection to the power station and an emergency connection to the grid. It was found, however, that this connection also had had a direct hit. Supply ceased at 7.5 p.m. on December 10th and the first reconnection to the grid took place at 5.20 a.m. on January 13th. Considerable ingenuity was shown by the C.E.B. engineering staff and the electrical staff of the undertaking in fixing temporary control gear. From this time the load was gradually built up again.

Some 60 per cent. of the mains system was put out of action by hits on underground cables and over 1,000 openings had to be made in the streets to repair them. About three weeks elapsed before the last consumer was reconnected, though a large proportion of them were connected again within a week. Great help was rendered by men of the Navy, the Army, and by skilled men from neighbouring undertakings. The repair work to the turbine plant gave considerable difficulty. The 30,000-kW alternator foundations had

to be rebuilt from the ground. The bomb crater was sheet piled and filled with concrete. Work was well under way with re-erection when a bad crack suddenly developed in the steam end foundation, which had not been replaced and one machine again had to be dismantled.

On March 10th, 1941, the inside of the turbine house again received a direct hit. This time, however, the bomb hit the wall before reaching floor level and caused superficial damage only. Unfortunately the connections to the grid were also cut at this time and a complete cessation of supply occurred from about 11 p.m. until 2 p.m. the following day. Hundreds of incendiaries fell on the power station, but those that penetrated the turbine house and boiler house caused no damage, thanks largely to the temporary roofing of Durasteel which protected the vulnerable parts of the electrical gear. At different times very considerable damage was done to superheater tubes, boiler tubes and steel ducting which were awaiting erection in the adjacent yards on extensions. Three other direct hits on the circulating water system and one in a transformer enclosure did little harm.

Daylight Attacks on Brighton

Situated right on the shore of the English Channel, the Southwick power station of the Brighton Corporation naturally came in for a good deal of attention and was in fact one of the few stations which was deliberately attacked in daylight. All the raids, which were by low-flying aircraft, occurred between 5 and 6 p.m., with the exception of one which was just after 6 a.m. Damage was caused on six occasions and altogether over fifty high-explosive bombs fell on or near the station. Despite this, the station never had to be relieved of any load and was never shut down, largely because the boiler-house is arranged in two sections at opposite ends of the building and it has been the practice to have steam up in boilers in both ends.

In the first three attacks, on November 9th and 13th, 1940, and April 24th, 1942, damage was insignificant, though on the second occasion the Germans reported that "Brighton power station had been destroyed." Considerable damage was, however, caused on May 12th, 1942, when two high-explosive bombs were dropped at the south end of the boiler house, killing one man and injuring five others. The structure of the main block of the boiler house was

seriously affected, the chemist's laboratory, offices, instruments and other equipment were destroyed, but the boilers themselves did not seriously suffer and after complete cleaning down and overhaul both were in full commission again by the following August.

A month later, on June 16th, two more bombs hit the administrative offices on the north side of the station and the wharf on the other side of the harbour. The first bomb destroyed the power station superintendent's office, drawing office, correspondence office, telephone switchboard, blacksmith's shop and part of the fitters' shop and also the temporary chemists' laboratory replacing that knocked out the previous month. All records and drawings were completely destroyed and l.v. distribution to the adjacent areas of Portslade and Aldington was temporarily interrupted. The second bomb affected the marine cables, one of which had to be abandoned.

It was, however, in the most recent incident, August 24th, 1942, that the greatest amount of damage to the plant itself was done. Then a bomb penetrated the concrete structure of the precipitation plant for No. 12 boiler, destroying one precipitator completely and damaging three others, two badly. The flue ducting of all four boilers was badly buckled and in some cases destroyed, all the lagging was damaged or blown off, and the supply cables to the precipitators and the induced draught fans were damaged. The base of the 250-ft. chimney was badly chipped. There were seven casualties, four to the undertaking's staff and three to the contractors' staff, one of them being fatal.

Damage at Grimsby

Grimsby has had a large number of air attacks, mostly comparatively brief, many of them causing damage to mains and services. Two of the raids were heavy and on both these occasions the power station was slightly damaged and the damage to the distribution system was widespread.

In June, 1943, in the first of the heavy attacks, three large phosphorus bombs fell on the generating station premises. One of these crashed through the roof and exploded in the turbine room, breaking gratings and throwing metal in all directions. Happily the incendiary mixture (rubber and phosphorus) did not ignite except for one portion on a running rotary convertor. This was promptly stopped and the fire extinguished with an asbestos blanket by a switchboard

attendant. A second similar bomb set a cycle shed afire; this was effectively dealt with by the works fire guards. The third fell in a concrete bunker and did no damage.

In this raid many houses were demolished or damaged and it was necessary to cut off supply from a number of streets during the day to facilitate cutting out of damaged or dangerous mains and services. Supply was restored to all habitable premises except fifty-one before nightfall.

In a second heavy raid, in July, 1943, a high-explosive bomb fell near the power station and broke all the windows on one side and damaged roofs. In this attack six 6,600-V feeder cables were severed and supply was cut off from a part of the town, but was restored within three hours.

We have to thank the engineers of these undertakings for the information given in this article:—Mr. W. C. Parker (Fulham); Mr. F. N. Rendell Baker (Croydon); Mr. B. Handley (Portsmouth); Mr. H. Pryce-Jones (Brighton since April 1st, 1943, succeeding Mr. W. N. C. Clinch); Mr. H. Midgley (Plymouth); and Mr. G. W. Parker (Grimsby). At the same time we would pay a tribute to the gallant way in which they and their staffs stuck to their posts and surmounted difficulties of sometimes appalling proportions.

Next week we intend to deal with the Greenock station which was badly damaged in May, 1941, when the engineer, Mr. D. McDougall, lost his life.

Recovery at East Ham

AN improvement in the financial position of the East Ham Electricity Department enabled the Council in 1943 to increase the cash discount from 2½ to 5 per cent. and reduce the wartime surcharge from 20 to 10 per cent. Nevertheless, the accounts for 1943-44 which we have received from the engineer and manager (Mr. G. W. Ablitt) record the largest net profit for a good many years—£14,077 against £1,767 in 1942-43. In view of this satisfactory result reductions have been made in the charges for prepayment supplies to come into force on February 1st. (Code B lighting rate is reduced from 4d. plus 10 per cent. to 3½d. plus 10 per cent. and Codes H, J and K are also modified.)

The total number of kWh sold increased from 30,436,000 in 1942-43 to 32,136,000 last year, while revenue rose from £229,913 to £232,450 although the average price received fell from 1.813d. to 1.736d. Bulk supply costs increased from 0.722d. to 0.735d. per kWh sold, but this was more than offset by economies in other directions, chiefly reduced sinking fund contributions, and the overall operating cost (excluding public lighting) decreased from 1.291d. to 1.260d.

Coal and Electricity

Adverse Effects of Poor Quality

AT a gathering of the Fuel Luncheon Club on January 18th, Mr. HAROLD HOBSON (chairman, Central Electricity Board) said that the electricity supply industry was the largest single industrial consumer of coal. Since 1913 the output of electricity in this country had doubled itself every seven years, and in 1941 was about sixteen times what it was when we entered the last war. Concurrently there had been a steady improvement in technical efficiency which, up to about 1938, kept pace with increasing prices of coal and was therefore accompanied by a steady downward trend in the price of electricity to the public.

These tendencies received a marked fillip with the coming into operation of the C.E.B. system in 1933 as the result partly of interconnection and partly of economies achieved by power-station owners because of the resulting large scale of their working. This reorganisation had contributed materially towards enabling the industry to meet the strain of the war.

Many of the new war factories were erected far from existing load centres, but practically all the power required was supplied from the public mains. He knew of no case in which the starting up of a war factory had been delayed for lack of electric power, although with machine tools from America it could be equipped much more quickly than a power station could be built or an existing station could be extended. A shrinkage of demand in the London area had provided a substantial surplus capacity there, and this was transmitted to South Wales, where war demands were far in excess of local capacity, by running three main grid lines.

In January, 1941, the high-voltage switchgear and generating plant at Plymouth was completely demolished in an air raid. Eleven panels of outdoor switchgear were despatched from the nearest store of the pool of spare equipment which had been provided by the Board at a cost of £3 million. Substantial supplies were resumed within forty-eight hours, and the whole work was completed in under a fortnight. In the same year Greenock power station and the adjacent grid substation received a direct hit. With the aid of a 20,000-kVA transformer and switchgear from the pool full supplies were restored

within five days. In September, 1940, the engine room of Fulham station was gutted by high explosive bombs cutting off 180,000 kW of plant, but except to the local distribution system the supply was fully maintained everywhere.

The effect of enemy action on grid overhead lines had been almost negligible, the proportion of prolonged interruptions being very small because of the rapidity with which they could be put back into service. The only lengthy repair (which took several months) was when an unexploded A.A. shell fell on a 132-kV buried cable.

On the outbreak of war the trend towards greater fuel efficiency was reversed until the middle of 1941, when it again improved, but only to the 1939 level, whereas since then more than two million kW of new and comparatively efficient generating plant had been installed. The most important single cause of the failure to attain commensurate efficiencies was the quality of coal available.

When a boiler plant was operated with coal having different characteristics from those for which it was designed there was a reduction not only in efficiency, but also in output. This reduction of boiler availability represented a loss of about 300,000 kW throughout the country. Deterioration in quality had often been quite inconsistent, so that boiler plant could not be structurally altered to burn a different type of fuel, nor could an operating technique be evolved which would improve efficiency with different grades of fuel.

Prices for Graded Qualities

Flat-rate increases had distorted the pre-war relationship between the prices of fuels of high and poor qualities. The electricity supply industry had spent many millions sterling in research work and in providing boiler plant designed to burn low-grade fuels. It had paid to do so and it had resulted in low prices for electricity to consumers, but there was not a reasonable return on that investment to-day.

The £90,000,000 programme for three million kW of power station plant could not be planned by the Board so as to increase maximum overall economy of production because no real information could be obtained as to price and quality of coal after the war. Therefore he urged the coal industry, immediately slightly more settled conditions prevailed, to evolve some scheme for selling its products to reasonably accurate specifications and grading its prices to reflect differences in quality.



Mr. H. Hobson

Radio Industry Council

Inaugural Luncheon in London

THERE was a gathering of nearly five hundred at last week's inaugural luncheon at the Connaught Rooms, London, of the Radio Industry Council. MR. F. B. DUNCAN (Electric & Musical Industries, Ltd.), chairman of the Council, who presided, said that the radio industry's achievements rounded out to the credit both of the industry

That experience of television technique in the industry had also helped largely to provide the scientists, engineers and tradesmen who had made it possible to operate the laboratories, factories, and the big technical units which were now serving in the armed Forces.

In one supremely critical year the radio industry had to move simultaneously in two directions. From every section and branch of the industry trained personnel were demanded for the Forces to maintain and operate Service gear, and to train yet more thousands to do the same work. At the same time it had to take in novices and train them to fill the depleted ranks, not only man-for-man, but much faster, for by 1942 the industry was two and a half times its 1939 size. The growth had not only been in personnel and factory space, but in complexity of method and machinery as well.

Radiolocation gear enabled men on the ground to detect and plot the course of enemy aircraft miles away. The enemy suddenly realised that the British nation was one scientific jump ahead of him. Every anti-aircraft gun-site and every searchlight in this country was equipped with special type radiolocation which reduced the human error in sighting. Mr. Duncan stressed the fact that British naval vessels were the first



itself and of British prestige.

Radio communication originated in these islands. It seemed to have been forgotten by many that British broadcasting was started (in 1922) by half a dozen commercial firms, not to make profits, but to found a fresh industry and develop a new art whose ultimate effect on human existence could then only be appreciated by a few visionaries. It was the British radio industry that produced (in 1937) the installation which broadcast television as a public service in England before any other country in the world had commenced to do so.

The industry believed in television, although it knew that in the early stages it could not recoup the investments that it was necessary to make; but it was in line with the spirit of leadership to use its resources to support the new development in the clear view that it would eventually add greatly to the renown of British radio and, later, mean considerably expanded employment in the country.

The expanded scientific and manufacturing structure which had been laid down by television, combined with the great work done by the Services in the application of those principles to war needs, made possible the use of radiolocation gear which had helped this country throughout the war.



Top: Mr. F. B. Duncan and Sir Stanley Angwin (Engineer-in-Chief, G.P.O.). Centre: Sir Robert Renwick. Below: Lord Hankey and Mr. E. E. Rosen (Ultra Radio)



in which dead-accurate gun-laying was assisted by radio beam. In 1941 an Italian fleet off Matapan was blasted from the sea by the guns of British cruisers and destroyers aided

by radiolocation in pitch darkness. Last year the *Scharnhorst* was sunk at an incredible range by battleship gunfire dead on the target, with the help of still more advanced radiolocation gear. By the second year of war night fighters were led by a ground control to enemy planes and by further development bomber planes were directed unerringly to their targets.

"D" day saw the most pregnant development of all when new and special types of radiolocation enabled air-borne and parachute troops to be accurately concentrated by radio on minute landing areas in darkness. So vast were the forces involved that no other means could have maintained contact and prevented the dispersal of such large forces. To-day pin-point aerial bombardment was assured by the recently disclosed "black box" which gave the bomber pilot an ever-changing picture of the earthly scene below him, so that neither darkness, cloud nor fog obscured the target.

Ingenious Vacuum Device

Probably the best single contribution from British engineers would ultimately prove to be a vacuum device, something infinitely more than a valve, of such delicacy and complexity that only the most skilful hands could make it. It was the heart of many of the most advanced types of radiolocation gear, permitting effective operation at very high frequencies. After the war it would be directly applied to automatic anti-collision devices to ensure the safety of ships and planes.

Applications of radio gear to tanks, ships and aeroplanes amounted to stupendous totals. Too little was known of these significant contributions to freedom's cause, nor was it widely enough known that much new development was built upon the foundations of the ordinary domestic radio industry of Great Britain.

To-day the adult industry was equipped with personnel and resources which qualified it to compete with any in the world, and it was precisely for that object that the new structure of the Radio Industry Council had been erected. The Council was a Federation Council of four separate independent bodies: the British Radio Equipment Manufacturers' Association, the British Radio Valve Manufacturers' Association, the Radio Component Manufacturers' Federation and the recently formed Radio Communication and Electronic Engineering Association.

In co-operation with the Government, and within the industry, much useful work had already been done, and the Council was now concentrating on plans for the reconversion of the industry and the expansion of exports. As producers they must have a constant regard for the export market, and treat it, at least from the production

point of view, as one problem with the home market, from which it was inseparable.

The first post-war receiving sets would be similar to those of 1939. Solid developments and improvements in technique there undoubtedly had been during the war which would lead to better transmission and reception, especially on short waves, and to greater reliability. They would also provide freedom of listening to radio broadcasting emanating from any part of the world. They looked for improvement in standards both of programmes and transmission and anticipated an immediate expansion of work in the field of television. The Radio Industry Council had made its submission to the Television Committee under Lord Hankey for an immediate restarting of the pre-war system of television as soon as the German war ended, not only a station in London but an immediate commencement of work upon the connecting up of the whole country by a network of radio links which, in fact, had already been envisaged before the war. A system with nation-wide coverage could be set up at no very great expense having regard to the eventual increase in employment and the propaganda value in connection with the export of transmission and receiving gear.

The public must not expect that the price of post-war television would be any lower than 1939 in the early stages. The object was to serve everyone, and it was elementary economics that a downward price curve followed an upward demand curve. Lord Hankey's Television Committee had sent its report to the Government and in the interest of industry planning the sooner its decision was made known the better. Within three years there should be a sufficient number of viewers to warrant an entertainment programme that could compete with any other.

Export Trade Considerations

There were big future possibilities in the use of electronic technique in a very wide field. Already a whole new industry was developing as more was learned about radio-frequency heating which would have a vast number of applications in many manufacturing processes.

In the export field the radio industry had not perhaps done as well as it might have done, but on the whole did not differ largely from that of British industry in general. Competition was a splendid incentive, but it could never take the place of a proper and continued study of comparative costs. Industry was by no means solely to blame for this position. Every section of the community must take its share of the blame, and from now on be conscious that we must export or reduce some standards of living.

In future the aim must be to organise units and programmes of manufacture, whether they be for process or for complete

manufacture, so that they were of a sufficient size to produce maximum economy and efficiency. The theory that certain large nations had a better basis than we had for economies and low costs in their large home markets and resources was largely fallacy. Our population and our home market were of a sufficient size to be a basis for, and to support, a profitable export trade in almost every kind of manufacture in which they were engaged provided they organised their industrial units to produce maximum efficiency. Price was a matter of re-organisation, with fearless thinking and ruthless scrapping of everything which was out of date. They would need much help from the Government to facilitate the renaissance of British export.

SIR ROBERT RENWICK (Controller of

Communications, Air Ministry) remarked that he found it difficult to reply to the clear picture the chairman had presented. If anything, he had underestimated the achievements of the industry. This year was the tenth anniversary of the successful trial of radiolocation and when its story could be fully told the nation would realise the debt it owed to the radio industry. They had never had too much equipment, but no section had suffered from the lack of it.

Although we were now becoming tired, one final effort was needed, for the 1945 programme was a very large one. If relations of the radio industry with the Board of Trade and the Department of Overseas Trade after the war were anything like they had been with the wartime supply ministries, then there would be nothing to fear in future.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AS reported last week, Mr. W. Winwood, A.M.I.E.E., has been appointed distribution engineer of the West Midlands Joint Electricity Authority. Mr. Winwood received his technical education as an articled pupil of Mr. S. T. Allen, then borough electrical engineer and manager at Wolverhampton, and attended Walsall Technical College and Wolverhampton and Staffordshire Technical College. He gained workshop and test experience with the Rees Roturbo Co. and the Electric Construction Co. In 1925 he became personal technical

assistant to the Wolverhampton borough electrical engineer. A year later he was appointed technical assistant with the West Midlands Joint Electricity Authority, being engaged on technical preliminaries in connection with the design of the Ironbridge station, and on the preliminary lay-out of new switchgear and control rooms at the Authority's other four stations. He

was appointed district engineer for the Authority's Shropshire Distribution Area in 1931 and mains engineer for the eastern district of the Shropshire Area in 1939.

British Insulated Cables, Ltd., announce that Mr. N. K. Bunn, works manager, and Mr. J. L. Harvey, production manager, have been appointed joint general works managers. Mr. W. J. Clements becomes works manager, Prescott works.

Mr. G. A. Ruff, who for the past three years has been acting as sales manager of the Kersons Manufacturing Co., Ltd., is resuming his previous position as London and Southern England manager for J. H. Tucker & Co., Ltd. Mr. Ruff will take up duties in London on January 29th, and while he will act mainly for

Tuckers he will be able to deal with Kersons' interests in the area. Until suitable office accommodation has been arranged his address will be 19, Cromford Way, New Malden, Surrey (tel.: Kingston 0414).

Mr. W. S. Proctor, regional engineer at the Scottish regional telephone headquarters in Edinburgh, has been appointed telephone manager for the Glasgow area in succession to Mr. R. Teasdale, who is due to retire next month. Mr. Proctor is joint author of a recently published book on telephony.

F/Lt. J. M. C. Field has been released from the R.A.F. in order to attend to the affairs of the Borth & Ynyslas Electric Supply Co., Ltd., of which he is the engineer and managing director.

Mr. A. Wynn, who since 1940 has been joint managing director of the Midland Electric Manufacturing Co., Ltd., with Mr. W. L. Barber the founder, has now been appointed sole managing director. Mr. Barber while relinquishing his position as joint managing director remains chairman of the company. Mr. Wynn joined the M.E.M. Co. in 1923 and since that time he has successively held the positions of production engineer, works superintendent, assistant general manager and general manager.

Miss Ruth V. Buckley, who at the age of twenty has obtained the B.Sc. degree in electrical engineering with honours, is the first woman to have achieved this success at Leeds University.

Three retiring employees at the Stafford works of the English Electric Co., Ltd., have just been presented with long-service testimonials by the directors and management. The recipients were Mr. Thomas W. Probert (56 years



Mr. W. Winwood



Mr. A. Wynn

service), Mr. E. G. Fuller (52 years) and Mr. T. Reynolds (40 years). The presentations were made by Mr. J. W. C. Milligan, manager of the Stafford works.

Brigadier G. C. Wickens, formerly chief signal officer of the London A.A. Command, has been appointed public relations officer to the G.P.O.

Mr. W. W. Vinsen, manager of the Coventry works of the British Thomson-Houston Co., Ltd., and **Mr. E. S. Little**, comptroller and head of the accounting department, have been elected directors of the company. Mr. Vinsen has been appointed assistant director of manufacture and will assist Mr. G. M. Campbell, director of manufacture.

Mr. E. R. Constance, A.M.I.E.E., has taken up an appointment with Cooke & Ferguson, Ltd., as London electrical representative after serving four years with the Air Ministry Works Directorate, where he was engaged in special electrical development work and in supervising the installation and maintenance of electrical plant associated with R.A.F. stations, including distribution schemes. Mr. Constance was formerly with the Metropolitan - Vickers Electrical Co., Ltd.



Mr. E. R. Constance

Two of the oldest members of the staff of the Aberdeen Corporation Electricity Works, **Mr. A. H. McKay**, mains superintendent, with 45½ years' service, and **Mr. W. Hodson**, chief technical assistant, with 41½ years' service, have just retired. Presentations were made to them by Mr. Alex. Gardner, city electrical engineer, at the annual meeting of the employees of the Department held recently.

Mr. L. A. Hooke, who has been associated with Amalgamated Wireless (Australasia), Ltd., since its incorporation in 1913 and has been general manager since 1936, has joined the board of the company and has been appointed managing director.

Mr. Colin F. Campbell, chairman of the Telegraph Construction & Maintenance Co., Ltd., was the guest of honour at a dinner held on January 17th. He was presented with his portrait in oils painted by Mr. James Gunn.

Mr. H. Macartney, late of Veritys, Ltd., has joined the Newman Motors staff and is operating from the company's Ordsall Works, Salford.

Mr. C. M. Cock, who has been for seventeen years with the Great Indian Peninsula Railway, is reported to be on his way home to take up the position of deputy to Mr. A. Raworth, chief electrical engineer to the Southern Railway.

Obituary

Mr. Killingworth Hedges.—By the death, on January 20th, of Mr. Killingworth Hedges, M.Inst.C.E., M.I.E.E., there passes a pioneer of the electrical industry and a man of great versatility. He was trained as a civil engineer and his early interests included bicycles, canals, railways, waterworks and even multiple tea

shops. Mr. Hedges installed Gramme dynamos at the Liverpool Docks in 1878 and designed the installation of the S.S. *Chimborazo*, claimed to be the first steamer to use incandescent lamps. He acted as consultant to several of the earliest electricity supply companies.

His name is probably best known, however, in connection with lightning protection. Having been consulted upon the lighting in St. Paul's Cathedral his attention was directed to the inadequate protection against lightning. He re-arranged the system upon the principles advocated by Clerk Maxwell and later applied the system to Westminster Abbey. He established the Lightning Research Committee of the R.I.B.A. and Surveyors' Institution in 1941 and acted as its hon. secretary. His collection of electric lighting apparatus is now at South Kensington.

Mr. Hedges was the author of a number of books and papers on electricity supply, and protection against lightning. He had been living in retirement for some years.

Mr. L. A. Lewis.—We regret to report the death on January 20th, at the age of sixty-one of Mr. Lucien Alexander Lewis, M.I.E.E., M.I.E.I., Director of Inspection, India Stores Department.

Mr. James T. Rankin whose death on January 21st at the London Hospital is reported, was for many years associated with the Sunbeam Vacuum Cleaner Co., and he was one of the founding directors of Bylock Electric, Ltd.

Major Hugh P. Samwell, M.C., Argyll and Sutherland Highlanders, Stirling, who has been killed in action in Europe, was managing director of Scottish Radio Industries, Denny, Stirlingshire. He was awarded the M.C. for gallantry during the Eighth Army's attack on the Mareth Line in the Tunisian campaign.

Wills.—Lord Herbert Scott, chairman of the Westinghouse Brake & Signal Co., Ltd., and a director of other companies, left personal estate in Great Britain valued at £12,060.

The late **Mr. A. R. Hoare**, chairman of the Isle of Thanet Electric Supply Co. and the Kalgoolie Electric Power & Lighting Corporation, left £23,279 (£23,168 net personality).

Appointments Bureau

THE Professional Engineers' Appointments Bureau to which reference was made in the *Electrical Review* of January 5th (p. 22) has commenced operations. We have received a copy of the rules which conform to the outline given in the December *I.E.E. Journal*. Accompanying this is a letter signed by the presidents of the Institutions of Civil, Mechanical and Electrical Engineers, which jointly sponsor the scheme, appealing to their members for the necessary funds. It is anticipated that the first year's expenditure will be about £2,000; in the next four years about £1,000 per annum will be required. A target figure of £10,000 is being aimed at so that there shall be reserves to tide over the first ten difficult years. Five shillings is suggested as a suitable donation but, naturally, larger amounts will be welcomed. Employers of engineers are also being approached.

Communications regarding the Bureau should be addressed to the Clerk to the Civil Engineers' Appointments Board, 8, Princes Street, S.W.1.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication.
Responsibility cannot be accepted for correspondents' opinions.

Universal Domestic Tariff

IN his article in your issue of January 5th Mr. J. L. Ferns seems to have overlooked the fact that, on his proposed tariff, a domestic consumer who used just over 1,200 kWh per quarter would obtain his current at an average price of less than $\frac{1}{2}$ d. per kWh, including fixed charge. This would not be sufficient to cover the cost of supply.

I am of the opinion that the installed load of a domestic consumer is no guide as to the cost of providing his supply, but Mr. Ferns suggests a bonus to domestic consumers for every type of heavy load connected. As we are in search of a universal form of tariff, would he recommend the same treatment to commercial and industrial consumers?

In any case, what will grandfather say to the slogan "The higher your MD the cheaper your supply"?

Welwyn Garden City,
Herts.

B. CROWSLEY,
A.M.I.E.E.

Contractors and Rural Industry

IN the first page of the article in the current issue of the *Electrical Review* dealing with electrical development in the area of the Boston & District Electric Supply Co., under the energetic auspices of Mr. H. Payn, M.I.E.E., there is an illustration of the vegetable dehydration plant recently extended and electrified in Boston. In fairness to the electrical contracting side of the industry, I would like to point out that this factory of F.M.S. (Potato Factories), Ltd., is one of a number which have been extended and electrified by this company, and the resultant consumption should be credited to contractors; I think Mr. Payn will be the first to regard this load in the light of "manna from heaven."

Before my company was called in to advise on the many problems of motive power, this factory was driven by a steam engine which operated a line shaft. The developments called for by the Ministry of Food in dehydration processes involved much additional machinery, and after very careful calculation of the economics of the situation we advised full electrification. On the general result of that advice, my clients have thanked me for the manifold advantages and flexibility of electric drive, plus also the economics of production costs.

Each of these dehydration factories will consume approximately 500,000-650,000 kWh per annum, and yet the contractors do not appear to have received any credit for this assistance to the generating side of the industry in general, and the Boston Company in

particular. I cannot help feeling that a slight measure of acknowledgment and thanks from the supply side to the contracting side would, in cases of this kind, just oil the wheels of commerce.

The particular problems and costs of electrical distribution in the Boston Rural District can be appreciated in a comparison of costs. Of four dehydration factories carried out, the average cost of electricity at Boston (on the basis of 500,000 kWh per year) is 1.155d. per kWh, whereas in an identical factory in North Lincolnshire the cost is 0.788d. per kWh; at a factory in South Yorkshire 0.785d.; and at a factory in Lancashire 0.77d.

London, E.C.4. J. MORTIMER HAWKINS,
Managing Director,
Mortimer, Gall & Co., Ltd.

I.E.E. Graduates' Position

CORRESPONDENCE in recent issues of the *Electrical Review* has thrown considerable light on the unfortunate position of many graduates of the I.E.E. Will Mr. W. K. Brasher state definitely what the present graduate's position is? For instance, is he expected to take some more evening courses?

In Mr. Brasher's opinion the problem is one of passing an examination. In our opinion the problem is that of obtaining a suitable position when we have passed our exams. What are these technical positions for which the new I.E.E. syllabus would train people?

The graduate is often superior to many people in responsible positions. It is not the graduate who requires this extra education but the many people who occupy positions graduates were trained for.

Bradford. A. R. CURETON, Graduate I.E.E.

THE experience of your "Graduate" correspondents does not seem to be confined to isolated cases. Having heard of several injustices from the persons involved I have also tasted the bitterness of rejection after having been selected for a higher post. From my experience, release under the Essential Work (General Provisions) Order as at present operated, is determined solely on the point of whether a man's present employer is willing to release him. The answer to that in these days of depleted staffs is obvious.

It was my belief that the Essential Work Orders were designed to prevent the frivolous movement of labour and not the legitimate promotion of freshly trained technical men. However, it seems that we must bury our

knowledge until we are either called up or, at some dim period in the future, the Essential Work Orders are revoked. It is certain that while the final decision for release is the prerogative of a locally situated civil servant, the parochial outlook will prevent a more important post from assuming its true position in his judgment, even if he is capable of assessing the relative importance of the various technical posts.

Thus we remain enmeshed in the bureaucratic web pondering on the need for Hankey Schemes, the Central Register, I.E.E. Appointments Bureau, etc., and sighing enviously at the apparent free flights of the "higher-ups." QUID NUNC.

ONE cannot but sympathise with "Graduate I.E.E." in your issue of December 29th. I have observed the same circumstances in many instances over a number of years. I would go so far as to say that the technical colleges turn out hundreds of students every year who, in the course of their jobs, are not called upon to use more than 5 per cent. of the theoretical knowledge imparted to them. I have in mind those students taking Ordinary and Higher National Certificates in Electrical and Mechanical Engineering.

That he and many hundreds like him cannot find suitable positions in which their

technical knowledge can be adequately exercised is, I believe, simply due to the relative scarcity of those positions in the structure of industry. In short, the supply of technical men is greater than the demand. The small proportion of technical men to other categories of employees can easily be assessed by anyone in a position to observe the make-up of an average firm.

"Graduate I.E.E." can only console himself with the thought that with his qualification his promotion is possible: without it, impossible. His letter reflects the very natural disgruntlement of young men who have made the effort to qualify and yet have not thereby made tangible progress. There exists no authority or body to guarantee to us a vocational reward proportionate to our labours and attainments in technical matters—or in any other sphere. Life on all planes is competitive. S. G. H.

"She Stoops to"

IT is a pity that the B.E.D.A. overstates the case. Your issue of November 17th, 1944, has an illustration of a new horizontal cooker which "does away with stooping." In your issue of January 5th there is a photograph of a woman *stooping* to put something into a horizontal cooker.

Hartington, Middx. H. R. BROADBENT.

Forthcoming Events

Saturday, January 27th.—London.—Caxton Hall, Westminster, S.W.1, 2.30 p.m. Association for Scientific Photography. "Electric-Discharge Lamps for Photography," by H. K. Bourne, M.Sc., M.I.E.E.

Bristol.—Merchant Venturers' Technical College, 3 p.m. I.E.E. Bristol Students' Section. "Electronic Stroboscope and its Applications," by Prof. G. H. Rawcliffe.

Mansfield.—County Technical College, 3 p.m. Association of Mining Electrical and Mechanical Engineers (Midland Branch). "Colliery Cables: Design, Installation and Performance," by R. F. D. Milner and J. R. Cox.

Monday, January 29th.—Birmingham.—James Watt Institute, 6 p.m. I.E.E. South Midland Centre Radio Group. Discussion on television to be opened by Dr. D. C. Espley.

Wednesday, January 31st.—London.—At Institution of Civil Engineers, 6 p.m. Institute of Welding. Discussion on "Welding in Higher Technical Education," to be opened by Prof. H. Wright Baker, and H. Martin.

Newcastle-on-Tyne.—Bolbec Hall, 6.45 p.m. Joint meeting of the Students' Sections of the North-East Coast Institution of Engineers and Shipbuilders and the I.E.E. North-Eastern Centre. "A Soviet Steelworks during the First Five-Year Plan," by M. Lasylo.

Thursday, February 1st.—London.—Institution of Electrical Engineers, 5.30 p.m. Ordinary meeting of the Institution, together with the Industrial Radiology Group of the Institute of

Physics. "A Survey of X-rays in Engineering and Industry," by V. E. Pullin, C.B.E.

Bradford.—Technical College, 6.45 p.m. Bradford Electronics Society. "The Modern Application of Mercury Arc Rectifier Valves," by J. C. Milne.

Friday, February 2nd.—Glasgow.—At Institute of Engineers and Shipbuilders, 8 p.m. Engineer Surveyors' Association. "Electrical Testing in Quarries," by G. S. Rough.

Saturday, February 3rd.—Manchester.—Engineers' Club, 6.30 p.m. I.E.E. North-Western Students' Section. The Students' Lecture: "The Cathode-ray Tube and its Applications," by Dr. W. Wilson.

Manchester.—16, St. Mary's Parsonage, 2.30 p.m. Junior Institution of Engineers (N.W. Section). Annual general meeting and chairman's address on "Factory Management," by F. Burgess.

Tuesday, February 6th.—London.—Brook Green Hotel, Hammersmith, 7.30 p.m. Association of Supervising Electrical Engineers (N.W. London Branch). "Drying by Infra-Red Radiation," by W. E. J. Drake, A.M.I.E.E.

Birmingham.—James Watt Institute, 6 p.m. Electrodepositors' Technical Society. "Influence of Anodes on Plating Processes," by S. R. Goodwin and H. A. Bechtold.

Saturday, February 10th.—Manchester.—College of Technology, 6-10 p.m. I.E.E. North-Western Students' Section and students of the College. Dance.

Power-Cable Economy

Some Wartime Measures

THE following notes deal with three aspects of economy in the use of cables as necessitated by present conditions, viz., data required when ordering; factors which conserve materials and effect the maximum distribution of power to new installations; and methods of increasing the power output of new and existing installations.

Cablemakers often receive orders and inquiries which include only brief details of the load or give an abbreviated specification which omits essential data, resulting in telephone messages or delays due to interchange of correspondence. The following data should be stated when issuing both orders and

By **C. C. Barnes,**
Graduate I.E.E.

system is earthed or unearthed. Standard pre-war practice was to protect all power cables laid

direct in the ground by a double layer of steel tape or a single layer of steel wires, the former mechanical protection being the most widely used for economic reasons. Wartime demands on steel have necessitated relaxations of pre-war regulations, and lead-alloy sheathed cables, with or without a textile serving, may now be laid direct, but they must always be protected by cover boards or tiles.

There are three standard methods of installing cables—laying direct in the ground, running in free air or pulling into ducts.

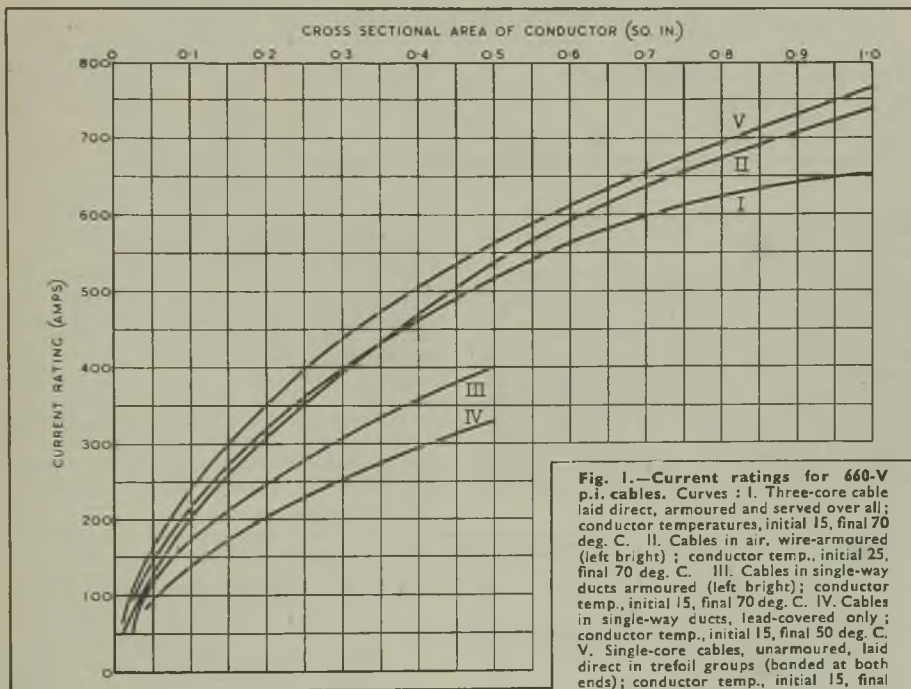


Fig. 1.—Current ratings for 660-V p.i. cables. Curves: I. Three-core cable laid direct, armoured and served over all; conductor temperatures, initial 15, final 70 deg. C. II. Cables in air, wire-armoured (left bright); conductor temp., initial 25, final 70 deg. C. III. Cables in single-way ducts armoured (left bright); conductor temp., initial 15, final 70 deg. C. IV. Cables in single-way ducts, lead-covered only; conductor temp., initial 15, final 50 deg. C. V. Single-core cables, unarmoured, laid direct in trefoil groups (bonded at both ends); conductor temp., initial 15, final 70 deg. C.

inquiries:—Conductor size or, alternatively, the load to be carried in HP, kW or kVA (when the HP or kVA loading is quoted, the type of system should also be stated or if the kW load is referred to, the power factor or the average power factor of the motors should also be specified); number of cores; type of dielectric (cables are classified according to the insulant); service voltage; and whether the

Should any special method of installation be necessary, or should any abnormal conditions exist, full details should be given. Special conditions may include the following:—Presence of corrosive substance due to chemicals in the ground; proximity of electric traction circuits along part or all of the cable route, which may result in electrolytic corrosion; excessively marshy or damp

ground ; steep inclines, which may require stop joints ; presence of hot pipes or other sources of heat, which may necessitate re-arrangement of the cable route ; excessive

but a higher conductor temperature and consequently a greater current loading is permitted if the cable is armoured.

In general, for the smaller copper sections the current rating is greater when laid direct, but for large cables the reverse is the case, the size at which the transition occurs varying with the type of cables. Careful consideration must therefore be given to the method of installation in order to obtain the optimum rating for new installations.

Where duct runs cannot be avoided (e.g., at road crossings) it may be advantageous to increase the conductor section at the duct run. A saving in copper section can often be achieved where heavy currents have to be carried by running two or more cables in parallel. This point is illustrated in Table I.

In industrial installations cables are normally subjected to cyclic loadings

and the following increases in continuous ratings are permitted for periods of eight hours on load and sixteen hours unloaded. Where cables are laid direct in the ground multiplying factors are employed of 1.07 for voltages up to 1.5 kV and 1.13 for voltages from 3.3 to 20 kV. When cables are pulled into ducts, the multiplying factors become 1.12 for one multicore cable, 1.20 for six multicore cables and 1.16 for three single-core cables, the number of ducts corresponding to the number of cables. No corresponding increase is allowed for cables run in free air in view of the comparatively short time that is taken

TABLE I

	Scheme I	Scheme II
Load to be carried ..	820 kVA at 660 V.	820 kVA at 660 V.
Maximum current ..	718 A.	718 A.
Type of cable	One group of single-core cables in trefoil formation.	Two groups of single core cables in trefoil formation with 18 in. spacing between cable centres.
Method of installation	Laid direct in the ground 18 in. deep.	Laid direct in the ground 18 in. deep.
Nearest standard conductor size (Curve 5, Fig. 1).	1.0 sq. in. carrying 764 A.	Two circuits of 0.3 sq. in. each carrying 436 A.
Correction factor for grouping at 18 in. centres (Table No. II).		0.87.
Maximum permissible kVA loading.	$\sqrt{3} \times 660 \times 764 = 870$ kVA.	$2 \times \sqrt{3} \times 660 \times 436 \times 0.87 = 870$ kVA.
Total copper area ..	$3 \times 1.0 = 3$ sq. in.	$2 \times 3 \times 0.3 = 1.8$ sq. in.
Saving in copper by adopting Scheme II.		40 per cent.

* If 12 in. spacing were adopted in order to reduce trench work, the maximum permissible loading would be reduced to 828 kVA which is still adequate.

vibration, which often occurs when cables are installed on bridges, roof girders or near travelling cranes.

Two specifications are at present used for paper-insulated cables for electricity supply:— B.S. 480-1942 and W.E. B.S. 1107-1943, the latter being a war emergency standard issued with the primary object of conserving raw materials. Unlike earlier cable specifications, both of them recommend the use of shaped conductors, except for the smallest sizes. This results in a big saving of materials and a small increase in the permissible current loading when compared with circular-conductor cables. Also, the design data given apply primarily to supply systems having the "centre-point earthed," unearthed systems being regarded as non-standard.

Maximum permissible continuous current ratings for three-core and trefoil groups of single-core 660-V paper-insulated cables (based on E.R.A. report F/T 128) are shown in Fig. 1. It is important to note the higher loadings permitted for armoured cables laid direct in the ground compared with those for armoured and unarmoured cables in ducts. The maximum conductor temperature for plain lead-covered cables in ducts is 50 deg. C.,

TABLE II

Reduction factors for grouped cables laid direct in the ground						
	Circuits	Touching	Distance between centres			
			6 in.	12 in.	18 in.	24 in.
Multicore cables in tier or horizontal formation.	Two	0.81	0.86	0.89	0.91	0.93
	Three	0.71	0.76	0.81	0.84	0.86
Single-core cables in groups of three (trefoil grouping) in horizontal formation.	Two	0.75	0.78	0.83	0.87	0.90
	Three	0.63	0.66	0.73	0.78	0.82

to attain maximum permissible temperatures.

When more than one cable is necessary to carry the load, or where a number of power circuits are grouped together in a limited space (i.e., in culverts or open channels) which limits the maximum permissible loading

of all circuits, the widest possible spacing should be adopted to ensure that cables are run at their maximum loading.

Table II gives standard correction factors which indicate clearly the large reduction in current rating which results from the grouping of several power circuits.

When multicore cables or trefoil groups of single-core cables are run in free air it is desirable to adopt the following minimum spacings (wider spacings are preferable), in which case no reduction in the permissible rating of individual cables is necessary. For conductor sections up to and including 19/083 (0.1 sq. in.) the minimum axial spacing is 3 in. and the maximum number of cables in the vertical plane is three.

For larger sections the minimum axial spacing is 6 in. with four cables as the maximum number permissible in the vertical plane. No limit need be considered in either case to the number of cables installed in the horizontal plane. When cables are erected on racks one above the other, a reduction in the temperature rise of the top cable will be obtained by placing baffles between each cable circuit, thereby redistributing the heat rising from the lower circuits.

An experience with the overheating of non-lead-sheathed cables was recently reported in the American publication, *Electrical World*, (March 18th, 1944) which emphasises the importance of investigating site conditions and the method of installation adopted. A 600 ft. run of six single-conductor 1.12 sq. in. 13.8-kV cables, two per phase, was laid in sand in two decks with 12 in. vertical and 8 in. horizontal spacings. It was found that the lower deck, 4 ft. deep, had attained a temperature of 60 deg. C at working load.

The cables were re-laid in a single layer 2 ft. deep and with 12-in. spacing. The trench was filled with yellow clay (tests proved that the fine sand originally used had a low conductivity rate) and a water catchment was arranged over the route, thereby reducing the operating temperature by 10 to 15 deg. C below the value experienced when the cables were buried in sand and dry soil conditions existed. The water catchment consisted of a 6-in. covering of earth with a 4-in. drain tile and concrete slabs laid in an inclined plane over the cable route. Fig. 2 illustrates the two methods.

The following summarises several possible methods of ensuring that cable circuits are being operated with the maximum possible economy:—For existing installations im-

provement of overall power factor of the system (which is reflected in the initial cost of power cables and in their operating efficiency); use of forced ventilation at sections where a number of circuits are grouped together in culverts or tunnels, which will increase the load that can be transmitted; alteration of existing routes so as to avoid grouping

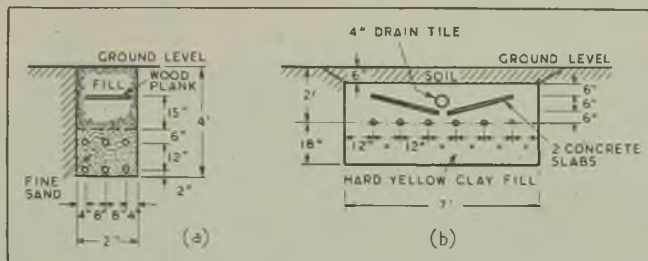


Fig. 2.—Reducing operating temperature of loaded cables originally installed as in (a) by re-laying as in (b)

cables together, bearing in mind that cables which have been in one position for many years should not be moved without first consulting the cable manufacturer, since handling may shorten the life of the cable; increasing current loading on some installations by increasing the voltage drop.

For new installations the following methods can be applied:—Adoption of a higher voltage in order to save copper; laying cables with the widest possible spacing and shielding them from all external sources of heat; paying regard to the decrease in loading in A per sq. in. with increasing copper sections (Table I) when deciding whether to use two medium-size cables in parallel in preference to one cable of larger copper section. Cablemakers are always willing to offer every assistance to ensure the efficient operation of cable systems and should always be consulted when expert advice is required.

Northern Ireland Proposals

AT the request of the Prime Minister of Northern Ireland a joint committee of representatives of the Ministry of Commerce and Belfast Corporation investigated the best means of securing effective post-war development of electricity supply in the Province. The main proposal put forward was for the creation of a central electricity authority.

The City Council, dealing with the matter, expressed the view that the scheme was too complicated, and empowered the Electricity Committee to obtain legal and technical advice to ascertain whether a better one could be evolved. The Committee, having discussed the proposed agreement, decided, with one dissentient, that no alteration was necessary, and the agreement therefore went before the Council again, which after a two-hour debate referred the matter to a special meeting.

Future of Lighting

Service Bureau Plans

REFERENCE was made by MR. W. J. JONES, director of the Electric Lamp Manufacturers' Association, at a Press gathering last week to probable trends in lighting development after the war. He was speaking of the work of the Lighting Service Bureau which, since it was founded in 1924, had been training men in contact with consumers on sound and fundamental lines. There had been no uncontrolled and un-directed propaganda; the Bureau's work had been technically and scientifically sound and as a result it had been recognised by Government Departments and Committees as a broadminded body which they could consult with regard to national lighting needs.

Mr. Jones said that the report of the Ministry of Works Lighting Committee indicated a tremendous market for electric lighting equipment if the recommended standards were adopted. The Lighting Service Bureau was willing to sponsor and assist any sound lighting development. There was a need for a strong body to deal with the technique of lighting and in this connection he praised the work of the Illuminating Engineering Society. He also referred to the lighting of the E. D. A. model kitchens as an example of correct illumination values.

Fluorescent Lamp Developments

At present the lamp manufacturers' research laboratories were busy on work in connection with the war so that the public could not expect too much until the war ended. The tungsten-filament lamp would continue in service for many years, but a great future lay in the use of the fluorescent lamp which so far had only been developed to a very small extent. This lamp was mainly a British invention but the United States had been able to proceed to exploit it at a much more rapid pace. Plans were being laid and as time went on there would be great developments in types and sizes of fluorescent lamps—but the war had to be won first. The "warm white" lamp was a good advance but there was difficulty in getting the necessary labour for installation and for the full expansion of the development.

In conclusion Mr. Jones again stressed the great lighting opportunities which would occur in shops, offices, factories and houses, although he pointed out that many months would pass before they were able to proceed with the work.

MR. E. B. SAWYER, acting manager of the Lighting Service Bureau, said he felt that the Bureau could do its share in finding work for the men who returned from the Forces. They were looking into the subject of educat-

ing men for the work of lighting development and were endeavouring to have matter prepared on the elements of lighting design, school, public and office lighting, etc. They planned a great expansion of their lecture service, particularly among architects who must be taught to make full provision for the use of electricity.

Fluorescent lighting was a new subject. The desirable standard of illumination was something over 50 ft.-candles. With fluorescent lamps this could easily be attained but a technique had to be evolved. The aim was a quality and quantity approximating to daylight. They wanted to benefit the worker—not merely to save employers' money—by securing the best possible working conditions in factories.

The Bureau intended to expand its activities in a number of areas to provide demonstration facilities. It was hoped to convert their Leeds office into a Bureau; there was already a Bureau in Glasgow. They wanted to be able to go to the people instead of expecting people, often at great inconvenience, to come to the Bureau. Mr. Sawyer said that many good contacts had been established by their policy of offering their premises to other bodies for their meetings.

MR. A. D. S. ATKINSON, a member of the Bureau staff, also spoke briefly on present work and future plans.

Icebreakers with Bow Propeller

AN unusual feature of new ice-breaking ships built in the United States is that in addition to the two conventional stern propellers there is another in the bow. This is driven by a Westinghouse DC 3,300 SHP motor which can revolve in either direction, reverse rotation being utilised to build up a bow wave to assist in cracking heavy ice, or in the forward direction to pull water out from under the ice so allowing the ice to break under its own weight.

Each of the stern propellers is driven by a 5,000-HP Westinghouse motor, and power is provided by six 1,375-kW Diesel-driven generators in three engine rooms separated by watertight bulkheads. In normal, free-running service the speed of the motor must be increased from the ice-breaking speed of 105 RPM to free-running speed at 145 RPM in order to utilise the 5,000 HP available. This is accomplished by means of an automatic current regulator in the motor fields.

When ice-breaking, a torque-limiting governor prevents damage to the equipment from overloading by automatically reducing the engine speed, which is followed by a reduction in motor speed and load. The overall result of the engine, motor and control system results in availability of full horse-power over a wide range of propeller speeds from several generators in parallel and at high efficiency.

Modern Public Lighting

Experimental Installation at St. Albans

FOR the purpose of comparing the visibilities provided by mercury discharge lamps of the ordinary and fluorescent types and sodium discharge lamps, seven weldless steel standards in staggered formation and spaced 150 ft. apart were erected at St. Albans by the Engineering & Lighting Equipment Co., Ltd., which has recently carried out a series of tests in conjunction with the

40, 36 and 45 lumens per watt, i.e., about two-and-a-half times that of a tungsten-filament lamp. Fluorescent lamps are obtainable in 80, 125 and 400 W ratings with luminous efficiencies of 38, 40 and 38 lumens

Demonstration street lighting at St. Albans employing 140-W sodium discharge lamps



Northmet Power Co. Each standard carries four different lighting units mounted at 25 ft. which can be individually switched. All lighting fittings are standard E.L.E. Co. types; lamps and control auxiliaries are also standard products.

Mercury lamps for public lighting are available in 80, 125, 250 and 400-W ratings, the two smallest for vertical and the others for either vertical or horizontal operation. Horizontal operation calls for magnetic control to prevent distortion of the discharge column. Initial luminous efficiencies are 38,

per W. For both types the average life is about 1,500 hr. Warming up takes ten minutes and if switched off when hot the lamps must cool before they will relight.

Sodium lamps have been developed for 45, 60, 85 and 140 W with luminous efficiencies of 55.5, 65.0, 71.5 and 71.5 lumens per W. The smallest size can be operated horizontally or vertically, the others horizontally only. Each lamp is in a detachable vacuum jacket, which has a life of at least three lamps. Average life is 2,500 hr. Warming up takes ten to twenty minutes, but the lamp will usually relight immediately if switched off when hot. The light source of the largest rating consists of a U-tube 18 in. long with the low brightness of 10 candles per sq. cm., reducing risk of glare. In its golden yellow monochromatic light the eye functions with nearly maximum sensitivity, perception of reflected colours is obviated and brightness contrasts and visual acuity are heightened.

In the demonstrations under mention, seven vertical 400-W mercury lamps were used in "Orbital" lanterns with 3 ft. 6 in. overhang. These are fitted with refractor plates embodying horizontal and vertical prisms; a top set of horizontal prisms redirects the upward light to the road surface and a bottom set refracts the lower zone of light and redirects it to the road at between

DATA FOR COMPARISON OF THREE TYPES OF LAMP

	Mercury Vertical 400W	Fluorescent Mercury 400W	Sodium 140W
Nominal lumens	18,000	15,200	10,000
initial lumens			
Average lumens through life	14,800	12,800	7,980
Wattage of lamp and auxiliaries	427	427	167
Power factor with capacitor (230V)	20 F 0.76	20 F 0.76	20 F 0.76
Efficiency of lantern, per cent. . .	75	75	75
Lumens per 100 ft. linear . . .	7,400	6,400	4,000
Costs:	£ s. d.	£ s. d.	£ s. d.
One lamp, net (excluding lantern)	1 13 0	2 3 11	2 12 2
One vacuum jacket, net	—	—	10 8
Lamps used, net	4 8 0	5 17 2	4 3 5
Vacuum jackets, net	—	—	5 8
Energy at 1d. per kWh	7 2 4	7 2 4	2 15 8
RUNNING COST . .	11 10 4	12 19 6	7 4 9

40 ft. and 75 ft. from the standard. B.S. test point illumination intensity was 0.22 f.c.

The seven 400-W vertical fluorescent lamps were in "Hamilton" lanterns with 6 ft. overhang. Owing to the larger dimensions of the luminous source, which includes the whole of the outer lamp bulb coated with fluorescent materials, and the slightly lower luminous efficiency, the B.S. test-point illumination was lower at 0.16 ft. candle. For the seven "Philora" 140-W sodium lamps the overhang was 6 ft. in "Golden Ray" lanterns with refractor plate control. B.S. test-point illuminating intensity was 0.21 ft. candle. As an example of side-street lighting seven 60-W sodium lamps were mounted in another model of "Golden Ray" refractor-plate fittings mounted at 14 ft. 6 in. and spread 150 ft. apart.

Actual cost of lamps and energy for the present demonstration, based upon dusk to dawn operation for two years (about 7,500

hr.), amounted to £151 for the mercury, £170 for the fluorescent and £114 for the sodium. These were made up of £93 for 22,147 kWh in both types of mercury lamp and £37 for 8,767 kWh for the sodium lamps. The cost of lamps came to £58 for the mercury, £77 for the fluorescent and £77 also (with vacuum jackets) for the sodium types. Capital costs and power requirements per mile (35 points) were £615 and 14.94 kW for ordinary mercury lamps, £635 and 14.94 kW for fluorescent and £637 and 5.84 kW for sodium. Capital costs cover standard, lantern, lamp, choke or leak transformer, capacitor but not labour, erection, cabling and switches. Tungsten lamps of 750 W would have involved a capital cost of £501 per mile and a power requirement of 26.25 kW. The basic data for the comparison is given in the table on page 133, covering dusk to dawn operation for one year (about 4,000 hours).

Television in America

Broadcasting Practice and Post-war Prospects

THE history of television broadcasting in America from 1927 to 1944 is reviewed in a paper prepared by Mr. D. G. FINK (office of the U.S. Secretary of War, on leave of absence from the staff of *Electronics*) for the Radio Section of the Institution of Electrical Engineers in London and read by Dr. D. B. Langmuir.

The first portion outlines the trend of activity as indicated by the number of transmitting station licences and construction permits authorised. It then traces the evolution of standards of transmission, frequency allocations and broadcasting methods, noteworthy programmes being recalled.

Standards of Transmission

The second part of the paper, which is concerned with present practice, gives a detailed account of the standards of transmission governing public service under the current regulations of the Federal Communications Commission. Stations "currently operating" are listed and equipment used in them described in four categories (studio, transmitter, radiator, mobile pick-up), as well as receivers in immediate pre-war use; none have been manufactured since 1941.

The author concludes with a digest of post-war prospects, remarking that television in colour will presumably not be a factor in immediate after-war activity, although its eventual importance cannot be doubted. Whether the recommended allocation of twenty-six 6 Mc/s channels between 50 and 246 Mc/s will be assigned remains to be seen, but Mr. Fink contends that the need is clearly apparent for a service as truly

nation-wide in its scope as the existing sound broad-casting system.

British television standards are eight years old by comparison with the most recent American revisions. In advocating that they might profitably be reviewed the author suggests that vestigial-sideband transmission be adopted in preference to the double-sideband system and that the number of lines be increased from 405 to some value between 500 and 600. The 25 per second frame rate should be retained, since it allows approximately 10 per cent. more lines than the 30 per second frame rate. A suitable figure to correspond with the American value of 525 lines would then be 567 lines ($= 3 \times 3 \times 3 \times 7$), since in all other respects, except polarity of transmission and equalising pulses, the American and British systems are closely similar.

The method of modulating the sound channel still needs much international discussion, but the issue is not a major one in any event.

Textile Mill Efficiency

ADDRESSING the Lancashire section of the Textile Institute at Manchester recently Mr. F. J. Stevenson said that for too long textile mill electrification had been considered simply as a question of changing over to electric power. He urged British electrical manufacturers to establish the advantage of driving the actual machine rather than the mill. The electrical industry could give the textile engineer the special motor and control gear necessary to operate his machine with the maximum efficiency and an improved technical service which could result in more efficiency from existing machines.

COMMERCE and INDUSTRY

Backing for Export Trade. Brazilian Railway Orders.

Export Credit Guarantees

AN increase from £75 to £200 million in the maximum liability which the Board of Trade may incur in guaranteeing payment for exports is authorised in a Bill which the President of the Board has introduced. The Bill also raises the maximum liability which may be incurred in respect of re-exports and for other purposes aimed at stimulating overseas trade.

This matter was referred to last week by Lord Woolton, Minister of Reconstruction, who also mentioned the encouragement now being given to manufacturers to produce designs and prototypes for post-war manufacture. He said that up to date 792 applications of this kind had been approved and only 30 rejected for the time being. The Government believed that mass unemployment could be avoided without sacrificing the essentials of freedom or democratic principles. This called for close collaboration between the State, industrialists and labour. While there must be greater stability in the capital expenditure of private industry he did not subscribe to the suggestion that the State should control the investment policy of every firm.

The success of private enterprise depended essentially upon individual decisions made according to the conditions of production and marketing. Lord Woolton did not think that this could be done by groups of officials without close acquaintance with details and having no personal interest in the matter.

Electrical Machinery Traders

A number of firms interested in electrical machinery trading, particularly as regards the disposal by the Government of surplus electric motors, generators and allied equipment, met in London early this month and decided to form an Electrical Machinery Traders' Association. A Committee was appointed to proceed with the organisation of the new body; its members are Messrs. H. W. Cole (Milo Engineering Works), E. H. Crook (Dynamo & Motor Repairs, Ltd.), E. J. Ferguson (Britannia Manufacturing Co., Ltd.), G. H. Holding (Newman Industries, Ltd.) and W. E. Lawton (Industrial Electrical Co., Ltd.).

There are sixteen founder members (detailed in an advertisement in this issue) and invitations to attend a further meeting are being sent to a number of similar firms throughout the country.

Patent Extensions

An originating summons issued on behalf of Guy Motors, Ltd., and Sydney Slater Guy for extending the period of a number of letters patent is to be heard by Mr. Justice Uthwatt in the Chancery Division on February 20th. The patents concerned are as follows:—"Improved means of control for electrically driven vehicles" (No. 278073); "A safety device for electrically driven vehicles" (No. 300326); "Improved means of controlling regeneration in electrically propelled vehicles"

(No. 330259); "Improvements in or relating to regulating regeneration in electrically propelled vehicles" (No. 340003); and "Improvements in regeneration in electrically propelled vehicles" (No. 341679). The first three and the last were granted to William Arthur Stevens and the fourth to Sydney Slater Guy and William Arthur Stevens.

Brazil Buys British Equipment

Col. Guimares, who recently visited Great Britain to buy materials for the electrification of the railway (Central do Brazil) of which he is director, has arranged large purchases of railway material and car equipment in this country. Col. Guimares said that he was very pleased with his visit and had formed the opinion that there was a good prospect of trade between Britain and Brazil being greatly increased. As soon as transport was a little easier he intended to send several Brazilian engineers to England for training.—*Reuter's Trade Service.*

Cartel Charge

The United States Attorney-General (Mr. Francis Biddle) has announced the filing of a civil suit in New Jersey charging the General Electric Company and International General Electric Company with "maintaining cartel agreements which still in effect restrain trade in the manufacture and sale of electrical equipment."

The suit, which is filed in the U.S. district of Newark, alleges violation of the Sherman Anti-Trust Act and the Wilson Tariff Act. It is alleged that the two defendant companies and six "co-conspirators" have conspired to divide the world into exclusive marketing areas. Those named as co-conspirators are Associated Electrical Industries, Ltd., of Great Britain, and German, French, Japanese, Belgian and Italian concerns.—*Reuter.*

Steam Utilisation

A film on "Steam Utilisation" which has been made by the Ministry of Information for the Ministry of Fuel and Power, has been shown to fuel economy experts and industrial technicians in London and Manchester. Its object is to indicate in a practical manner the principal methods of saving steam by contrasting good and bad practice. Applications for the film to be shown should be made to the Ministry of Information or the Ministry of Fuel and Power and copies will be available in film libraries.

Infra-Red Lamp Heating

A brochure has just been published by the General Electric Co., Ltd., on the subject of infra-red lamp heating. It not only describes developments recently made in this radiant form of heat treatment for industrial processes, but also illustrates and gives technical particulars of installations in which infra-red rays have been applied successfully. The company will

advise, without obligation, on the best procedure to suit the needs and purposes of any firm which may be interested in the adoption of methods of heat treatment in which speed in production and improved finish are paramount features.

Glasgow Cable Contracts

Five-year contracts for supply of electric cables are to be placed by Glasgow Corporation with members of the Cable Makers' Association, at rates showing only a slight increase over pre-war charges.

The general manager reported to the Electricity Committee on the result of the inquiries he had made with regard to the type and make of cables used by other electricity undertakings. The Committee agreed to take no further action in the matter.

Thousandth Transformer

It was reported at the last meeting of the Dumfriesshire Electricity Committee that since the start of the Council's distribution scheme a thousand transformers had been supplied by Bruce Peebles & Co., Ltd. The thousandth one is being given by the company free of cost. Expressing appreciation of this action, the convener said that a commemorative label would be affixed. The Council had bought all its transformers from Bruce Peebles and they had given great satisfaction.

Payments to Bolton Officials

Bolton Electricity Committee has issued a statement declaring that, subject to the approval of the C.E.B., the sum of £7,800 will be paid in respect of the additional professional services to be rendered in connection with the extensions at the Back-o'-th'-Bank power station which are to be completed by September, 1946. This sum to be allocated as follows: Messrs. H. E. Annett (borough electrical engineer), £5,050; T. Jack (deputy borough electrical engineer), £1,000; P. S. Rennison (town clerk), £400; and W. Appleyard (borough treasurer), £400, with smaller amounts for minor officials. The town clerk and borough treasurer say they will decline to accept such payments. Recently Mr. Annett, who was offered £3,000 for the 1940-41 extensions, said it would be "repugnant and derogatory" to accept this offer.

Position at Blackburn

In view of the controversy at Bolton concerning grants to the electrical engineer and others, an official statement has been made on the position at Blackburn, where extensions have similarly been carried out. The town clerk (Mr. C. S. Robinson) stated on January 18th that the first extension to the generating station was completed in 1943 and the second extension was now in progress. Mr. R. H. Harral, the borough electrical engineer, was engaged on work in connection with the first scheme for the five years 1938-1943 and he received a total bonus of £3,200. Due regard was paid to the fact that from June 1st, 1940, his annual salary was increased from £1,100 to £1,400. The town clerk and borough engineer each received £500 in 1943 and subordinate officials of the Electricity Department received amounts varying between £100 and £25 per year for this period,

or a total of £1,168. There were also payments of between £50 and £20 and totalling £346 to officials on the borough treasurer's staff, and certain of the Town Clerk's staff received £350 in bonuses. The Central Electricity Board approved these payments as part of the capital cost of the extensions. Had a consultant been engaged, the 5 per cent. remuneration would have totalled £45,000. No steps had yet been taken regarding the second extension, although subordinate officials would receive these grants during the progress of the work: Electricity Department, £500; Borough Treasurer's Department, £125; and Town Clerk's Department, £100.

The first extension, authorised by the C.E.B. in 1940, included a 30,000-kW turbo-alternator which more than doubled the original capacity. In its first year it ran almost continuously fully loaded. By the time the first stage was completed arrangements had been made for the second, including a 40,000-kW turbo-alternator. At one time 360 men, in addition to the station staff, were employed on the site, which has been enlarged by 17½ acres, making a total of 85 acres. Included in the new plant are two 250-ft. concrete cooling towers, each with a capacity of 1,800,000 gal. of water per hr., and six 150,000 lb. per hr. steam generating units.

Lighting Fittings for Egypt

One of our subscribers tells us that friends in Cairo are seeking an agency in Egypt for enamelled reflectors and glassware electrical accessories. We shall be pleased to pass on any offers from British manufacturers of these goods.

Flameproof Apparatus

Copies of the customary quarterly list of apparatus, both mining and industrial, for which certificates of flameproof enclosure were issued during the three months ended December, 1944, are now obtainable. At the request of B.E.A.M.A. a limited number may be purchased for 1s. 2½d. post free from the library, Ministry of Fuel and Power, King's Buildings, Dean Stanley Street, London, S.W.1.

Machinery Control

Hitherto it has been necessary for any person wishing to acquire controlled machinery and plant to obtain a Board of Trade Licence. The Machinery, Plant and Appliances (Control) (No. 9) Order, 1945 (S.R. & O. 1945 No. 6, Stationery Office, 1d.) empowers the Board of Trade alternatively to license manufacturers to supply these goods. Reconditioning is no longer to be regarded as "manufacture" and parts for reconditioning, as well as those for repair, are now exempt from control. The new Order is operative from January 15th.

Conference on Atmospheric Pollution

The Institute of Fuel and the National Smoke Abatement Society are holding a joint conference on atmospheric pollution at the Institution of Electrical Engineers, Savoy Place, London, W.C.2, on Friday, February 23rd. The conference opens at 10 a.m. and Sir Lawrence Chubb will be chairman at the morning session when a short address is to be given by the Minister of Fuel and Power, Major Lloyd George. Dr. G. M. B. Dobson

will submit a statement of the problem and its effects will be described by Major S. F. Markham, M.P. Dr. E. W. Smith is to preside at the afternoon session commencing at 1.30 p.m. when the speakers will include Mr. J. Bruce, A.M.I.E.E., who will deal with grit and smoke from power stations.

Consulting Engineers

A membership list, corrected to November 30th, 1944, issued by the Association of Consulting Engineers, 36, Victoria Street, London, S.W.1, not only names individuals and firms alphabetically with addresses and telephone numbers, but also includes a geographical list and a list of engineering subjects in which members specialise. Copies can be purchased by non-members for 1s. each post free.

Switchboard Supervisor's Death

An electric shock is believed to have been responsible for the death of a switchboard supervisor, Reginald Percival Hawtin (58), at Portobello power station, Edinburgh. He was found lying on the floor in the transmission house, having apparently fallen down some stairs after receiving an electric shock. Artificial respiration was applied without success.

Gas Co-ordination

By the merging of the Central Executive Board of the National Gas Council and the Executive Committee of the British Commercial Gas Association a joint governing body for the gas industry has been set up. Mr. A. E. Sylvester, managing director of the Gas Light and Coke Co., has been elected chairman. This is the initial stage in the reorganisation of the national bodies of the gas industry, and by it a single voice for the industry will now be created in all matters of national interest, policy and commercial development.

Little Barford

In the article describing the above station in our last issue we said that each International Combustion boiler has two burners at each corner of the combustion chamber. This was incorrect. There are three burners at each corner. One mill serves one burner at each corner, while each of the other mills serves two burners at each of the diagonally opposed corners.

"A Plan for Coal"

Under this title, Mr. Robert Foot, chairman of the Mining Association of Great Britain, has produced a 67-page report to the colliery owners upon the present state and future direction of the coal industry. The objective of the plan is said to be organisation for national service and Mr. Foot sets forth twenty principles which must be followed; he recommends the establishment of a Central Coal Board charged with the duty of applying them.

Contract Price Adjustment Formula

No change is recorded in the latest figures for the B.E.A.M.A. contract price adjustment formula. They are as follows:—(a) "Rates of Pay": the rate of pay for adult male labour at January 20th shall be deemed to be 90s. 6d.;

(b) "Costs of Material": the index figure for intermediate products last published by the Board of Trade on January 20th is 176.2 and is the figure for the month of December, 1944.

Trade Publications

Lawrence G. Western (Incubators), Ltd., East Hanningfield, Chelmsford, Essex.—List of spare parts available from stock.

Cressall Manufacturing Co., Ltd., 31, Tower Street, Birmingham, 19.—Priced list (No. 82) giving details and dimensions of toroidal-wound 50 and 100 W potentiometers for panel mounting.

Applications for copies of these publications should be made on business letter-headings.

Changes of Name

Exeter Radio & Television Services, Ltd., has changed its name to R.T.S. Electronics, Ltd. L. G. Attree & Co., Ltd., Bishop's Stortford, have changed their name to Goddard's (F. H.), Ltd.

Calendar

Bold white figures on a black background make the monthly sheets of the Mitchell Electric calendar very easily readable.

Trade Announcement

J. & N. Wade (London), Ltd., have opened a new branch at 616, Finchley Road, London, N.W.11 (telephone: Speedwell 2935).

TRADE MARK APPLICATIONS

RECENT applications for British trade marks include the following objections against which may be entered within one month from January 17th:—

BROOKHIRST (design). Class 9, No. 627,488. Switchgear, switches, switchboards, contacts, resistances, control apparatus, relays and cut-outs, all being electrical goods; and parts not included in other classes.—Brookhirst Switchgear, Ltd., Northgate Works, Newry Park, Chester.

ANODAL. Class 9, No. 630,760. Insulated wire.—British Aluminium Co., Ltd., Salisbury House, London Wall, London, E.C.2.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

Manufacturers of "Senelec" ammeter; and "Apollo" fires,

Views on the News

Reflections on Current Topics

IN connection with the account given on another page of the hard work, tenacity and courage of all concerned in getting the Fulham power station into operation again after it had been completely put out of action by bombing, there is another story, or rather a series of stories, relating to those "forgotten" members of the undertaking's staff, the men who work on its fleet of seven coal boats. They have been involved in at least a couple of dozen enemy attacks and have been bombed, torpedoed, mined and machine-gunned. One of the colliers has been sunk, though happily the crew was saved, while another boat, which struck a mine and had its chief engineer killed, was salvaged and recommissioned. Two rescues were made while in convoy, saving thirty lives in one and five in the other. The shooting down of an enemy plane was claimed on yet another occasion.

Another enemy aircraft was shot down by the gunner of the *Arthur Wright*, one of the two colliers owned by the Brighton Corporation, during dive-bombing attacks to which it was subjected on several occasions. The Corporation's other ship, the *Henry Moon*, was sunk in the Straits of Dover in June, 1940, as a result of dive-bombing.

* * *

I referred last week to the proposals by a town planning consultant (Mr. Thomas Sharp) for the treatment of Durham. Mr. Sharp's report ("*Cathedral City*," Architectural Press, Ltd., 45, The Avenue, Cheam, Surrey, 5s.) is a handsomely-produced volume with copious illustrations. While it is true that Mr. Sharp condemns the proposal to build a power station just outside the city, he is impartial as between gas and electricity. His forthright comments on the power station project are balanced by his remarks on the city's gasholders which, he says, "are right in the heart of the city close to the Cathedral, occupying a dominant position in the views from the railway and the Framwellgate Bridge." He advocates that the whole plant should be removed at the earliest opportunity.

* * *

Visiting the Croydon Corporation's showrooms and offices in Wellesley Road a few days ago, I wondered whether those who criticised the expenditure on them at the time of their construction have changed their views yet. The premises, which were started just before the war, were not opened until November, 1941, and still await the end of hostilities for the completion (furnishing only) of the lecture theatre. This

seats 1,000 and is equipped with cinema and television apparatus, cloakrooms, restaurant, etc.; it will be quite self-contained and will be available for private entertainments. For a cost of about £186,000 to date the borough possesses what are almost certainly the most up-to-date and best-equipped showrooms in the country, premises which will play an ever-increasing part in making the benefits of electricity more widespread and will serve many other useful purposes. As to-day the cost of providing similar premises would probably be double, the showrooms are likely to remain unrivalled for a considerable time to come, for few undertakings would contemplate the expenditure of such a sum for this purpose.

Farnworth, in Lancashire, is the latest town to decide upon electricity for all purposes in its "factory-made" houses. All purposes means lighting, immersion heater, cooker, wash-boiler and refrigerator. Mr. A. J. Hutchinson, the Council's electrical engineer, says that during the gas-electricity truce he has had some remarkable letters from people who want to change as soon as possible from gas to electricity; only one has, quite inexplicably, wished to go the other way.

Lanark Housing Committee has decided, on grounds of cost, that its 96 houses at Baillieston shall be all-electric.

In spite of the war, the Bureau de l'Union Internationale des Télécommunications in Berne has continued to offer reproductions of autotype engravings of pioneers in telecommunication. Recently I have received a note from the Bureau offering the portrait of Alexandre Popov, the Russian inventor, who joins a gallery including Morse, Hughes, Bell, Marconi, Clerk Maxwell and Siemens. The Bureau is fortunate enough to be able to offer "450 exemplaires sur papier de luxe," measuring 23 by 17 cm.

* * *

Floodlighting "rehearsals" do not seem to be so premature as they might have seemed a month ago before the great advances by the Russians. I have just seen some pictures of Paisley Abbey which was floodlighted for half an hour recently and of the Municipal Buildings which were hung about with fairy lamps at the same time. It does one's heart good to see such indications of approaching victory after more than five dark years.—REFLECTOR.

Technical Education

I.E.E. Discusses Planning Committee's Report

LAST week's ordinary meeting of the Institution of Electrical Engineers was devoted to the discussion of the report of the Post-War Planning Committee on part-time further education at technical colleges. (See *Electrical Review*, January 12th, p. 54.) The President (Sir Harry Railing) presided, and Sir Arthur Fleming presented the report for discussion.

LORD HANKEY, Hon. M.I.E.E., said that the young people who were to be educated must be persuaded that the plans put forward were in their best interests; in fact, a very great work of persuasion and propaganda had to be carried out by the Institution, and he was confident that the plan drawn up with so much sincerity and knowledge would receive the most careful consideration of all concerned, from the Ministry of Education downward. But he hoped that all parties would consider it in the light, not of 1939 standards, but of post-war conditions, which called so clamantly for the highest possible development of all sections of industry.

Responsibility of Industry

SIR ROBERT WOOD (Deputy Secretary, Ministry of Education) welcomed the report not merely because it was a full and detailed review of the subject, but also because, instead of contenting itself merely with posing problems, it made a real endeavour to propose solutions. He was glad that emphasis had been laid on the responsibility of industry. The training of craftsmen was not entirely a matter for the educational institutions; it was very considerably a matter for the vested economies of industry itself. He had gathered that the greatest weakness was felt to be in respect of the middle grade (technicians) and it might be that another differentiation of grades was required.

MR. J. C. JONES (principal, Regent Street Polytechnic) said that certain types of employment now to be regarded as non-professional in the electrical engineering industry were accorded professional status by other and allied industries. Joint discussion would seem desirable between the several professional bodies concerned before final action was taken. He urged the need for caution in putting forward any schemes which tended to harden the divisions and make virtually impossible transfer from one grade to another.

When the Institution put forward suggestions for what was in effect a complete recasting of the existing National Certificate schemes, it should be emphasised that there were three parties to such schemes; consulta-

tion at an early stage with the other parties would have been of advantage. The existing National Certificate schemes, moreover, all conformed to a general pattern, and the considerable modification of the one must necessarily have effect upon the others if a state of confusion were not to arise. Nationally recognised certificates in respect of courses in craftsmanship would only have significance if the courses incorporated some definite standard of craft training, provision for which did not appear to have been made.

Age for Classification

In considering the schemes of study outlined for the technician and professional grades, account should be taken of the opinion of the Committee that the former grade would not be eligible for membership of the I.E.E. Although not all students in the present National Certificate courses were likely to attain to ultimate professional status, Mr. Jones thought that the necessary distinction could not, and should not be made at the normal school-leaving age. The solution of the difficulties would seem to lie in the adoption of an ordinary National Certificate course embodying the broader concepts referred to and common to both groups; and Mr. Jones suggested the lay-out of such a course. The advantages would be, first, that the distinction as between technician and professional groups would be deferred until an age when truer assessment of individual ability could be made by the educationist, the employer and by the student himself; secondly, the number of types of course to be provided in the early stages would be maintained as at present (the full scheme suggested by the Institution could only be carried out at a limited number of technical colleges and many more students would be required to travel than at present); and thirdly, the introduction of the term "Intermediate National Certificate" would be avoided.

If an ordinary National Certificate course common to both groups were accepted, there would be little difficulty in agreeing with the suggested analysis of the more advanced work into three main types of study (*a*) workshop administration courses, (*b*) technicians' courses, and (*c*) professional courses.

High and Progressive Standards

DR. W. E. FISHER (principal, Wolverhampton Technical College) said the report encouraged the present highly appreciated tendency of industry to extend the practice

of part-time day release. The colleges must meet every such concession; but they would still have the evening students, so that the multiplication of courses might be very difficult even for a local technical college.

It was for the profession to define its own professional standards, and there was no reason why they should not be high and progressive; and because of that, he could not see any reason why a good deal of work in pure science, and so on, should not be specified at an appropriate stage. He would like to see the professional course include the technicians' course.

Difficulty in Selection

MR. G. WANSBROUGH (director, A. Reyrolle & Co.) thought that differentiation between the three grades would provide much more satisfactory education for 80 per cent. of students. At the same time, he felt that the report did not touch sufficiently on the difficulties involved in that differentiation. With the selection of the students as between the technicians' and professional engineers' courses, the lad of fifteen years would not feel that the real attraction to a technical education was the possibility of becoming a professional engineer, and should not feel too much resentment against being persuaded to take the technicians' course when he hoped to take the professional engineers' course. On the other hand, there must be good arrangements for transfer of students, by reason of their ability, from a lower group to a higher group.

DR. P. DUNSHEATH (Henley's) said that so much was required of the professional engineer that it was hopeless to try to crowd it into a part-time course. Surely, if the industry required 1,000 professional engineers per annum, as indicated in the report, it was not beyond the wit of man or of the Government to ensure that any capable boy was given the proper facilities for full-time education. He would like to see a manifesto to industry generally, supported by the Institution and the Ministry of Education, calling attention to the vital importance of part-time education for craftsmen and technicians and of bringing it into operation forthwith, instead of waiting until it was made compulsory under the Education Act.

Post Office Needs

MR. H. FAULKNER (Post Office) said he could see very little in the suggested courses for the ordinary National Certificate to cover the telecommunication and the expanding electronics industry. Courses in technology had been backed very strongly by the Post Office for many years and a very high grade course had been developed. The courses sometimes led to membership of the Institution, but apparently the comparatively small number of those who eventually rose to the

professional grade in the Post Office would have to take the Intermediate National Certificate course. He suggested that the amount of mathematics which it was possible to include in this course was insufficient to cover line or radio communication, which might form the special subjects in the Higher Certificate course. Therefore, instead of applied mechanics, the student should have more mathematics. Similarly, instead of heat, sound and light, there might be a subject labelled "radio physics."

MAJOR H. R. WALTERS (Ministry of Labour) said that during the war the numbers on the power side of the electrical engineering industry had remained appreciably constant, but there had been a substantial wartime increase on the telecommunications side. The difficulties of re-settlement on the power side were not very serious; the courses during the war were not being curtailed, and the number of men who had to return to further education and training was very small. On the telecommunications side, however, rather more than half had been taken out after one or two years at a university, and would qualify for return under the further education and training scheme if they had their places at the universities. The real problem was that they were mostly physicists, and the number of communications engineers was small. Very few of the first-class men wanted to go to industry; quite a number would take up research and teaching appointments. Another basic problem was that graduates, when they had completed their courses, were put into research laboratories or into the Services. They had had no practical training, so that a year or two in the shops would not be bad for them.

Manchester Scheme

MR. L. H. A. CARR (Metropolitan-Vickers) referred to a report prepared by a committee set up by the Manchester Regional Advisory Council for technical and other forms of further education and the Manchester and Salford Trades Council. The committee represented employers' organisations, trade unions, educational authorities, and the Institutions of Mechanical and Electrical Engineers. It did not overlap the report of the I.E.E. in respect of workshop training; but on the technical college side it did overlap, and it was most remarkable that the two reports, drawn up by two entirely differently constituted bodies, were almost identical. The committee had realised that one day release per week was not enough for the necessary vocational training as well as cultural training and it had based its scheme eventually on two days per week up to the age of eighteen years of age.

MR. C. GRAD (B.T.H. Co.) stressed that the part of the I.E.E. report dealing with the

training of craftsmen was the part which would be welcomed most by the industry. But there seemed to be a need for broadening the status of the professional engineer over and above that which had been accepted for the Higher National Certificate scheme in the past. He would like to see something along the lines of the present London external degree, with a broadened and raised status, which would still give an opportunity to the few part-time students who were able to train to become professional engineers. At the same time there should be free access to the universities and the opportunity for transfer from one grade to another.

MR. C. F. PARTRIDGE (Central Technical College, Birmingham) commented on the difficulty of dividing students into technological and professional groups; it was only in the large firms, he said, where clearly defined groups occurred, and the number of large firms in the country was not great. The proposal that the Institution should concern itself with a National Certificate course, starting at 15 plus, appeared to be a retrograde step; such preparatory courses should be left to the colleges.

The new Intermediate courses would give a much less satisfactory preparation for Higher National Certificate work to the syllabus laid down in the report. In his own college the cut in basic electrical circuit theory under the new scheme would be more than 50 per cent. The rest of the time would be taken up with mechanics, light and sound.

MR. E. S. BYNG (Standard Telephones &

Cables) recalled that three years ago the Sydney, N.S.W., Council, in advertising for a chief engineer and manager, had stressed particularly that technical abilities would not be considered so much as administrative and organising abilities. During the last year or so in this country there had been a trend in the same direction; therefore, he was glad the Institution visualised that those further qualifications would be necessary after the war for chief engineers.

SIR ARTHUR FLEMING, in a brief reply, said there seemed to be an idea that the report proposed to put men into three watertight compartments. But the report showed a number of means whereby a student could transfer from one group to another if he had the ability. He believed the proposals in the report would diminish the "mortality" rate, which had been very serious, as shown by a study of the numbers who commenced courses and the numbers who finished them. Dealing with Dr. Dunsheath's remarks, he said that although the professional group was normally recruited from the universities, it was necessary to provide for the recruitment of a proportion by part-time courses, if those who had not the opportunity of university education were not to be penalised.

THE PRESIDENT said that if men could be placed after leaving the universities he would open the universities as widely as possible; if the numbers became too great, he would make entry to the universities more difficult.

The discussion was then adjourned until yesterday (Thursday).

Rural Supply Costs

Experience in Tasmania

THE financial effects of the Tasmanian Government's rural electrification policy are shown in a memorandum which the State Electricity Commission has recently submitted. In 1941 the Government passed an amendment to the Hydro-Electric Commission Act requiring the Commission to make its retail charges uniform throughout the State at the same level as in Hobart. This has resulted in a decrease in revenue per consumer from £8-258 in 1941-42 to £7-571 in the year ended June 30th last, while the revenue per kWh sold has fallen from 1-209d. to 0-885d.

Simultaneously with its enactment regarding charges, the Government required the Commission to report to the Minister on any extension where the revenue guaranteed by prospective consumers was insufficient to meet the annual charges. In such cases the Treasurer was authorised to pay the Commission for seven years an amount equal to 20 per cent. of the guarantees required. One consequence of this has been that would-be consumers have limited the amounts they are prepared to guarantee.

It is the Commission's practice to require a return of 20 per cent. per annum of the estimated cost of an extension, but the expense is considerably greater. In 1943-44 the annual

charges incidental to a rural service, when expressed as a percentage of the capital expenditure including expenditure from reserves, were 34-196. The difference between this and 20 per cent. is the amount of subsidy the town consumers are paying towards rural extensions. Moreover, in only rare instances do consumers use electricity up to the full amount of the guarantee after the seven years has expired, so that the extensions fail to be self-supporting.

From estimates recently compiled it has been found that the cost of extensions to 504 rural consumers has been £30,935, or £61-37 per consumer, with annual charges of approximately £20 per consumer. Last year the average revenue from rural supply, excluding industries, water pumping, etc., was under £6 per consumer, indicating an average annual loss of £14. There are about 9,000 rural homes not yet connected, and under present conditions the annual loss on these would thus be £126,000. A Bill now before Parliament provides that where a projected extension is unlikely to produce sufficient revenue, financial assistance may be given up to three-quarters of the capital cost. Allowing for this, there would still be a net annual loss on supplies to the 9,000 consumers of £105,287.

PARLIAMENTARY NEWS

By our Special Reporter

New Generating Plant

IN the House of Commons on January 16th Mr. Higgs asked the Minister of Fuel and Power what new capacity had been added to the selected generating stations since 1939.

Major Lloyd George said that the new plant which had been brought into commission in selected generating stations between January 1st, 1940, and December 31st, 1944, was approximately 2,650,000 kW.

Mr. Higgs referred to a statement in the Press this month that the breaking point was 8.4 million kW, and said it is well known that the total plant, plus that on order, before the war was 8.6 million kW. How did the Minister account for that discrepancy?

Major Lloyd George replied that the new plant to which he had just referred was about equal to the increased demand since the war, but difficulty arose owing to the fact that the labour for maintenance was not as great as it was before the war.

Mr. Higgs: But the figures I have quoted show that there has been no increase in plant, although there has been an addition of 2,000,000 kW and over.

Electro-Acoustical Problems

On January 17th Mr. Attlee, Lord President of the Council, replying to Sir Douglas Hacking, said that the members of the Committee appointed to advise and assist the Medical Research Council in promoting research into electro-acoustical problems relating to the design and application of instruments in alleviation of deafness were Dr. W. G. Radley (chairman), Mr. E. J. Barnes, Sir Lawrence Bragg, Mr. N. Fleming, Dr. C. S. Halpike, Mr. L. C. Pocock and Dr. T. S. Littler (secretary). It was not anticipated that the Committee would be in a position to make any recommendations before the end of the year.

Organisation of Fuel Industries

On January 18th Mr. Ness Edwards asked the Minister of Fuel and Power if any plans were under consideration for integrating, co-ordinating and planning on a unified basis, fuel, light and power in any of the coalfields and unifying such production under a single over-riding authority.

Major Lloyd George said that the future organisation of the whole of the coal, gas and electricity industries was at present receiving consideration and it would be premature to consider regional plans such as those suggested in the question.

Electricity for Farm Work

Brig.-Gen. Clifton Brown asked the Minister of Agriculture whether he was aware that many schemes for providing farm premises with electricity were now being held up by War Agricultural Committees; and whether, in cases where material was available and contracts signed he would now modify the Orders by which those Committees appeared to be bound to the detriment of milk and food production.

Mr. T. Williams said that County War Agricultural Executive Committees were informed recently that applications for installing electricity on farms should be supported where the supply would result in increased production or economy in labour, provided the outlay was reasonable having regard to the use which would be made of the supply. The Minister was not aware that proposed installations falling within these terms were being held up by Committees. The only restrictions on the installation of electricity on farms were those imposed by the limitation of supply of material and labour.

High-Tension Batteries

Mr. E. Walkden asked the President of the Board of Trade why 120 V "Exide" batteries which are sold at 11s. 1d. were in short supply and only other 120-V batteries of less reliable make and sold at 15s. 6d. were available; whether there was a price control Order to cover the full range of batteries for wireless sets; and, if so, why was the difference of 4s. 5d. allowed to certain makes of similar voltage.

Mr. Dalton said that wireless batteries were now in short supply, owing to the heavy demands of the Services, and it was necessary, therefore, to make use of the output, although small, of the higher-cost producers. Prices were controlled under the Prices of Goods Act, 1939, and those charged for both classes of battery referred to had been investigated and approved by the Central Price Regulation Committee.

Pressed further by Mr. Walkden, who said that these batteries were largely used by small cottagers in lowly circumstances, Mr. Dalton said that he was very anxious to get a fair distribution of whatever supplies there were, but the best batteries were required for the Services in a very great and increasing quantity. The less satisfactory batteries were less than 10 per cent. of the whole and they were better than nothing at all.

Radio Repairs

In reply to Mr. Liddall, Mr. Dalton said that the Central Price Regulation Committee was investigating the possibility of controlling radio repairs, but there were great practical difficulties.

Glasgow Supply Interrupted

EXPLOSIONS at St. Andrews Cross substation, Pollokshaws, Glasgow, on January 15th resulted in most of the south side of the city being deprived of an electricity supply. A convertor was destroyed and switchgear and cables were damaged, but the main switch escaped damage. Two workmen were trapped in the building but they were able to reach the roof and escape by the firemen's turntable ladder. The explosions, which occurred at six o'clock in the evening, were followed by an oil fire and the power had to be switched off at Dalmarnock power station before this could be tackled. The supply was restored in most places by 8.15 p.m.

ELECTRICITY SUPPLY

Services for Temporary Houses. Sheffield Price Increase.

Accrington.—**ELECTRICITY DECISION.**—The Housing Committee has reaffirmed (after reference back) its recommendation that prefabricated houses shall be equipped with electricity only for lighting, cookers and wash-boilers.

Darlington.—**MOISTURE FROM COOLING TOWERS.**—The borough electrical engineer is to report to the Town Council on the question of reducing the condensation from the cooling towers at the generating station.

Easington (Co. Durham).—**ELECTRICITY CHARGES.**—Further reference to the campaign to secure reduced and uniform electricity charges in the area was made at a meeting of the Rural District Council. It was stated that Horden Collieries, Ltd., one of the suppliers, was anxious to co-operate and was prepared if necessary to hand over its supply undertaking to the North-Eastern Electric Supply Co., Ltd. Efforts are being made to convene a conference.

Edinburgh.—**GAS PROPOSAL REJECTED.**—At a meeting of the Housing Committee it was stated that members had received a letter from the manager of the Gas Department regarding the Committee's decision that 810 temporary houses should be served exclusively by electricity. It was now moved that gas should be used for cooking, etc., and electricity for lighting. In the discussion it was pointed out that the Housing Advisory Committee had reported that more than half of the housewives who gave evidence were in favour of electrical appliances in post-war houses, and that it was the considered opinion of the Ministry of Works that one service in the houses would make for speed of erection. It was agreed to abide by the decision for electricity.

Glasgow.—**SITE NEGOTIATIONS.**—The town clerk recently reported to the Electricity Committee on a meeting which the convener and sub-convener had had with the Clyde Navigation Trustees when amended proposals for the use of a site at Braehead for the erection of a generating station were put forward. These proposals, he said, had been submitted to the Central Electricity Board and the Board had appointed Mr. James Barr, F.S.I. to advise it.

GASWORKS ELECTRICAL INSTALLATION.—The Corporation Gas Committee has authorised the general manager to arrange with the Electricity Department for the extension, reconstruction, etc., of the main switchboard in the electrical substation and running duplicate power and lighting cables to the switchboard in a new retrofit house at the Tradeston gas works.

Hull.—**INCREASED COSTS.**—Submitting the 1945-46 estimates to the Electricity Committee last week, Councillor W. McNicol, chairman of the Finance Committee, said that generation was estimated to cost £567,013, nearly £100,000 more than the probable cost in the current year, although that was likely to be £96,000 above the estimated expenditure. The general manager (Mr. D. Bellamy) stated that the probable surplus of £11,150 on revenue account was much better than expected; a year ago they

provided for a loss of £30,000, and since then there had been a second and unexpected increase in the price of coal. The position was entirely due to fuel cost. He spoke of the possibility of some revision of charges being necessary in the near future.

Inverness.—**RIVER NESS WATER POWER.**—Sir William Halcrow, in a letter to the Council, said that he was carrying out investigations on behalf of the North of Scotland Hydro-Electric Board, and were looking into the possibility of developing power on the River Ness. He wished to ascertain the extent to which the Council's agreement with the Ness District Fishery Board in connection with the Bught power station affected the flow of the river. When the Council considered the matter Provost MacKenzie, a member of the Board, said he did not think the question of the development of the River Ness had come before the Board. Another councillor pointed out that in the past hydro-electric schemes adversely affecting the river had been put forward. It was decided that before replying to the letter the town clerk should inquire what the proposals of the Board were regarding the river.

Lanark.—**ELECTRICITY CHOSEN.**—After hearing that the cost of mains, services and electric cookers for 96 houses at Baillieston would be £1,661, compared with £2,043 for gas for cooking and electricity for lighting, the Housing Committee has agreed that the houses shall be all-electric.

Lincoln.—**COOLING WATER PROBLEM.**—at a meeting of the interested parties last week at the Guildhall Sir Robert Pattinson, chairman of the Witham and Steeping Rivers Catchment Board, explained his proposals for enabling the Corporation to use water from the Trent as an alternative to cooling towers for the power station extension. Mr. C. E. Farran, Doncaster, who has been retained as consultant by the Corporation, was asked to submit a full report upon the scheme, and any other relevant matters, for consideration by the Electricity Committee.

London.—**BERMONDSEY'S CHOICE.**—The Bermondsey Housing Committee has considered the tariffs for the supply of electricity and gas for the temporary huts being erected on various sites and is satisfied that the provision of heating and lighting by electricity would be more reasonable.

Margate.—**PURCHASE OF UNDERTAKING.**—The Town Council at its last meeting adopted a report on the arrangements for the proposed purchase of the whole of the undertaking of the Isle of Thanet Electric Supply Co., Ltd., authorised by the Margate Corporation Electric Lighting Order, 1896; the Broadstairs E.L.O., 1899; the Isle of Thanet (Rural) E.L.O., 1901; and the Westgate and Birchington Electricity Special Order, 1924. The Electricity Commissioners having notified their consent to the Corporation and the Broadstairs and St. Peter's U.D.C. together giving notice to the company, the Town Council resolved to give the company not less than six months notice

expiring on January 1st, 1946, and to notify the Broadstairs and St. Peter's U.D.C. of this resolution. In the event of the latter's deciding, before June 1st, 1945, to join in the purchase of the undertaking, application would then be made to the Commissioners for a Special Order for the constitution of a joint board.

Oldham.—ELECTRICAL APPARATUS FOR NEW HOUSES.—The Housing Committee is to install electric refrigerators, cookers and wash-boilers in the proposed 350 temporary houses, on sites at Crete Street, Incline Road and Byron Street.

SUPPLY EXTENSION.—Cables are to be laid by the Electricity Committee to provide an electricity supply to two mills.

Sheffield. — INCREASES IN CHARGES SANCTIONED.—Following the refusal of the Ministry of Fuel and Power to permit proposed increased charges for electricity, further representations were made and increases amounting to about 10 per cent. have now been sanctioned. A special meeting of the City Council last week approved the new charges, after some discussion.

Alderman J. A. Longden, chairman of the Electricity Committee, in answer to a series of questions, said that the average cost per ton of coal last year was 28s. 5d. compared with 35s. 2d. to-day. The overall price per kWh under

the new scale of charges to householders on the inclusive domestic rate, with a rateable value of £20 per annum and a consumption of 1,200 kWh, would be 0.733d. per kWh, and the price to a power user taking 600,000 kWh for power and 400,000 kWh for lighting would be 0.66d. per kWh for power and 1.87d. per kWh for lighting. The Committee had arrived at something near what it had asked for, and the Electricity Commissioners would consider the case again should the occasion arise. The average increase to domestic consumers on the rateable tariff would be 4s. 7d. per annum. Councillor F. Lloyd said that as a member of the Transport Committee he did not see how the transport undertaking could stand the extra cost without raising fares.

Stockton-on-Tees.—NEW SUBSTATIONS.—The Electricity Commissioners have decided that the Town Council's plans for new substations in Outram Street and West Row are urgent and should proceed without delay. The cost will be about £20,000. The Council also proposes to extend the Norton Road substation.

West Hartlepool.—SERVICES IN TEMPORARY HOUSES.—Seventy temporary houses to be built for the Town Council are to be supplied with electricity and forty-six with gas.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

E. K. Cole, Ltd. — In his speech at the company's annual meeting last week Mr. W. S. Verrells, chairman and joint managing director, referred to the increase in trading profit from £263,401 to £423,124. This, he said, by no means adequately indicated the considerably greater output from the company's factories, which had been achieved with greater efficiency, enabling them to fix even lower prices. The figures did not include the profits of Ensign Lamps, Ltd., now a wholly owned subsidiary.

After reviewing the important part which the company's products had played in the war, the chairman turned to post-war conditions and said that certain flexible and broad lines of policy had been framed and plans formulated. He stressed the importance to civilian applications of the technical advances made during the war. The company's radio interests had been broadened to cover not only broadcast and television receivers, but also telecommunication and public address equipment and electronic devices. The lighting division, which incorporated Ensign Lamps, Ltd., had the opportunity of participating in the remarkable possibilities for expansion inherent in fluorescent lighting.

Mr. E. K. Cole, joint managing director, had just returned from a visit to the United States undertaken in connection with the development of the company's expanding interests. The chairman also referred to the prospects of the plastics and household appliances divisions, and the "special products" division which had been formed to concentrate on specialised research and development of products which in the early stages did not lend themselves to mass-production methods. With regard to these divisions he said that the directors

envisaged the possibility that at a later stage it might become advantageous to form them into separate subsidiary companies.

On Government control, the chairman observed that in his opinion the word "control" was often used loosely. He considered that basic controls over materials and labour should be gradually relinquished, but Government co-operation with and co-ordination of industry, from which obvious advantages had been and could be obtained, should be continued and strengthened.

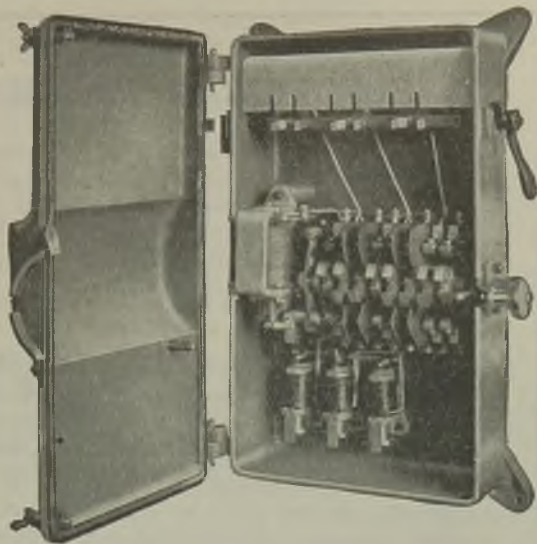
In conclusion the chairman said that the board would give careful consideration to whether it would be desirable to change the company's financial year, at present terminating on September 30th. As regards a proposal to extend the company's objects, he would make an explanatory statement at the extraordinary general meeting on January 31st.

The Electrical Apparatus Co., Ltd., states that its net profit for 1943-44 was £19,856 (against £14,517 in 1942-43). A sum of £5,000 (against £5,500) is transferred to general reserve and the ordinary dividend is again 15 per cent., leaving £30,290 (against £23,405) to be carried forward.

R. A. Lister & Co., Ltd., from a net profit of £127,735 for the past year (against £136,839) are paying a final ordinary dividend of 5 per cent. and a bonus of 6 per cent., again making 16 per cent. for the year.

Radio Rentals, Ltd.—The chairman, Mr. H. F. Hunt, in a statement circulated with the report and accounts, says that the fifth year of war proved to be one of extra difficulties, more especially as most of the company's premises and the majority of its subscribers were in Southern England, where the enemy's attacks were concentrated. He was glad to say that

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for
squirrel-cage
motors*



by



- * overloads cutout in starting position
- * correct sequence device
- * all contacts renewable
- * interlocked isolator in same case if required
- * immediate despatch

WORKS: ASTON, BIRMINGHAM 6

Sales Headquarters : BRETENHAM HOUSE, LANCASTER PLACE, W.C.2

TO ELECTRICAL MACHINERY TRADERS

A MEETING was held at the Holborn Restaurant, London, on January 2nd, 1945, attended by a number of representative firms interested in Electrical Machinery Trading, with particular reference to the question of Government Disposals of Surplus Electric Motors, Generators, and Allied Equipment. It was decided to found immediately an Electrical Machinery Traders' Association.

A Committee was appointed with powers to proceed with the further organisation of the Association.

It is proposed to hold a general meeting in London at an early date to explain the aims and objects of the Association. Invitations to attend this meeting have been issued to a number of firms throughout the country, but the Committee is anxious that every concern with similar interests to the founder members of the Association shall have an opportunity of attending the meeting.

Accordingly, any firm which has not received an invitation before February 2nd, 1945, and who would like to attend, should get in touch with one of the founder members who will arrange for an invitation to be sent to the applicant and also will be very pleased to give further information.

The founder members are :—

Britannia Manufacturing Co. Ltd.	.. .. .	London.
Burdette & Co. Ltd.	.. .. .	London.
Dynamo & Motor Repairs Ltd.	.. .. .	Wembley.
Fyfe, Wilson & Co. Ltd.	.. .. .	Bishop's Stortford.
The Industrial Electrical Co. Ltd.	.. .. .	London.
Magstarlite Ltd.	.. .. .	London.
The Manchester Armature Repair Co. Ltd.	.. .. .	Oldham.
Midland Counties Electrical Engineering Co. Ltd.	.. .. .	West Bromwich.
The Midland Dynamo Co. Ltd.	.. .. .	Leicester.
Milo Engineering Works	.. .. .	London.
Newman Industries Ltd.	.. .. .	Yate, Bristol.
Oldfield Engineering Co. Ltd.	.. .. .	Salford.
W. H. Sugden & Co. Ltd.	.. .. .	Barking.
Stewart Thomson & Sons	.. .. .	Liverpool.
Universal Electrical Co.	.. .. .	London.
R. F. Winder Ltd.	.. .. .	Leeds.

The Committee comprises :—

H. W. Cole	.. .. .	Milo Engineering Works, London.
E. H. Crook	.. .. .	Dynamo & Motor Repairs Ltd., Wembley.
E. J. Ferguson	.. .. .	Britannia Manufacturing Co. Ltd., London.
G. H. Holding	.. .. .	Newman Industries Ltd., Yate, Bristol.
W. E. Lawton	.. .. .	The Industrial Electrical Co. Ltd., London.

The Committee thanks Messrs. Burdette & Co. Ltd., Stonhouse Street, Clapham, S.W.4, for the use of this page.

losses of apparatus were negligible. The demand for sets was greatly increasing, but it was possible that they would not receive enough new sets this year to enable them to maintain their gross rental income. Their proportion of the civilian wartime receivers had not been received on the dates expected, but they anticipated early delivery.

Redfern's Rubber Works, Ltd., from a net profit of £18,210 (against £19,334), are paying a final ordinary dividend of 6½ per cent., making 10 per cent. for the year, plus a bonus of 2 per cent., as last year.

New Companies

Telcon-Magnetic Cores, Ltd.—Private company. Registered January 13th. Capital, £20,000. Objects: To carry on the business of manufacturers of, and dealers in, cores for electrical transformers, etc. The directors are: Sir Geoffrey R. Clarke, W. F. Randall, J. A. Holden and A. Asplin; the first two represent the Telegraph Construction & Maintenance Co., Ltd., and the last two Magnetic & Electrical Alloys, Ltd. Solicitors: Bircham & Co., London, E.C.2.

Provincial Electrics & Refrigerators, Ltd.—Private company. Registered January 9th. Capital, £3,000. Objects: To acquire the business of electrical, radio, refrigeration and general engineers carried on by W. W. Wilson and E. Perkins at Gosport and elsewhere as the Hampshire Electrical Co. Directors: W. W. Wilson, Roseleigh, Curdrige, Southampton; E. Perkins, 5, Molesworth Road, Gosport; and H. Howell, Bickleigh, St. Mary's Avenue, Alverstoke. Registered office: 1, High Street, Gosport, Hants.

Spencer's Agencies, Ltd.—Private company. Registered January 9th. Capital, £500. Objects: To carry on the business of agents for the import, export, purchase and sale of electrical goods and merchandise, etc. Directors: Olive M. W. Spencer, Keith Lodge, Brockenhurst; and W. J. Green, 13, Willis Road, Southampton. Registered office: Keith Lodge, Brockenhurst, Hants.

Household Electrix, Ltd.—Private company. Registered January 3rd. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, radio sets and equipment, electrical goods, etc. Subscribers: M. M. Toubkin, 45, Waldegrave Gardens, Twickenham; and R. W. Gardner, 12, The Green, Richmond, Surrey. Registered office: 12, The Green, Richmond.

H. Warren & Son, Ltd.—Private company. Registered January 3rd. Capital, £1,500. Objects: To carry on the business of manufacturers of, and dealers in, radio apparatus, electrical and mechanical engineers, etc. Subscribers: H. Warren, 397, Whalebone Lane North and G. T. Warren, 497, Whalebone Lane North, both of Chadwell Heath. First directors: H. Warren and H. F. Warren.

Harrison & Co. (Electrical), Ltd.—Private company. Registered January 6th. Capital, £1,000. Objects: To carry on the business of retail and wholesale merchants, manufacturers, repairers and factors of wireless and electrical apparatus and accessories, etc. The first directors are:—S. Harrison, 51, Old Montague

Street, E.2; and Doreen Harrison, 46, Menclik Road, N.W.2. Secretary: D. Gerlis. Registered office: 6, Broad Street Place, E.C.2.

Companies' Returns

Increases of Capital

General Electric Co., Ltd.—The nominal capital has been increased by the addition of £2,000,000 in 2,000,000 4½ per cent. "C" cumulative preference (not redeemable) shares of £1, beyond the registered capital of £9,600,000.

Morphy-Richards, Ltd.—The nominal capital has been increased by the addition of £20,000 in 20,000 "A" shares of £1, beyond the registered capital of £30,000.

Varley Dry Accumulators, Ltd.—The nominal capital has been increased by the addition of £30,000 in £1 ordinary shares beyond the registered capital of £30,000. To December 7th, 1943, 14,802 shares of £1 had been issued, of which Oliver Pell Control, Ltd., held 10,450.

Mortgages and Charges

New Era Time & Telephone Systems, Ltd.—Satisfaction to the extent of £10,000 on September 8th, 1944, of 5 per cent. debenture stock, authorised February 14th, 1936, and registered April 2nd, 1936, securing £30,000. (Notice filed January 10th, 1945.)

Liquidations

R. H. Whittaker, Ltd.—The first meetings of creditors and contributories under the compulsory liquidation of the company were held on December 16th at Columbia House, Aldwych, W.C. Mr. H. P. Naunton, Senior Official Receiver, reported that the company was formed in October, 1939, to carry on business as manufacturers of, and dealers in, artificial lighting apparatus and electrical components and equipment of all kinds. The failure of the company was attributed solely to flying bomb attacks. The liabilities amounted to £4,747 against assets valued at £3,436. A resolution was passed for Mr. C. Leslie Walker, C.A., to act as liquidator and wind up the company with the assistance of a committee of inspection.

Electrical Utilities, Ltd.—Last day for receiving proofs for dividend January 31st. Liquidator, Mr. C. L. Walker, 10-11, Park Place, St. James's Street, S.W.1.

Bankruptcies

H. J. Gill, electrical engineer and radio dealer, residing and carrying on business at 10, High Street, Keynsham, Somerset.—Order for discharge made at Bristol on December 15th and suspended for one week.

B. J. Wainwright, electrician, lately carrying on business as the Wells Road Garage at 197-202, Wells Road, Shepherds Bush, W.12, and as Wainwright Neon Displays at 197, Wells Road, Shepherds Bush, and previously at 14, St. Thomas' Road, Harlesden, N.W.10.—Last day for receiving proofs for dividend January 30th. Trustee, Mr. P. Phillips, 76, New Cavendish Street, London, W.1.

STOCKS AND SHARES

TUESDAY EVENING.

STATISTICS now being published as to the cost of the war have no effect in checking the appetite for Stock Exchange securities. The gilt-edged issues, led by British Government stocks, go steadily ahead. The ordinary shares in the best class industrial companies remain in demand and the complaint is still that there are not sufficient shares to satisfy the buyers. Though the volume of business may not be excessive, investment absorption exercises its natural effect upon quotations.

The more speculative issues have halted, and in some cases have gone back. Last week's capture of Warsaw, and the rate of the Russian advance, led to talk of the possibility that the war might be nearing its end. This opened up vistas of a general election, labour difficulties, dearer money and other factors conducive to financial unsettlement.

Price Fluctuations

Notwithstanding the dullness that affected sections of the industrial market, several useful rises are noticeable in the manufacturing and equipment group. A rise of 5s. to 7½ in International Combustions follows upon similar gains in each of the last two weeks. Lancashire Dynamo at 5½ are the fraction to the good, and Consolidated Signals at 6¾ are ½ up. Electric Constructions at 63s. 6d. are 2s. 3d. better. A florin advance has lifted Ever Ready to 45s., notice being attracted to the shares by the yield they afford. The return compares favourably with that obtainable from shares of similar character and calibre. Improvements this week have been secured also by Aron Meter, Burco, English Electric, Mather & Platt, British Vacuum Cleaner, Crompton Parkinson, Falk Stadelmann, Veritys, and Ward & Goldstone. On the other hand, declines have occurred in British Insulated, Callender's, Henley's, Johnson & Phillips, Christy Bros. and a few others.

Electricity Supply

Erratic movements in the price of Tokyo Electric sixes do not necessarily imply there is any marked public interest being taken in the bonds. Last week the price fell 2½ points; this week it is 2 points up at 23½. A single buyer, or a single seller can bring about fluctuations of this kind, without his order, be it to buy or sell, being of any material extent. In the Home electricity supply list, Bournemouth & Poole are 1s. higher at 63s. 6d., and the shares of the parent company, County of London, are 1s. better at 45s. Metropolitan Electrics at 44s. 6d., Northmets at two guineas and North Easterns at 35s., have gains to their credit. Edmund-

sons hardened to 32s., British Power & Light to 33s. 6d. and Electrical Finance and Electric Supply Corporation to 61s. and 51s. respectively.

General Electrics

General Electric ordinary shares have made history for themselves by rising to a little over £5 before easing off to 99s. 6d. Last year, the price very nearly touched 100s. Some eight years ago it got up to 96s., but the current quotation is nearly the best since the company was registered in 1900. In the dark days of 1940, General Electrics fell to 52s. 6d. The dividend for that year was 20 per cent., to be followed since then by 17½ per cent. annually, of which 7½ per cent. has been declared as bonus. It had been hoped last year that the dividend would be restored to 20 per cent. and it is this expectation that gives the shares a peculiar attraction in the eyes of investment. Dividends are paid once a year. The issued capital is £9,798,000, there being another £1,801,000 of ordinary stock authorised but not yet issued. The former amount of £9,798,000 includes the £2,000,000 of 4½ per cent. "C" preference shares which recently have been the subject of considerable notice.

Murex

Murex shares are again a good market at 5½, and there is some talk of a possible increase in the dividend. For the last eight years, 1937 to 1944 inclusive, the interim dividend of 7½ per cent. has been followed by a final of 10 per cent. and a bonus of 2½ per cent., making 20 per cent. for the year in each case. For 1935 and 1936, the company distributed a bonus. The issued ordinary capital is now £1,000,000 in £1 shares. There is a small amount of 7 per cent. preference capital. During its fifteen years existence, Murex has gone steadily ahead, and the balance-sheet is now in excellent shape. The year ends with June 30th. Goodwill and patents have been written down to £1. At the present price of the shares, the yield is £3 8s. per cent. on the money, in itself an indication of the hope that the dividend may be increased, either now or soon after the war.

Miscellaneous Matters

Home railway stocks have made a languid effort to go better, but not very successfully, and Southern preferred at 79 is unchanged on the week. The dividend announcements from the Southern Railway and the London Transport Board will be made on February 15th. Thomas Tillings are 1s. up at 63s. British Electric Traction deferred rose 15 to 1215. Lancashire Transports and West Riding run neck-and-neck with rises of 1s. 6d. to the common price

(Continued on page 148)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend		Middle Price Jan. 23	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price Jan. 23	Rise or Fall	Yield p.c.
	Previous	Last					Previous	Last			
Home Electricity Ordinary						Equipment and Manufacturing					
Bournemouth and Poole	12½	12½	63/6	+1/-	3 19 1	Aron Elec. Ord.	10	15	62/-	+1/-	4 16 9
British Power and Light	7	7	33/6	+6d	4 3 10	Assoc. Brit. Eng. Assoc. Elec. Ord.	6	7	53/9		2 12 0
City of London	7	5½	30/-		3 13 4	Ord.	10	10	58/-		3 9 0
Clyde Valley	8	8	42/-		3 16 0	Pref.	8	8	40/-		4 0 0
County of London	8	8	45/-	+1/-	3 11 1	Automatic Tel. & El.	12½	12½	67/-		3 14 0
Edmundsons	6	6	32/-	+9d	3 15 0	Babcock & Wilcox	11	11	54/-	-6d.	4 1 6
Elec. Dis. Yorkshire	9	9	45/6		3 19 6	British Aluminium	10	10	46/-		4 7 0
Elec. Fin. and Securities	12½	13½	61/-	+6d.	4 8 6	British Insul. Ord.	20	20	5½	-½	3 10 6
Elec. Supply Corporation	10	10	51/-	+6d.	3 18 6	British Thermostat (5/-)	18½	18½	21/3		4 2 0
Lanes. Light and Power	7½	7½	37/-		4 1 1	British Vac. Cleaner (5/-)	30	30	33/-	+6d.	4 11 0
Llanely Elec.	6	6	26/6		4 10 7	Brush Ord. (5/-)	8	9	11/-		4 1 9
Lond. Assoc. Electric	3	4	26/-		3 1 6	Buroc (5/-)	15	15	16/3	+6d.	4 12 3
London Electric	6	6	30/6		3 18 8	Callender's	15	20	5½	-½	3 9 9
Metropolitan E.S.	8	8	44/6	+1/-	3 12 0	Chloride Elec. Storage	15	15	87/6		3 18 7
Midland Counties	8	8	41/6		3 17 0	Christy Bros.	12½	17½	77/6	-½	4 10 2
Mid. Elec. Power	9	9	44/6		4 1 0	Cole, E. K. (5/-)	15	20	42/6		2 7 0
Newcastle Elec.	7	7	32/-		4 7 6	Consolidated Signal	24	27½	6½	+½	4 0 0
North Eastern Elec.	7	7	35/-	+6d.	4 0 0	Cossor, A. C. (5/-)	7½*	10*	32/-	-6d.	1 11 4
Northampton	10	10	50/6		3 19 4	Crabtree (10/-)	17½	17½	44/6		3 18 7
Northmet Power	7	7	42/-	+1/-	3 6 8	Crompton Parkinson Ord. (5/-)	20	22½	34/6	+6d.	3 5 3
Richmond Elec.	6	6	26/-		4 12 4	De La Rue	35	40	9½	-½	4 1 8
Scottish Power	8	8	40/6		3 19 0	E.M.I. (10/-)	6	8	35/3	-1/9	2 5 4
Southern Areas	5	5	23/-		4 7 0	Elec. Construction	10	12½	63/6	+2/3	3 18 7
South London	7	7	30/-		4 13 4	Enfield Cable Ord.	12½	12½	64/-	-1/-	3 18 0
West Devon	5	5	24/6		4 1 8	English Electric	10	10	57/9	+9d.	3 9 2
West Gos.	4½	3½	25/-		2 16 0	Ensign Lamps (5/-)	25	15	21/3		3 10 8
Yorkshire Elec.	8	8	43/-		3 14 5	Ericsson Tel. (5/-)	22*	20*	56/3		1 15 6
						Ever Ready (5/-)	40	40	45/-	+2/-	4 9 0
						Falk Stadelmann	7½	7½	35/6	+6d.	4 4 9
						Ferranti Pref.	7	7	31/9		4 8 2
						G.E.C.:					
						Pref.	6½	6½	34/-		3 16 4
						Ord.	17½	17½	99/6	-6d.	3 10 6
						General Cable (5/-)	15	15	17/-		4 8 3
						Greenwood & Batley	15	15	48/9		6 3 0
						Hall Telephone (10/-)	12½	12½	31/6		3 19 4
						Henley's (5/-)	20	20	27/6	-6d.	3 12 9
						4½% Pref.	4½	4½	24/-		3 15 0
						Hopkinson's	15	17½	75/9		4 12 7
						India Rubber Pref.	5½	5½	24/-	+1/-	4 11 9
						Intl. Combustion	30	30	7½	+½	4 2 9
						Johnson & Phillips	15	15	78/6	-6d.	3 16 6
						Lancashire Dynamo	22½	22½	102/6	+½	4 10 0
						Laurence, Scott (5/-)	12½	12½	14/3		4 8 6
						London Elec. Wire	7½	7½	38/-		3 19 0
						Mather & Platt.	10	10	57/-	+9d.	3 10 2
						Metal Industries (B)	8	8½	49/-		3 9 6
						Met. Elec. Cable Pref.	5½	5½	21/3		5 3 6
						Mid. Elec. Mfg.	25	25	7½		3 9 10
						Murex	20	20	5½	+½	3 18 0
						Newman Ind. (2/-)	20	20	7/3		5 10 0
						Philco (2/-)	—	—	15/-	-1/-	—
						Power Securities	6.	6.	29/6		4 1 4
						Pye Deferred (5/-)	25	25	33/9		3 14 0
						Ransome & Marles	20	20	87/6		4 11 4
						Revo (10/-)	17½	17½	44/6		3 18 7
						Reyrolle	12½	12½	72/6		3 9 0

(Continued on next page)

* Dividends are paid free of Income Tax.

Company	Dividend		Middle Price Jan. 23	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price Jan. 23	Rise or Fall	Yield p.c.
	Pre- vious	Last					Pre- vious	Last			
Equipment and Manufacturing (Continued)											
Siemens Ord. ..	7½	7½	36/6		4 2 2	Cape Elec. Trams	5	6	26/-		4 12 4
Strand Elec. (5/-)	10	12½	11/6		5 8 8	Lancs. Transport	10	10	49/-	+1/6	4 1 8
Switchgear & Cow- ans (5/-) ..	20	20	20/9		4 16 7	Southern Rly. :					
T.C.C. (10/-) ..	5	7½	25/-		3 0 0	5% Prefd. ..	5	5	79	+1	6 6 7
T.C. & M. ..	10	10	57/-		3 10 2	5% Pref. ..	5	5	119½		4 3 8
Telephone Mfg. (5/-)	9	9	12/-		3 15 0	T. Tilling ..	10	10	63/-	+1/-	3 3 6
Thorn Elec. (5/-)	20	20	28/9		3 9 6	West Riding ..	10	10	49/-	+1/6	4 1 8
Tube Investments 20	22½	22	5 ½	-½	4 1 1	Telegraph and Telephone					
Vactric (5/-) ..	Nil	Nil	17/3		3 10 6	Anglo-Am. Tel. :					
Veritys (5/-) ..	7½	7½	9/6	+6d.	3 19 0	Pref. ..	6	6	125½	+½	4 15 7
Walsall Conduits (4/-) 55	55	55	52/6		4 3 10	Def. ..	1½	1½	31		4 16 9
Ward & Goldstone (5/-) ..	20	20	30/6	+6d.	3 5 8	Anglo-Portuguese	8	8	29/6		5 8 6
Westinghouse Brake 12½	14	14	76/-		3 13 8	Cable & Wireless :					
West, Allen (5/-)	7½	7½	8/9		4 5 9	5½% Pref. ..	5½	5½	118		4 13 3
Traction and Transport						Ord. ..	4	4	85		4 14 2
Anglo-Arg. Trans. :						Canadian Marconi \$1 Nil			4cts.	9/6	
First Pref. (£5)	Nil	Nil	2/6		—	Globe Tel. & Tel. :					
4% Inc. ..	Nil	Nil	6½		—	Ord. ..	8½ ^a	5 ^a	42/-	-6d.	2 7 8
Brit. Elec. Traction :						Pref. ..	6	6	31/-		3 17 5
Def. Ord. ..	45	45	1215	+15	3 14 0	Great Northern Tel. (£10) ..	Nil	Nil	29	+½	—
Pref. Ord. ..	8	8	190		4 4 3	Inter. Tel. & Tel. Nil	Nil	Nil	27	+2	—
Bristol Trams ..	10	10	57/-		3 10 2	Marconi-Marine. ..	7½	7½	35/-	-6d.	4 5 9
Brazil Traction ..	1½	2	26½	+½	7 12 5	Oriental Tel. Ord. 16	10	10	49/6	+6d.	—
Calcutta Trams	6½	7½	64/6	+2/-	2 6 6	Telephone Props. Nil	6	6	20/-		6 0 0
						Tele. Rentals (5/-)	10	10	12/3		4 1 8

* Dividends are paid free of Income Tax.

Stocks and Shares (Continued from page 146)

of 49s. International "Tel & Tel" at 27 show an advance of \$2. Great Northern Telegraphs are up 10s. at 29, on the victorious Russian drive. Cable & Wireless stocks are unchanged. At 125½, Anglo-American Telegraph preferred is again 10s. better. The company has declared the usual dividend of 6 per cent. on the preferred and 1½ per cent. on the deferred stocks.

Radio Companies

Interest in the radio group is actively maintained. The market in the shares of some of the companies, Cossor, for example, and Philco, is amongst the most lively from the speculative point of view. The question is continually asked in the Stock Exchange as to whether these shares already stand too high, or if there is a further chance of improvement. The answer can only be that it all depends upon what view is taken of the prospects of television and radio when the companies are able to settle down to peacetime work.

The reaction, which was accentuated early this week, was reflected in a 1s. fall, to 15s., in Philco. E.M.I. dropped 1s. 9d. to 35s. 3d., and E. K. Cole fell to 41s.

Matters of Opinion

It is obvious that after the war many people will require fresh wireless sets, and equally certain that television will come to

the front, as Mr. Churchill has said it will, as one of the most interesting post-war developments. To what extent television will appeal to the man in the street—that is to say, to the prospective purchaser of sets—must depend to a great extent upon the stage to which the invention is carried. Such questions as these are largely a matter of opinion, but from the manner in which shares in the companies concerned have been raised in price, the general view of what is likely to happen is made tolerably clear.

Calcutta Utilities

Calcutta Tramways shares are again coming into the picture. After being a dull and uncertain market, the shares apparently attracted attention from buyers who are always on the lookout to pick up shares which have had a substantial fall. Market opinion has no further explanation to offer for the recovery than this. No fresh development in regard to the acquisition of the company has yet been made public on this side. Meanwhile, the price of Calcutta Electric Supply shares is again 6d. better at 48s. 6d. The purchasers contend that though the Calcutta Corporation may not proceed at once with the proposed acquisition of the Electric Supply Corporation, the latter is paying sufficiently good dividends on its ordinary shares to make its shares a useful investment. Madras Electrics are 1s. higher at 31s. 6d.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

E. ARON and **C. H. Vidal**.—"Variable-speed electric driving mechanism." 10810. July 2nd, 1943. (566635.)

Automatic Telephone & Electric Co., Ltd., **C. Gillings** and **C. E. Beale**.—"Telephone and like systems." 10679. July 1st, 1943. (566602.)

British Electric Meters, Ltd., **N. B. Coop** and **E. S. White**.—"Prepayment mechanism for electric and like meters." 5735. April 9th, 1943. (566578.)

British Insulated Cables, Ltd., **J. Holland** and **A. Sephton**.—"Section insulation for use in overhead contact wires of electric railway systems." 15647. September 23rd, 1943. (566562.)

British Thomson-Houston Co., Ltd.—"Electric motor control systems." 12500/42. September 6th, 1941. (566494.) "Protective arrangements for star-connected electrostatic condensers." 8695/43. May 30th, 1942. (566584.) "Air-break electric switches." 13423/43. August 22nd, 1942. (566617.)

British Thomson-Houston Co., Ltd., and **H. E. Cox**.—"Non-inductive electric resistors." 14698. September 8th, 1943. (566559.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—"High-frequency electronic discharge devices." 11731. July 19th, 1943. (566542.)

British Vacuum Cleaner & Engineering Co., Ltd., and **H. J. Whiteside**.—"Time-controlled electric switch-operating mechanisms." 13866. August 25th, 1943. (566619.)

J. W. Brown, **J. Caldwell** and **C. Hipwell**.—"Magnetic separators." 10815. July 3rd, 1943. (566636.)

H. Butler, Ltd., and **H. Butler**.—"Electrical measuring instruments." 11223. July 10th, 1943. (566610.)

Chicago Pneumatic Tool Co.—"Electric reversing switches." 17534/43. February 15th, 1943. (566648.)

G. H. Collins and **H. F. Collins**.—"Electric irons." 3959. March 11th, 1943. (566599.) "Electric irons." 14640/44. March 11th, 1943. (Divided out of 566599.) (566624.) "Electric irons embodying thermal switches." 14641/44. March 11th, 1943. (Divided out of 566599.) (566625.)

C. Cutler and **Metropolitan-Vickers Electrical Co., Ltd.**—"Small electric transformers." 16637. October 11th, 1943. (566642.)

E. I. Du Pont De Nemours & Co.—"Electro-deposition of tin and electro-plating baths." 10759/43. July 4th, 1942. (566633.)

Durham Cables, Ltd., and **N. Stell**.—"Induction coils and the like." 5249. April 1st, 1943. (566576.)

General Electric Co., Ltd., and **A. J. Biggs**.—"Piezo-electric oscillators." 7555. May 12th, 1943. (566515.)

General Electric Co., Ltd., **M. R. Gavin** and **V. A. Heathcote**.—"Frequency-modulation

apparatus." 14059. August 27th, 1943. (566556.)

A. Graves, **T. J. Dawes** and **Alltools, Ltd.**—"Apparatus for small electrical currents." 13311. August 16th, 1943. (566551.)

R. Haddan.—"Methods and apparatus for electric glass working." 8246. May 24th, 1943. (566629.)

S. B. Jackson.—"Variable-speed couplings of the electro-magnetic type." 9472. June 11th, 1943. (566589.)

Johnson, Matthey & Co., Ltd., and **E. R. Box**.—"Production of electrical condenser plates." 16780. October 13th, 1943. (Addition to 558714.) (566643.)

Landis & Gyr Soc. Anon.—"Counting device for over-voltages." 17042/43. November 7th, 1942. (566645.)

J. Lucas, Ltd., and **A. D. Prickett**.—"Electric lamps." 9280. June 9th, 1943. (566587.)

Marconi's Wireless Telegraph Co., Ltd.—"Testing arrangements for variable gain amplifiers." 10363/43. June 26th, 1942. (566524.) "Electric signal amplifiers having selective input circuits." 10489/43. June 29th, 1942. (566540.) "Mounting piezo-electric crystals." 13001/43. August 12th, 1942. (566549.)

Okonite-Callender Cable Co., Inc.—"Processing of lead." 6340/43. April 14th, 1942. (566579.)

H. Pearce.—"Electric gas lighters." 15594. September 23rd, 1943. (566622.)

Philco Radio & Television Corporation.—"Frequency modulation receiver." 10772/43. July 2nd, 1942. (566634.)

Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken).—"Electric connections." 9203. May 24th, 1940. (Convention date not granted.) (566492.)

Philips Lamps, Ltd., and **J. H. De Boer**.—"Photographic flash-light lamps." 14892/44. January 8th, 1943. (Divided out of 420/43.) (566527.)

Plessey Co., Ltd.—"Electric power supply systems." 10411/43. October 23rd, 1942. (566537.)

Pulsometer Engineering Co., Ltd., and **A. V. Price**.—"Centrifugal pumps." 10699. July 1st, 1943. (566603.)

Revo Electric Co., Ltd., and **F. H. Reeves**.—"Lighting fittings." 14311. September 2nd, 1943. (566557.)

Siemens Electric Lamps and Supplies, Ltd., **H. R. Treace** and **R. A. Wilkinson**.—"Electrical excess voltage protective devices." 8497. May 27th, 1943. (566582.)

Standard Telephones & Cables, Ltd.—"Cord connectors for telephone instruments." 14408/43. December 29th, 1942. (Addition to 560586.) (566558.)

R. L. Taylor and **Crompton Parkinson, Ltd.**—"Divertors, variable resistances, and the like." 13155. August 13th, 1943. (566550.)

W. Y. Thomson and **R. N. Aitken**.—"Electric or gas radiators." 12010. July 23rd, 1943. (566544.)

E. T. Williams.—"Resistance elements." 12658. August 5th, 1943. (566546.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—March 1st. Western Australian Government Tender Board. Two 25,000-kW turbo-alternators and condensing plant; boiler-house equipment (boilers, pulverised coal equipment, economisers, feed pumps, air heaters, mechanical draught plant, pipework, buildings, etc.); and 25,000-kW frequency changer.

April 26th. Melbourne City Council. Electrostatic flue gas dust collecting equipment. Spec. 419. City Electrical Engineer's Office (£1 ls.).

Victorian State Electricity Commission. February 21st. Paper and varnished cambric insulated cable. Spec. 44-45/41.

Boote.—January 27th. Town Council. Electric lamps (Form No. 14), for six or twelve months from April 1st, 1945. Forms of tender from the borough engineer, Town Hall.

Eston.—January 29th. Urban District Council. Kiosk substation, with 300-kVA transformer and switchgear; also cable. (January 19th.)

Eire.—**GALWAY.**—February 1st. County Council. Electrical installation at nurses' home extension, Central Hospital, Galway. Plans, etc., from J. P. Tierney & Co., 44, Kildare Street, Dublin.

Gellygaer.—February 3rd. Electricity Department. Indoor and outdoor transformers, kiosk complete with switchgear and accessories, e.h.v. and l.v. cable, overhead line equipment, wood poles. (January 12th.)

Orders Placed

Australia.—The placing of the following contracts is reported in *Tenders* (Melbourne):

Brisbane City Council. New Farm power house. Ash-handling plant (£7,760).—Babcock & Wilcox. High-voltage switchgear (£4,217), instruments (£782) and substation equipment, rectifiers and control gear (price not stated).—Australian General Electric. Supervisory control gear (£6,098).—British General Electric.

Sydney County Council Electricity Department. 33,000-V and pilot submarine cables, Spec. 719 (£4,285).—Siemens (Aust.). Pilot cable, Spec. 720 (£3,041).—British General Electric.

Cardiff.—Water Committee. Accepted. Five cwt. electric lifting block (£114).—George King, Ltd.

Darlington.—Corporation. Accepted. Spare parts for the electric pumps at the Corporation waterworks (£345).—E. N. Mackley & Co.

London.—ISLINGTON.—Electricity Committee. Accepted. Switchgear for three years.—Electric Construction Co.

Middlesbrough.—Corporation. Accepted. Equipment for supplying electricity to factory: Cable (£798).—Hackbridge. Circuit-breakers (£671) and l.v. panel (£118).—English Electric Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ardwick.—Additions to works, Bennett Street; R. Broadbent, architect, 4, Kiln Hill Lane, Chadderton, Oldham.

Bedford.—Adaptation of Castle Buildings as museum (£2,300); borough engineer.

Brighouse.—Works extensions, Mill Lane; Wood, Robinson & Co., Ltd., silk spinners, Wilkinroyd Mills, Brighouse.

Corby.—Catholic school; priest-in-charge, Catholic Church, Corby, Northants.

Coventry.—Nursery and primary school; D. E. E. Gibston, city architect.

Dartford.—New printing works, Kent Road; Dimond & Co.

Derbyshire.—Extensions to the Secondary School, Shirebrook (£2,600); J. Harrison, county architect, St. Mary's Gate, Derby.

Enfield.—Canteen and plating shop, Green Street, for British Ideal Patents; Bowyer & Bowyer.

Hamer.—Canteen, store, etc., Roch Street; Dale Mill Co., Ltd., cotton spinners, Dale Mill, Rochdale.

Hampshire.—Maternity homes, Emsworth and Barton (£15,500); county architect, Winchester.

Lancashire.—Central kitchen, Longview and junior and infants' school, Leyland; A. T. Nicholson, county architect, Preston.

Liverpool.—Factory on Corporation land; Evans, Sons, Lescher & Webb, Ltd., wholesale druggists, 56, Hanover Street.

London.—BERMONDSEY.—Proposed rebuilding of Guy's Hospital; governors.

Mansfield.—Elementary school, King George V Avenue; R. F. B. Grundy, borough surveyor.

Morecambe and Heysham.—Elementary schools for senior and junior scholars at Torrisholme; R. B. Savage, borough surveyor, Town Hall, Morecambe.

Newcastle-on-Tyne.—Repair and reinstatement of City Dispensary, New Bridge Street; city property surveyor, Town Hall.

Oldham.—Pathological laboratory, Westhulme Hospital (£3,250); G. E. Hardy, borough engineer, Municipal Buildings.

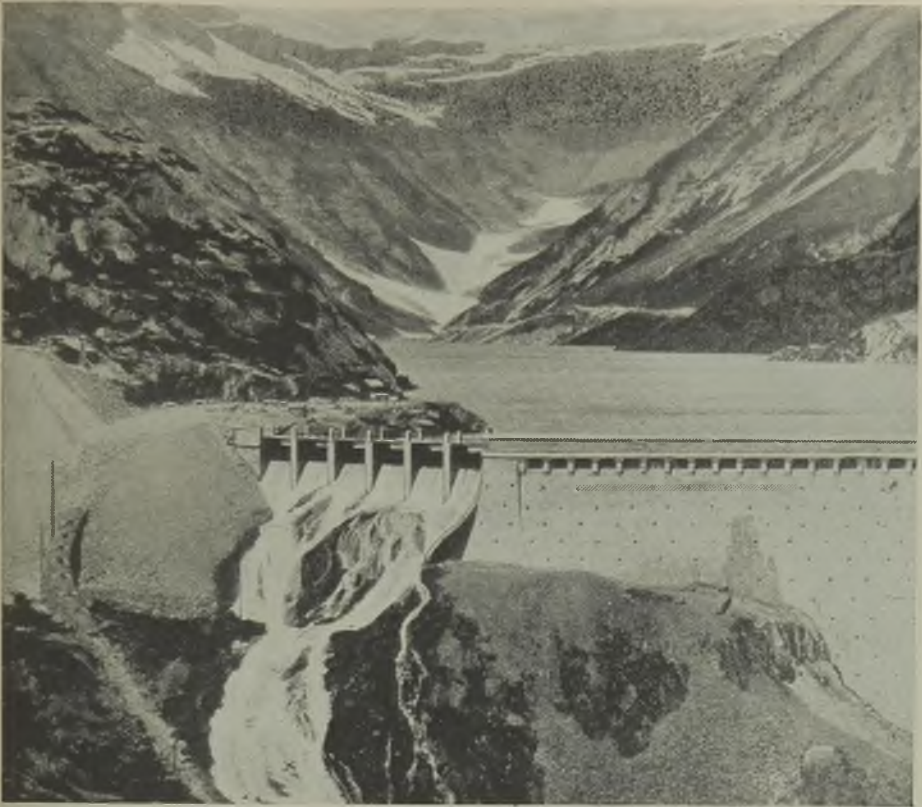
Rawtenstall.—Canteen, Albert Works, White-well Bottom; Mitchell Bros., Ltd.

Stockport.—Alterations to Heathfield and Woodbank for conversion into secondary schools; L. Yates, education architect.

Swansea.—Crematorium; borough engineer.

Widnes.—Junior and infants' school; J. Holt, borough surveyor, Town Hall.

Wigan.—Central kitchen, Swinley area; L. Lyons, borough engineer, Municipal Buildings, Library Street.



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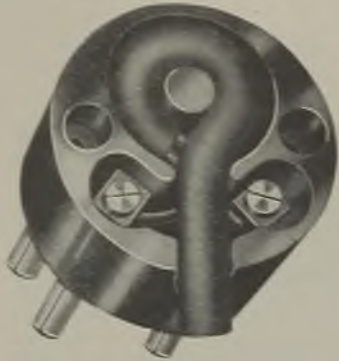
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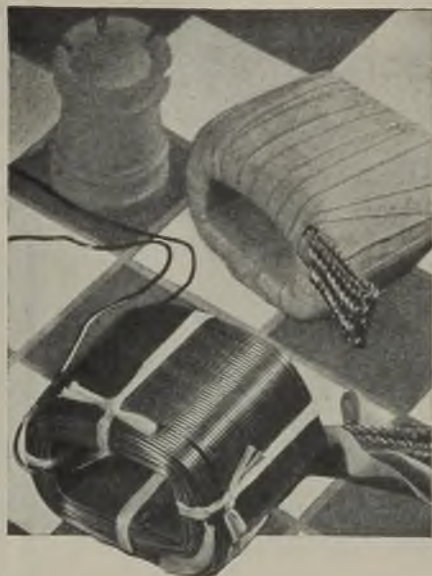
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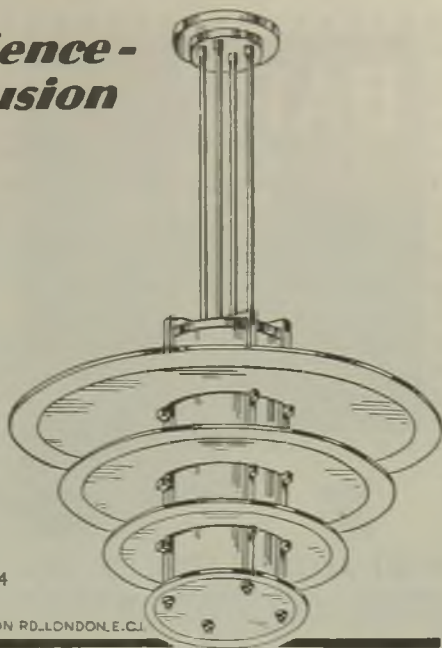
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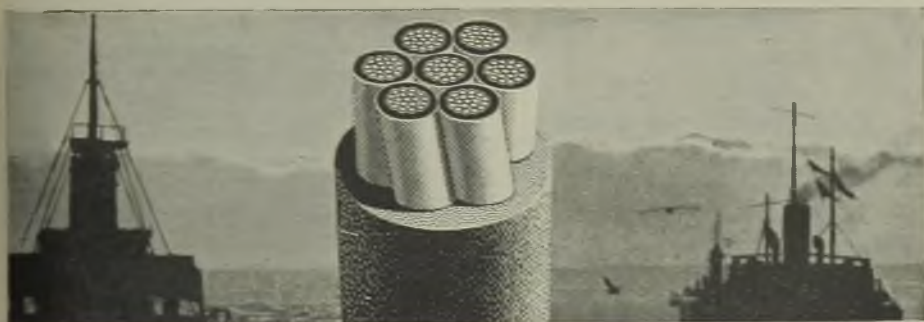
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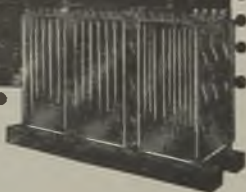
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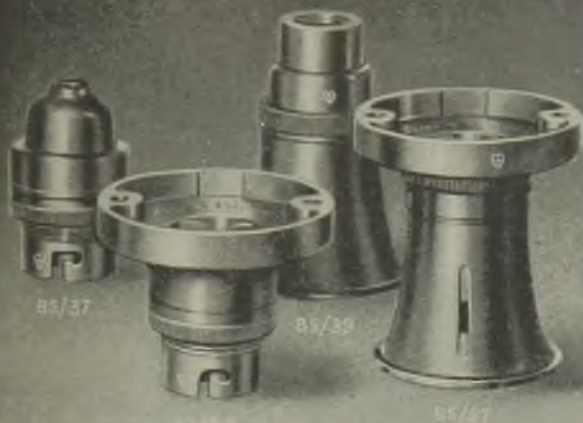
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This illustration shows W. & G. Lamp-holders, one of many types of lampholders supplied with and without porcelain interiors.

A wide and comprehensive range of electrical accessories is available to consumers for National Service.

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ESTABLISHED OVER HALF A CENTURY

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VULCANIZERS

for

REPAIRING & JOINTING

Electric CABLES

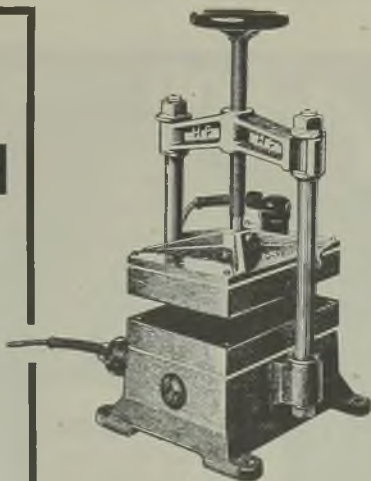
The Harvey Frost (HF) Process of repairing and jointing Electric Cables maintains them in efficient service and extends their life. HF Electric Vulcanizers are specially designed for this work and a full range of Moulds is available for Cables of the widest variety. Heat is automatically controlled by thermostat, correct temperature being indicated by pilot light.

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He is the man who has to use the tools you provide and he knows their merits. There is a Flextol machine for every job,—Filing, Grinding, Scurfing, Polishing, Flexible Disc Grinding, Screw Driving, Nut Setting, etc. Send for Catalogue No. F 22.

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"More Power to your elbow"

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THE GREEN, EALING, LONDON, W.1

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STOP THE LAMP THIEF!



WITH
'LOX-ALL'
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LOCKS

100%
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No unauthorised person can remove electric light bulbs when once they are fitted with Lox-All Locks, which prevent theft and reduce breakages... they can be used with all bayonet-type lamp holders and the first cost is the last cost.

Lox-All Locks are extensively used by Government Departments, Municipalities, Public Utility Companies and Industry generally.

Sales Representative: PERCY PHILLIPSON,
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FLOW INDICATORS

The oil or water spins a chromium plated ring under a glass dome. If the flow stops, the ring stops

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1945—Is this the year?

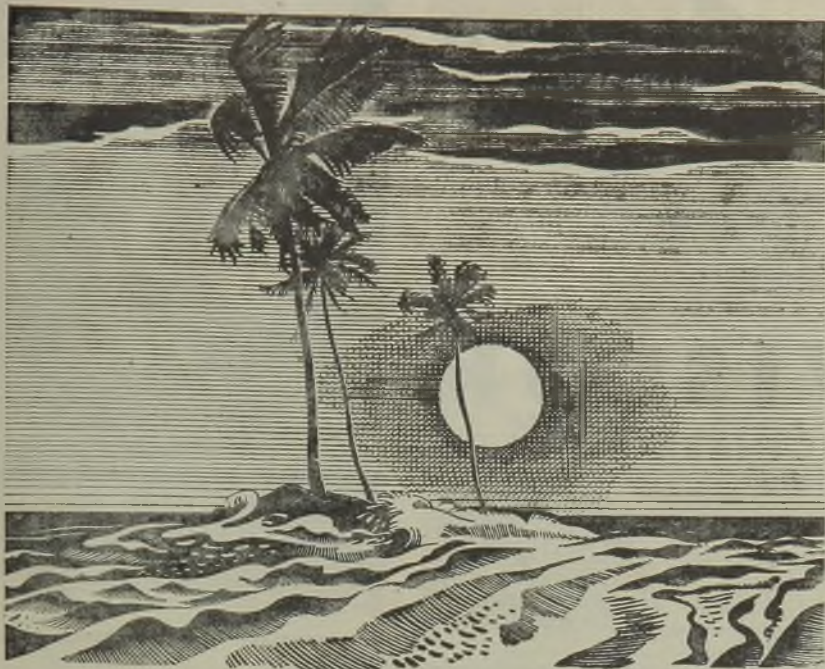
Peace in Europe—happy prospect, yes: but soon it'll be on top of us, a fact that leaves little breathing space for the industrialist caught unprepared. Already the Government is releasing technicians and designers in preparation for the great switch-over. Industries, too, would do well now to release a little of their attention to consider the immense effect that the new war-tested aluminium alloys will be having on post-war industry. If you would like to know just how they could influence the character of your products write to us.

We can give you

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NORTHERN ALUMINIUM CO. LTD.

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The Isle that Grew from the Sea

A little land above the surface of the sea ; white surf and leaning palms . . . but underneath, out of sight, the foundations go down deep and wide to the bed of the ocean.

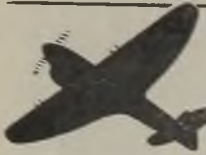
So, too, with great industrial organisations like that of Philips. Their achievements

and the high reputation of Philips products are broad-based on persistent research, skilled technicians, highly-developed factories and long-accumulated knowledge and experience of the application of electricity to the needs of the modern world.

PHILIPS



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BRIGHT STEEL HEXAGON
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Guaranteed
Accuracy to
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Produced on latest types of automatics. All sizes and threads. We are in a position to offer good delivery. Prices on application.

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ENGINEERING LTD.

A.I.D. Fully Approved
**MARKET
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SOLDER TAGS

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The **HAMPTON WORKS**
(STAMPINGS) **LIMITED**
PRESSWORK **IT** EXPERTS

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Natural in all Grades and Qualities, Stove Micas, Plates, Washers, Commutator Segments, Condenser Films, etc.

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SEND TO THE MANUFACTURERS
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GREY IRON CASTINGS

— for speedy and
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THE **- NODARK -** **CIRCUIT BREAKER**

Supersedes ordinary Switches and Fuses. Fully Automatic, Free Handle Pattern. Safe Rating up to 15 amperes, 250 volts. Instantaneous overload trip or time lag overload trip or shunt trip.



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The
POWER EQUIPMENT
COMPANY LIMITED

"MACINTYRE"

**HIGH-GRADE
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PORCELAINS

are competitive in price, but their superiority in quality, accuracy and efficiency ensure a very **REAL REDUCTION** in the cost of assembly, etc.

¶ The increasing demand for these PORCELAINS has necessitated considerable alterations to premises and plant which will greatly facilitate production and service.

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BURSLEM

**Pioneer Producers of Electrical
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In applying the rubber tape under tension (after first removing the red protective interleaving cloth) each layer fuses to the other to form one piece of **SOLID** yet flexible rubber. A single layer withstands more than 5,000 volts.

From all Electrical Wholesalers & Factors
*Manufactured by ROTUNDA LIMITED
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'PRANA' PRESSURE Die Castings

BASIC METALS -
ALUMINIUM, ZINC, TIN AND LEAD



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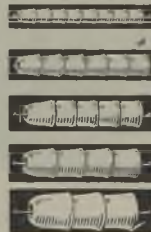
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"METWAY" INSULATING BEADS

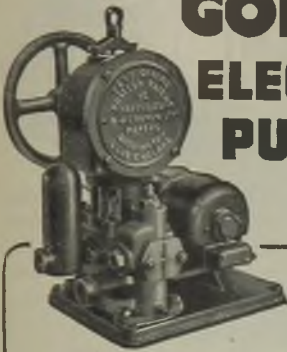
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**GODWIN
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PUMPS**

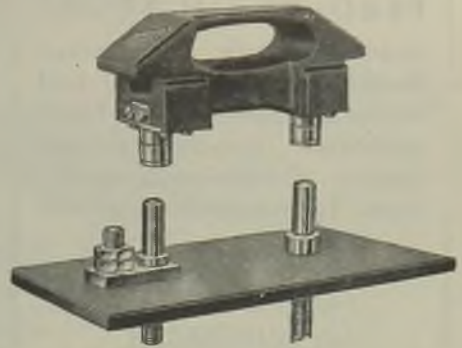


**TYPE A.I.E.
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Is one of a range particularly useful where light and

efficient duty is required. It has a capacity of 250 G.P.H. to a head of 80 feet and is fitted with Totally enclosed Self-oiling Mechanism with BALL BEARINGS throughout. Other special features include non-corrodible GUN-METAL PUMP BODY, STAINLESS STEEL PISTON ROD and also AUTOMATIC ISLAND ADJUSTMENT which reduces friction to a minimum. Write for fully illustrated lists, prices and generous discounts of the comprehensive range of Godwin Electric Pumps and Water Systems.

H. J. GODWIN LTD.
QUENINGTON GLOS.

Standardise on
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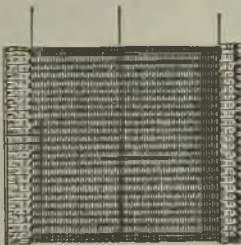
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Perfection in Design — Reliability in Service
G. P. DENNIS LIMITED

Specialists in Switchboards, Control Panels, Switch Fuses, Distribution Boards, Fuses, etc.

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IN ADDITION TO A COMPREHENSIVE RANGE OF STANDARDISED SIZES, SPECIAL TYPES ARE MADE AT SHORT NOTICE



Send particulars of your requirements to our Technical Service Dept.

ALWAYS IN STOCK
IMMEDIATE DELIVERIES

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FEED; REGULATORS

ensure steady continuous feeding at all loads and maintain boiler water level between pre-determined limits. Continuous operation. Immediate response.

NO SPRINGS

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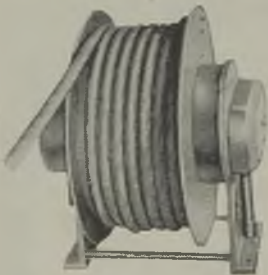
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CABLE

DRUMS

All sizes and types of self-winding drums supplied for electrical cable or pressure hose.

Our experience is at your disposal. Quotations promptly upon receipt of particulars of your requirements.

The NEWAY ENGINEERING CO. LTD.

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Telegrams: "Newbeck, Nottm." Phone: 41045/6 Nottm.



As soon as conditions permit, our full range of 'Crescent' portable and inset fires will reappear. Just now we are helping to 'turn on the heat' in other directions.

Distinguished Design

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FAN DISC LOCK NUT VIBRATION PROOF

This nut holds locked on one thread against all vibration. Only a fraction of the cost, space and weight of solid nuts. All sizes. All threads. R.H. and L.H.

SEND FOR SAMPLES
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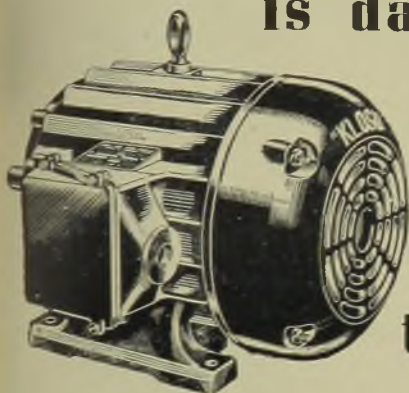
FAN DISC LTD

NORTHWOOD ST., ST. PAUL'S, BIRMINGHAM 3



If the place

is damp and dirty...



this is your motor.

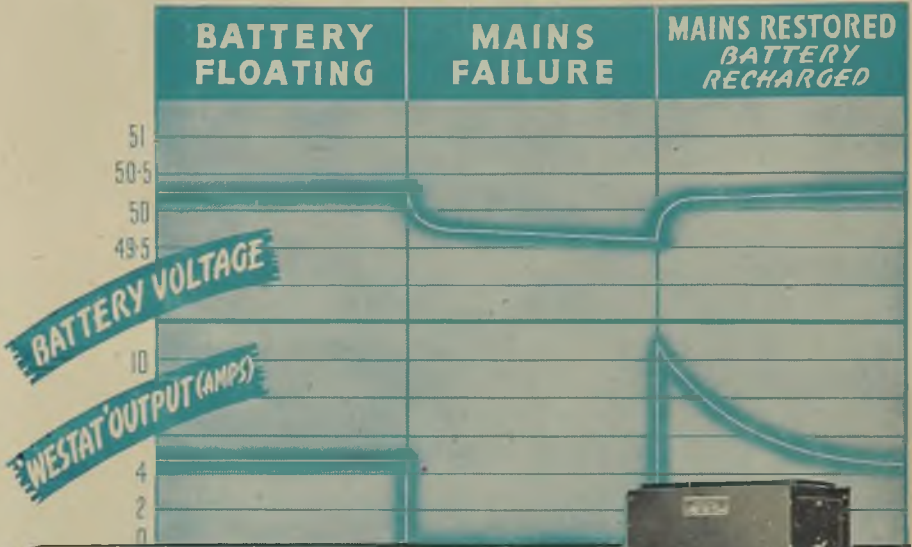
It is the Parkinson "Klosd" fan-cooled Motor. It has the virtue of keeping cool while keeping out damp and dust. And it does it exceptionally well. Being a Parkinson Motor that is not extraordinary. But what is extraordinary is that the special motor is one of over 2,000 types in the standard Parkinson range. It, and other very much more

unusual motors, can be obtained with remarkable ease and speed.

With the Parkinson flow production system standardised parts and sub-assemblies are always kept stored and ready. Final assembly of any required type is quickly completed if the motor is not a stock item. In this way Crompton Parkinson can give you a service that is as good as the motor itself.

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**CONSTANT VOLTAGE
RECTIFIER EQUIPMENT**
for use with batteries

In addition to compensating for load variations, the "Westat" Constant Voltage Rectifier Equipment will maintain the output voltage between limits of $\pm 1\%$ at constant load for mains variations of $\pm 10\%$. After a mains failure, when the battery voltage is low, the "Westat" automatically provides a fairly heavy charge, which tapers as the voltage reaches the specified level.



Typical 1,200 watt "Westat" supplied to the Southern Railway for floating batteries



Write for descriptive pamphlet No. 11

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Pew Hill House, Chippenham, Wilts.

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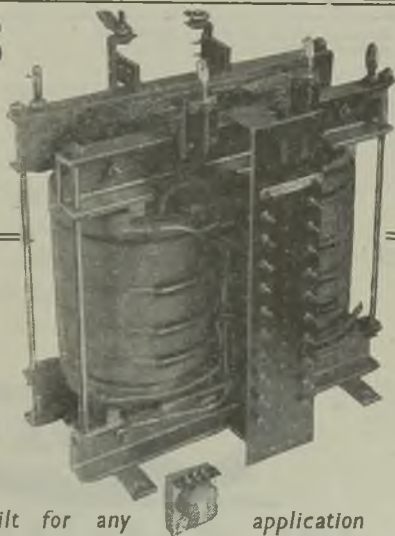


AN INDEPENDENT COMPANY, MAKERS OF E.H.T.,
AND L.T. PAPER MAINS CABLES, VARNISHED CAMBRIC
C.T.S. MINING TRAILING, "IVERITE" INSULATED CABLES
AND THERMOPLASTIC CABLES (P.V.C.)

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Telephone: IVER 491; Telegrams: "BRITANNIC, IVER"

TRANSFORMERS

AIR-COOLED
AND
OIL IMMERSED
0-50 kVA



Also

**SWITCHBOARDS and GENERAL
POWER EQUIPMENT
MANUFACTURED and SUPPLIED**

Special units designed and built for any application

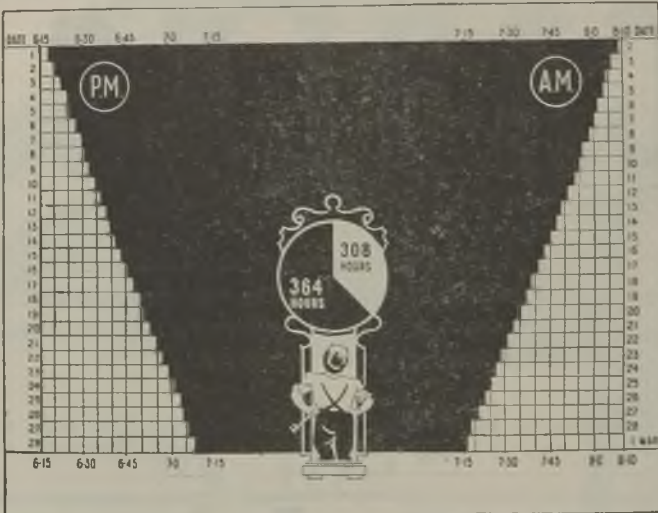
THE NELSON ENGINEERING CO. LTD.

NETHERFIELD WORKS, NELSON, LANCS.

PHONE 1545-6

The Turn of the Tide

DIM-OUT CHART FOR FEBRUARY



Reproduced from the Nautical Almanac by permission of the Controller of H.M. Stationery Office

*Times shown are those for the London area.

It is in February that already we feel the approach of spring. Better weather is ahead, the dark days of winter are receding. In the industrial field, February heralds the narrowing of the dim-out chart, but during the shortest

month, however, blinds must be drawn for over 364 hours. Good lighting is still of the greatest importance in keeping up spirits and keeping down strain and fatigue. Osram can do much to help.

Osram

A
G&C
PRODUCT

THE WONDERFUL LAMP

Agents: The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2.

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS for insertion in the following Friday's issue are accepted up to **First post on Monday**, at Dorset House, Stamford Street, London, S.E.1.

THE CHARGE for advertisements in this section is 2/- per line (approx. 8 words) per insertion, minimum 2 lines 4/-, or for display advertisements 30/- per inch, with a minimum of one inch. Where the advertisement includes a Box Number there is an additional charge of 6d. for postage of replies.

SITUATIONS WANTED. — Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to advertisements published under a Box Number if not to be delivered to any particular firm or individual should be accompanied by instructions to this effect, addressed to the Manager of the **ELECTRICAL REVIEW**. Letters of applicants in such cases cannot be returned to them. The name of an advertiser using a Box Number will not be disclosed. All replies to Box Numbers should be addressed to the Box Number in the advertisement, c/o **ELECTRICAL REVIEW**, Dorset House, Stamford Street, London, S.E.1. Cheques and Postal Orders should be made payable to **ELECTRICAL REVIEW LTD.** and crossed.

Original testimonials should not be sent with applications for employment.

SITUATIONS VACANT

None of the vacancies for women advertised in these columns relates to a woman between 18 and 41 unless such woman (a) has living with her a child of hers under the age of 14, or (b) is registered under the Blind Persons Acts, or (c) has a Ministry of Labour permit to allow her to obtain employment by individual effort.

BOROUGH OF STOCKTON-ON-TEES

Appointment of General Manager and Engineer of the Electricity Department

A PPLICATIONS are invited for this appointment from qualified Electrical Engineers, preferably not exceeding 45 years of age, with considerable experience in the management and administration of an electricity undertaking.

The salary will be at the rate of £850 per annum, plus cost of living bonus (at present fixed at £33 16s. per annum).

The appointment will be terminable by three months' notice by either party, and is subject to the provisions of the Local Government Superannuation Act, 1937. The person appointed will be required to pass a medical examination.

Forms of application will not be issued, but applicants should give particulars of age, present position and duties, salary, past service, and all other essential information, including applicant's position with regard to liability for National Service.

Applications, accompanied by copies of three recent testimonials, must be addressed to the undersigned and delivered in sealed envelopes endorsed "Electricity General Manager and Engineer," not later than first post on Wednesday, 7th February, 1945.

Canvassing, either directly or indirectly, will disqualify.

ERIC BILLINGHAM, Town Clerk.

Barclays Bank Chambers, Stockton-on-Tees, 10th January, 1945. 1272

BOROUGH OF ERITH

Electricity Department

Appointment of Mains Superintendent

A PPLICATIONS are invited from Engineers who have had a sound technical training together with practical experience on the installation and operation of H.T. and L.T. underground distribution systems and equipment.

Corporate or Graduate Membership of the Institution of Electrical Engineers or equivalent qualifications essential. Salary will be in accordance with N.J.E. Schedule Class F, Grade 4 (at present £550 16s.).

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

Application forms and particulars of the appointment may be obtained from E. A. Logan, M.Inst.C.E., M.I.E.E., Borough Electrical Engineer and Manager, Electricity House, Erith, Kent, and must be returned by Monday, the 12th February, 1945.

Canvassing either directly or indirectly will disqualify.

J. A. CROMPTON, Town Clerk.

Council Offices, Bexley Road, Erith, Kent, January, 1945. 1303

COUNTY BOROUGH OF SWANSEA

Electricity Department

Appointment of Mechanical Maintenance Engineer

A PPLICATIONS are invited for the above position from qualified engineers not over 45 years of age.

Applicants must have had a first-class practical training as mechanical engineers and experience in large, modern power stations employing pulverised fuel. It will be considered an advantage if applicants have electro-technical knowledge and experience, corporate membership of the Institution of Mechanical Engineers and/or Electrical Engineers.

The salary will be in accordance with Grade 5, Class J of the N.J.B. Schedule of Salaries (at present £583 rising to £612 per annum). Applicants must have had actual experience in the whole of the mechanical maintenance of a large power station, including boilers, coal pulverising equipment, turbines and all auxiliary plant wherever situated in the Station. The person appointed will be responsible to the Station Superintendent for preparing and maintaining a complete programme of repairs and maintenance.

The appointment will be subject to the provisions of the Local Government and Other Officers Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications, which must be made on a prescribed form obtainable from the Borough Electrical Engineer and Manager, Guildhall, Swansea, together with copies of not more than three recent testimonials, must be delivered to the undersigned not later than Saturday, the 3rd February, 1945.

Canvassing, either directly or indirectly, is prohibited and will be a disqualification.

T. B. BOWEN, Town Clerk.

Guildhall, Swansea, 14th January, 1945. 1297

BOROUGH OF CHEPPING WYCOMBE (HIGH WYCOMBE)

Electricity Department

Chief Accountancy Assistant

A PPLICATIONS are invited for the appointment of Chief Accountancy Assistant, in the Electricity Department, at a salary of £330-15-375, per annum, plus War Bonus (at present £49 8s. 0d.). The commencing salary will be fixed according to experience.

Candidates must have had a wide experience in electricity finance, and accounts. The appointment will be subject to Council's Conditions of Service, and to Local Government Superannuation Act, 1937, and will be terminable by one month's notice on either side. The successful candidate will be required to undergo a medical examination.

Applications, stating age, experience, and qualifications, accompanied by copies of two recent testimonials, should reach the undersigned not later than the 8th February, 1945.

H. ROBSON,

Frogmoor, High Wycombe, Borough Electrical Engineer. 1325

CITY AND COUNTY BOROUGH OF CARLISLE

Electricity Department

Appointment of Charge Engineer and
Switchboard Attendant

APPPLICATIONS are invited from suitable candidates for the following positions at the Willow Holme Power Station:—

Shift Charge Engineer

Candidates must have had a sound practical and technical training in mechanical and electrical engineering and experience in the operation of modern high pressure boiler and turbo-alternator plants.

Applicants should be Corporate Members of the Institution of Electrical Engineers and/or Institution of Mechanical Engineers or possess qualifications of an equivalent standard.

Salary and conditions of service will be in accordance with the N.J.B. Agreement, Class H, Grade 8 (present salary £433 per annum).

Switchboard Attendant

Candidates should hold a technical qualification or show that they are in course of obtaining qualification for Corporate Membership of the Institution of Electrical Engineers.

Experience with a manufacturer of power station electrical equipment or with an Electricity Supply Authority in a modern Power Station Control Room is essential.

Salary and conditions of service will be in accordance with N.J.B. Agreement, Class H, Grade 9a (present salary £326 per annum).

The appointments will be subject to the provisions of the Local Government and Other Officers' Superannuation Act, 1937, and the successful candidates will be required to pass a medical examination.

Applications, giving age, details of training and experience, together with copies of not more than three testimonials, or, alternatively, the names and addresses of three referees, should be delivered to the undersigned in sealed envelopes, appropriately endorsed, not later than Monday, February 12th, 1945.

A. C. THIRTLÉ, A.M.I.E.E., A.M.I.C.E.
City Electrical Engineer.

Electricity House,
46-48, Castle Street,
Carlisle.

1324

COUNTY BOROUGH OF IPSWICH EDUCATION
COMMITTEE

School of Technology

Principal: T. S. Harker, B.Sc., M.I.Mar.E., A.M.I.Mech.E.

APPPLICATIONS are invited for the post of LECTURER in ELECTRICAL ENGINEERING subjects, duties to commence in September next. Candidates should have had good industrial experience and preference will be given to those who are corporate members of the Institution of Electrical Engineers. Previous teaching experience would be a recommendation.

Salary in accordance with the Burnham Scale for Technical Colleges with such appropriate additional allowances, depending upon the qualifications of the successful candidate, as may be allowed under the new salary scale.

Forms of application and further particulars may be obtained from the undersigned to whom applications should be returned so as to be received not later than 16th February, 1945.

J. T. HILL,
Chief Education Officer.

Education Department,
17, Tower Street,
Ipswich.

1299

ASSISTANT to Managing Director required by a Midlands engineering firm. Practical experience in works administration, costing and works statistics essential. Salary £600-£650 p.a. Applications in writing (no interviews), stating date of birth, full details of qualifications and experience (including a list in chronological order of posts held) and quoting reference No. 1572, should be addressed to the Ministry of Labour and National Service Appointments Office, 2, Calthorpe Road, Birmingham, 15.

1302

COUNTY BOROUGH OF BOLTON EDUCATION
COMMITTEEMunicipal Technical College
(Principal: J. W. Simpkin, M.Sc.)

APPPLICATIONS are invited for appointment to the permanent staff of the Engineering Department of a full-time Lecturer with special responsibility for Electrical Engineering; duties to begin on 1st May.

Applicants should be well qualified to teach Electrical Engineering subjects to Higher National Certificate standard. Industrial and some previous teaching experience are essential.

Salary according to the Burnham Technical Scale, with an addition for special responsibility (at present £43 per annum) plus war bonus (at present £52 per annum). Allowances will be made for approved industrial and teaching experience.

Application forms and further particulars may be had from the undersigned, to whom completed applications should be returned on or before 5th February, 1945

JOHN A. COX,

Education Offices,
Bolton, Lancs.

Director of Education,
1305

Associated Municipal Electrical Engineers
(Great Britain and Ireland)

and

The Electrical Power Engineers' Association

NOTICE

Stockton-on-Tees Corporation

Appointment of Engineer and Manager

THE Standing Joint Committee of the above Associations desire to point out that the above advertised post is not in accordance with Clause 10 of the Agreement made by the National Joint Committee of Local Authorities and Chief Electrical Engineers (Electricity Supply Industry), under which clause the latest available data of output indicates a commencing salary of £948 per annum.

ALL ENGINEERS, WHETHER ENGAGED IN THE ELECTRICITY SUPPLY INDUSTRY OR NOT, ARE URGENTLY REQUESTED NOT TO APPLY FOR THE POST NOW BEING ADVERTISED, AND IF AN APPLICATION HAS ALREADY BEEN MADE IT SHOULD BE WITHDRAWN.

W. ARTHUR JONES, A.M.I.E.E.,

Secretary,
Standing Joint Committee,
A.M.E.E., E.P.E.A.

1273

A well-known manufacturer of Electrical Appliances requires first-class Representatives to cover Scotland, Lancashire, Yorkshire, South Coast and Midlands. State age, experience and salary required.—Box No. P.123, c/o 19-21, Corporation Street, Birmingham, 2.

DRAUGHTSMAN required by company engaged in the manufacture of cables and plastic materials. Applicants should preferably have had several years of industrial experience; age limits preferably 25/40. The position offered is in the Manchester area and of a permanent character. Salary in accordance with age and experience. Progressive post for suitable applicant. Please send full details to—Box 1321, c/o The Electrical Review.

ELECTRICAL Engineer. Experienced Manager required to take charge of department for the design, development and testing of small type switches, solenoids and other electrical equipment. Must have sound theoretical and practical experience. Commencing salary £800-£1,000 per annum according to qualifications.—Box 1258, c/o The Electrical Review.

ELECTRICAL factors, old established, require experienced Manager to take control of London branch.—Box 1313, c/o The Electrical Review.

FEMALE Technical Librarian required by small works located in S.E. London. Must have sufficient knowledge of physics to abstract from technical journals for compilation into regular library bulletins to assist firm's research workers. Ability to act as confidential shorthand typist for technical reports and letters highly desirable and competent knowledge of technical German would be a great asset. Salary from £200 according to experience. Applicants should write, quoting A.70XA, to the Ministry of Labour and National Service, Central Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms which should be returned completed on or before 9th February, 1945.

1337

FIRST class Man wanted for sale of non-ising cables in Southern England. Please write, with details of experience and connections, to—Box 1334, c/o The Electrical Review.

GENERAL Manager, not over 45, of proved managerial ability, preferably with engineering qualifications, required for manufacturing company employing 500, well established and financially sound, specialising in electrical components, London area. Good salary and prospects. Application, stating age, previous experience, salary required and all relevant information, to—Box 1314, c/o The Electrical Review.

HEAD Foreman for coil winding shop required, London district. Must be conversant with all types of coil winding, including transformers, radio, electrical and coil winding for trade and industry in general. Must have held a similar position previously, and be interested in post-war prospects. Write, giving full particulars, to—Box 1326, c/o The Electrical Review.

HEAD Foreman for tool room required, London district. Must be conversant with press tools, drills, jigs, and general tool room jobs, and be experienced tool-maker with approved administrative ability, interested in post-war prospects. Write, giving full particulars, to—Box 1327, c/o The Electrical Review.

MANAGER required by North London manufacturers for design development of North Electrical Accessories, preferably with recent and extensive similar experience. Must be familiar with modern mass production methods, utilising plastics. Salary £750 p.a. upwards, according to qualifications. Applications in writing (no interviews), stating date of birth, full details of qualifications and experience (including a list in chronological order of posts held) and quoting reference No. Q.S.876, should be addressed to the Ministry of Labour and National Service, Appointments Department A.3 (A), Kingsway, London, W.C.2.

MANAGER to take charge of department making up telephone cords. Must be capable of controlling sixty women. Urgent Government work. Factory in North-West. Please reply, giving full details and salary required—Box 1292, c/o The Electrical Review.

MECHANICAL Engineers required for the Government of Nigeria Public Works Department Temporary Staff for one tour of 12 to 24 months in the first instance. Salary between £600 and £1,000 a year according to qualifications and experience. Outfit allowance £60. On salary of £600, separation allowance is payable to married men between £26 and £156 a year according to number of children. Free passages and quarters. Candidates should have a university degree in engineering or be A.M.I.Mech.E. and must have had subsequent practical experience either with power station plant such as Babcock boilers, steam turbines, reciprocating internal combustion engines and gas producer plant, or public works machinery such as road and building construction plant, pumping machinery and motor vehicle overhaul and maintenance. Applicants should write, quoting C.2361A, to the Ministry of Labour and National Service, Appointments Department A.3 (B), Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms which should be returned completed on or before 7th February, 1945.

OVERSEAS Employment: Assistant Mechanical Engineer required for the Electrical Branch of the Nigerian Government Public Works Department for one tour of 12 to 24 months, with possible permanency. Salary £475, rising to £660 a year. Outfit allowance £60. On salary of £475 there is a local allowance of £42 and a separation allowance for married men between £84 and £204, according to number of children. Free passages and quarters. Candidates must have served an apprenticeship in a good engineering works and have experience of Babcock boilers, steam turbines, reciprocating internal combustion engines and gas producer plant. They must be competent to take charge of shifts and run small power stations. Written applications (no interviews), giving the following essential details: (1) Full name; (2) Date of birth; (3) Industrial training and experience; (4) Name and address of present employers; (5) Details of present work, should be sent to The Secretary, Overseas Manpower Committee (Ref. 1391), Ministry of Labour and National Service, York House, Kingsway, London, W.C.2. Applications will not be acknowledged.

RELIEF Charge Engineer required at generating station in Home Counties, N.J.B. conditions, Grade 8a, Class F, experienced with H.P. boilers, turbo-alternators, converting plant. State age, single or married, to—Box 1253, c/o The Electrical Review.

REQUIRED for engineering works engaged on Government work, Crickwood area, Shorthand-Typist or Ediphone Typist. Please reply, stating experience and salary required, to—A. 1, c/o Street, 110, Old Broad Street, E.C.2.

POWER Station Plant Engineer for consultants. Applicants should preferably hold H.N.C. or better qualification, have served apprenticeship, including D.O., with manufacturer of power station plant, e.g., turbines, boilers, pumps, etc., and have a knowledge of power station layout, operation and practice. Location, Surrey. Salary £330 to £450 p.a., according to qualifications. Applicants should write, quoting D.1049XA, to the Ministry of Labour and National Service, Appointments Dept. A.3 (B), Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 1st February, 1945. 1301

SALES Engineer required, having an intimate and up-to-date knowledge of the design and manufacture of heavy power transformers. Apply, stating salary, experience, etc., to—Box 1309, c/o The Electrical Review.

SALES Representative required for South London by an Electrical Wholesaler. Knowledge of electrical trade an advantage. Permanent and progressive position, with exceptional post-war prospects. Write, stating age, experience, and salary required.—Box 1275, c/o The Electrical Review.

STORES Assistant (permanent) required at once. Write, stating age, salary required and electrical stores experience, to—Wholesale Electric Co., 37, Vauxhall Bridge Road, S.W.1. 1218

STORES Clerk required by electrical wholesalers. Good knowledge of electrical material essential. Apply to London Electrical Company, 92, Blackfriars Rd., S.E.1. 25

THE services of a capable Commercial/Technical Electrical man are required, in Yorkshire, to take charge of sales of new and used electrical equipment and power plant. Applicants must have drive and initiative. Experience in valuations an asset. Permanent post-war prospects. In replying give details of experience and salary expected to—Box 1311, c/o The Electrical Review.

WORKS Manager required by leading cable manufacturer, London area; sound managerial qualifications essential, together with experience of manufacture of rubber and thermoplastic insulated cables; age 35-45; excellent opportunity for first-class man; write salary required and past experience to—Box 1310, c/o The Electrical Review.

APPOINTMENTS FILLED

Dissatisfaction having been so often expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

A Sales Representative seeks change, desires to represent manufacturer of elec. fittings, commercial and industrial. Connection with wholesalers, supply companies and Govt. Dept. Area covered, London and South of England.—Box 6643, c/o The Electrical Review.

A.M.I.E.E. (39), construction, operation and maintenance power stations, O.H. and U.G. distribution systems, practical, technical and commercial exp. electricity undertakings. Situation desired overseas.—Box 6614, c/o The Electrical Review.

CHIEF Draughtsman or Designer, Engineer with varied mechanical and electrical experience (not radio), design, planning, tools and production, desires responsible post. S.W. London area preferred.—Box 6612, c/o The Electrical Review.

DRAUGHTSMAN-Designer requires spare-time work.—Box 6685, c/o The Electrical Review.

ELECTRICAL and Mechanical Engineer desires post. Long experience in charge of planning installation and maintenance of industrial plant.—W. M., 82, Leighton Rd., Bush Hill Pk., Enfield, Middx. 6684

ELECTRICAL Engineer, B.Sc., A.M.I.E.E., 17 years' varied experience in responsible positions with leading manufacturing companies, requires post of high responsibility giving scope for initiative. Consultative work considered.—Box 6623, c/o The Electrical Review.

ELECTRICAL Engineer, supervise installation contracts or factory maintenance, 28 years' experience, good organiser, labour control, age 44 years, seeks responsible position. Now disengaged.—Box 6629, c/o The Electrical Review.

ELECTRICAL Engineer (39), first-class experience in rural supply and distribution, desires position of responsibility with supply authority; not afraid of hard work, 20 years' practical experience.—Box 6649, c/o The Electrical Review.

ELECTRICAL Mechanical Engineer (35), A.M.I.E.E., etc., seeks London appointment. Free in one month. Now holding executive position covering sales, drawing office, installation and service departments.—Box 6610, c/o The Electrical Review.

INSURIMENT Engineer, 30 years' experience, instruments, relays, transformers, recorders, integrating meters to Government specifications, Meter Act, etc., quotations, design, development and manufacture, large or small quantities to customers' requirements, mixed labour, 15 years' leading manufacturer. Executive post with post-war prospects, salary commensurate with responsibility.—Box 6656, c/o The Electrical Review.

MANAGER, electricity service centre, 25 years' engineering experience, M. & E., B.O.T. Cert., E.D.A. Sales Engrs.' Diploma, seeks similar post with electricity undertaking with good scope for future development. First-class development record, sales and consumers, expert on all types of domestic apparatus and appliances, motors, pumps and machinery generally, responsible for H.T. and L.T., town and rural supply maintenance, good organiser, keen worker. Present post (voluntary from outbreak of war), shift supt. engr. over 300 employees. Release possible in near future owing to moving of works. Please reply in confidence, giving first details, to—Box 6613, c/o The Electrical Review.

POST in electricity supply sought by A.M.I.E.E., aged 39 years. Wide experience in urban and rural electrification, including administration of construction, operation and sales. Dominions appointment considered. Minimum salary £700 p.a.—Box 6686, c/o The Electrical Review.

PRODUCTION Engineer seeks progressive appointment with company in London, 12 years with leading electrical accessories firm. Excellent practical engineering and administrative experience.—Box 6692, c/o The Electrical Review.

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WORKS Electrical Engineer, A.S.E.E., desires post, 25 yrs.' technical and practical exper. planning installations and maintenance for large industrial plants.—Box 6642, c/o The Electrical Review.

YOUTH, 16 yrs., secondary school education, seeks situation in distribution department or drawing office.—Box 6627, c/o The Electrical Review.

FOR SALE

Traders buying and selling hereunder must observe the Restriction of Resale Order, S. R. & O. 1942 No. 958.

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THE Electricity Committee of the Bradford Corporation invite tenders for the purchase and removal of ONE 6,000-kW (M.C.R.) BRITISH WESTINGHOUSE TURBO-ALTERNATOR.

The alternator is of the 3-phase type, suitable for 6,600 volts between phases, 50 cycles per second.

The set is in running condition, and, by appointment, can be seen in operation at the Valley Power Station.

Form of tender and further particulars may be had on application to Mr. T. H. Carr, A.M.Inst.C.E., M.I.Mech.E., M.I.E.E., Electrical Engineer and Manager, 27, Bolton Road, Bradford, to whom all enquiries respecting the set should be addressed.

Tenders, on the forms provided, must be delivered to the undersigned not later than 10 a.m. on Wednesday, the 21st February, 1945, and no tender will be received unless enclosed in a plain, sealed envelope bearing the words "Tender for purchase, etc., of No. 4 Turbo-Alternator," but not bearing any mark or name indicating the sender.

The highest or any tender will not necessarily be accepted.

N. L. FLEMING.

Town Hall, Bradford,
24th January, 1945.

Town Clerk.
1320

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400 lbs.	No. 24 s.w.g. Plain Copper
200 22
300 20
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1 3-panel "Standard make" L.V. Switchboard, 440-230 volts, 3-phase, 4-wire, consisting of 1 auxiliaries feeder and 2 transformer panels for controlling L.V. side of 2 x 300-kVA transformers.

This equipment can be inspected at the Ilford and Barking Joint Sewerage Committee Pumping Station, Alfred's Way, Barking, by arrangement with the Superintendent (Mr. Leary), Telephone No. Rippleway 3870.

Quotation should be submitted to L. E. J. Reynolds, Joint Engineer, Ilford and Barking Joint Sewerage Committee, Town Hall, Ilford, marked "Quotation for Second-hand Switchgear." 1317

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A.C. Motors, 1/50th h.p. to 3 h.p. from stock. Also D.C.—The Johnson Engineering Co., 86, Great Portland Street, London, W.1. Museum 6373. 57

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ROTARY Converter with 3,000-v. transformer, switch-gear and accessories by Metro-Vickers, 175 kW, 220 D.C. volts, 795 D.C. amps., 6-ph., 50 c., 1,000 r.p.m.; Motor Converter by Bruce Peebles with switchgear and accessories, comprising A.C. Motor, 3,000 v., 50 c., 3-ph., 750 r.p.m., 43.5 amps.; D.C. Generator 200 kW, 310 D.C. amps., 220 v.—Lilleker Bros. Ltd., Doncaster Gate, Rotherham. 1335

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TWO 20-kW, 120-v. D.C. Steam Turbo Sets; Kohler Automatic Set, 5 kW, 220 v.; Steam and Diesel Sets, 4 to 1,000 kW, A.C. and D.C.; Alternators, 400/3/50, 25 to 350 kW.—E. Binns, 156a, Falsgrave Road, Scarborough. 6690

2 40-h.p. Motors, 220 v. D.C., 1,400 r.p.m.; others at 700/800 r.p.m. and 600 r.p.m.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford, 1332

250-kVA Alternator, 400 volts, 3-phase, 50 cycles, 750 revs., with direct coupled exciter.—Midland Counties Electrical Engineering Co. Ltd., Grice Street, Spon Lane, West Bromwich. 36

400-kW Metropolitan-Vickers Rotary Converter, with starting motor, A.C. booster and exciter, 250 volt D.C., three-wire, with Transformer, 11,000 volts, 3-phase, 50 cycles.—Britannia Manufacturing Co. Ltd., 22/23, Britannia Walk, London, N.1. 1243

2,000-kW by English Electric, 440/500 volts, 4,000 amps., 12 poles and interpoles, speed 500 revs., driven by Howden eight-stage turbine, 6,000 revs.; through David Brown reduction gear, Worthington surface condenser; with motor-driven circulating and extraction pumps and switch panel.—Thomas Mitchell & Sons Ltd., Bolton. 1304

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COMPANY MEETINGS

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THE Annual General Meeting of E. K. Cole Ltd. was held on January 16th at Aston Clinton.

Mr. W. S. Verrells (chairman and joint managing director) said that the accounts for the year ended 30th September, 1944, reflected substantial progress in the activities of the company. The trading profit was £423,124 as compared with £263,401 for the previous year. The net profit amounted to £383,165 before deducting taxation. The directors recommended a final dividend of 12 per cent., actual, less income tax, making a total of 20 per cent. for the year.

There had been no phase of the war, either defensive or offensive, in which radio in one form or another had not played a vital role. The most intensive effort had been required of the radio industry, and the company, in war as in peace, had played a leading part. The full story of how important that had been to the successful prosecution of the war had yet to be told, but it must already be clear that truly remarkable radio devices had been used by all branches of the Services and had played a conspicuous part in every major operation.

Radiolocation and Communication

As typical of the wide and varied uses of radiolocation and radio-communication equipment could be instanced: The accurate placing of our limited fighter force in the Battle of Britain, as a result of advance radiolocation of the enemy's approach; the co-ordination of searchlights with anti-aircraft guns during the bombing attacks on our cities; the part played in Fighter Command's successes during day and night raids; invaluable aid in the battle against U-boats, and widespread use by the Army. In addition to meeting the heavy demands of the forces, the industry had been able to give considerable assistance to Allies.

Ekco radio equipment had been used in most types of aircraft, including the Lancaster, Halifax, Flying Fortress, Tempest, Typhoon, Spitfire, Mosquito, Beaufighter and Sunderland, and in battleships, destroyers, submarines and patrolling craft. Commandos and artillerymen had carried Ekco pack sets and portable transmitter receivers. Ekco radio gear had been installed in tanks, Bren-gun carriers and radio-communication vehicles, and was much in evidence in ground radio installations at airfields and control headquarters. Ekco radio equipment had earned a high reputation both in the Supply Ministries and the Operational Services. During the past year the radio and television division had also joined in the co-operative effort between the radio industry and the Board of Trade in the manufacture and distribution of the company's quota of the "civilian war-time receiver."

Interests Broadened

Their radio interests had broadened to cover not only broadcast and television receivers, but also telecommunication and public address equipment and electronic devices. Their lighting division—including Ensign Lamps Ltd.—had a substantial and encouraging output of electric lamps. Their plastics division was firmly established. The household appliances division, which before the war was making steady headway, would become reinvigorated with the advent of European peace, and the "Special Products" division had been formed to concentrate on the specialised research, development, manufacture and distribution of those products which in the early stages did not lend themselves so readily to mass production methods.

Neither the radio industry nor any other industry could have achieved the staggering figures of output with such little friction without Governmental co-operation and co-ordinated planning, but he considered that the basic controls over materials and labour should be relinquished gradually.

The report was adopted.

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EDUCATIONAL NOTICES

LATEST A.M.I.E.E. RESULTS

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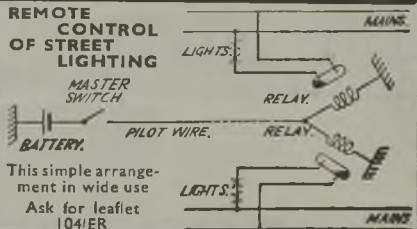
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