

ELECTRICAL REVIEW

FOUNDED
1872

Vol. CXXXVII. No. 3534

AUGUST 17, 1945

9d. WEEKLY

QPI and no humbug



The Q is quality and the P is price. Most cable users want a first-class product without paying through the nose for it.

Aberdare quality passes every test of highest British electrical practice. Aberdare Cables are sold at sensible prices.

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When wartime controls have been withdrawn, QPI again will be the steadfast policy of Aberdare Cables.

Aberdare Cables

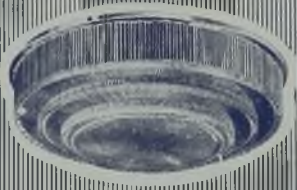
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London Office :
Nineteen Woburn Place, W.C.1

Independent specialists
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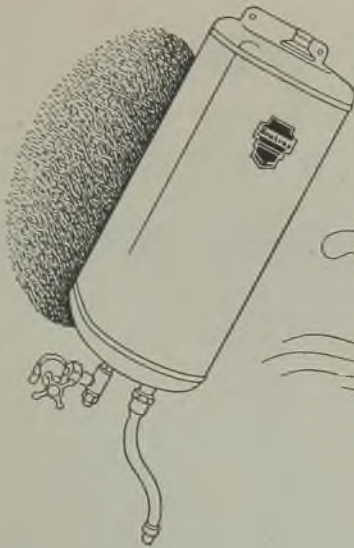
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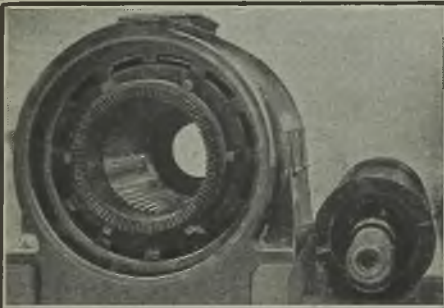
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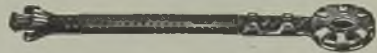
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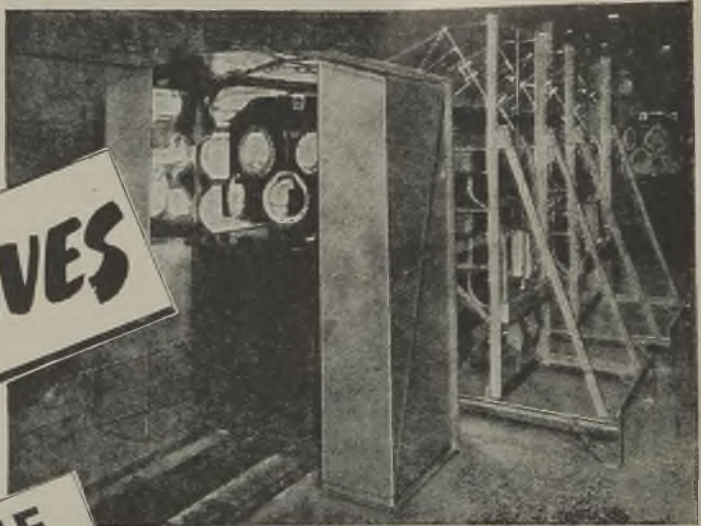
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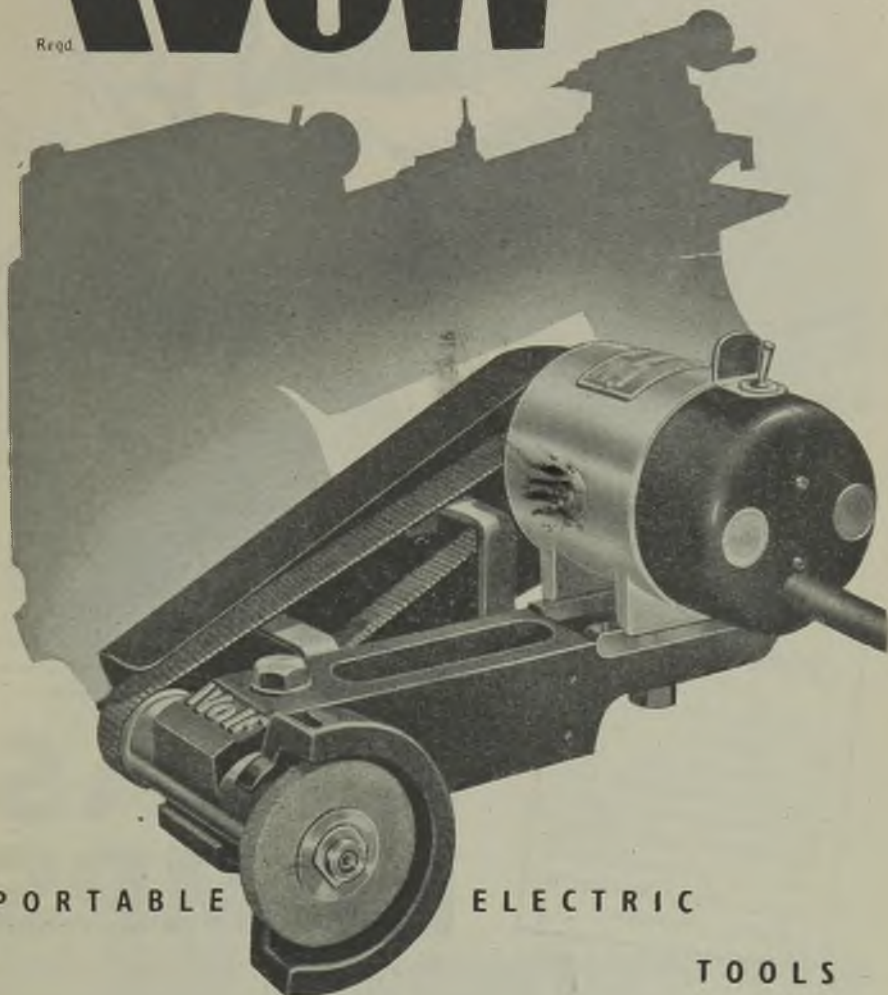
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G.E.C. INFRA-RED LAMP HEATING
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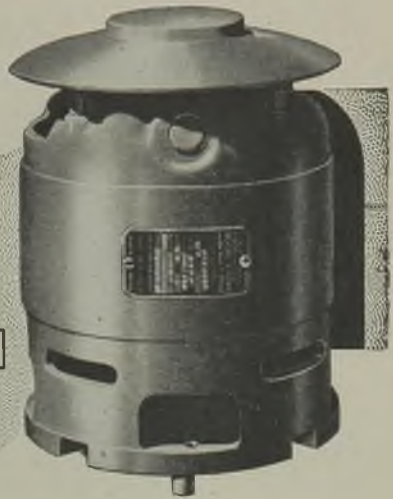
N.E. Depot: 46 Sandhill, Newcastle-on-Tyne, 1.

'Phone: Newcastle 24068

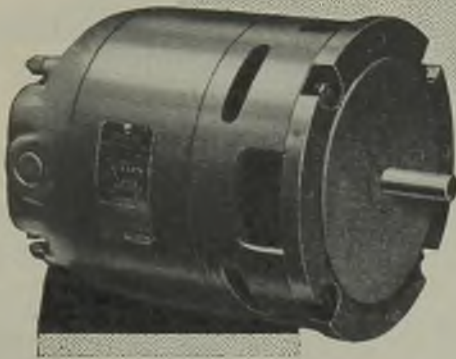


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**Spigoted or Plain
Endshields for
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Sizes from $\frac{1}{8}$ H.P. to 1 H.P.
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*BTH products include all
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Mercra, and Sodra lamps*

BTH

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RUGBY

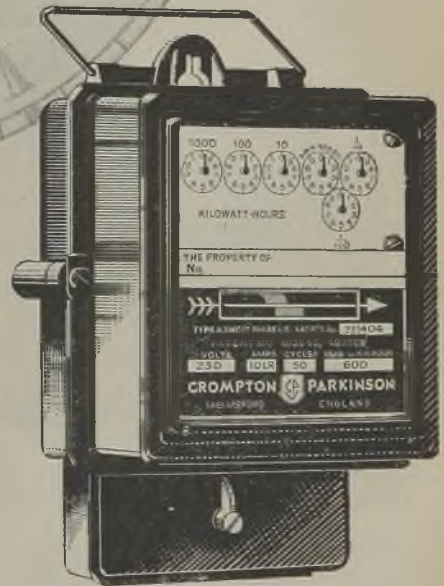
THE BRITISH THOMSON-HOUSTON COMPANY LIMITED, RUGBY, ENGLAND





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tell on a**

**Crompton
Meter**



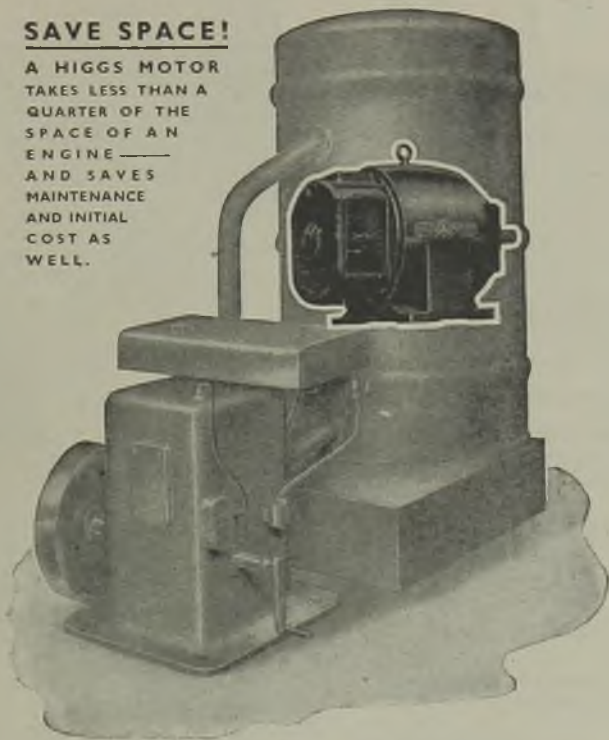
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Let us send you full particulars of the
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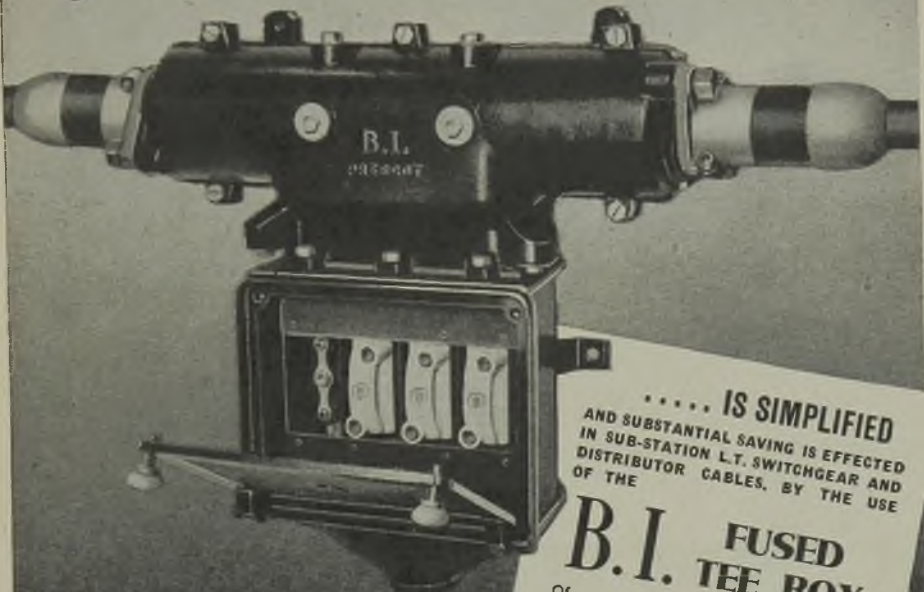
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 AND SUBSTANTIAL SAVING IS EFFECTED
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 DISTRIBUTOR CABLES, BY THE USE
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B. I. FUSED TEE BOX

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Please call upon us to help you solve any Resistance problem.

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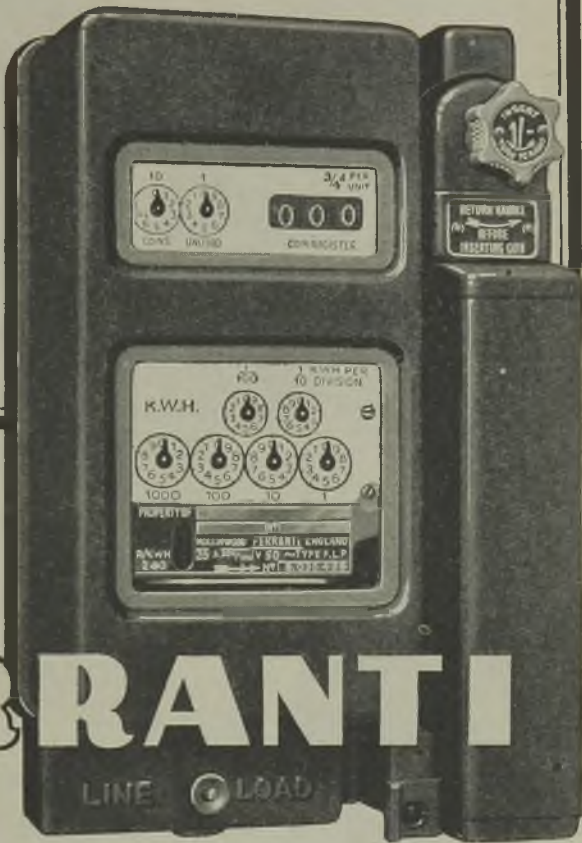
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**a Switch that
breaks 100 Amps
without injury**

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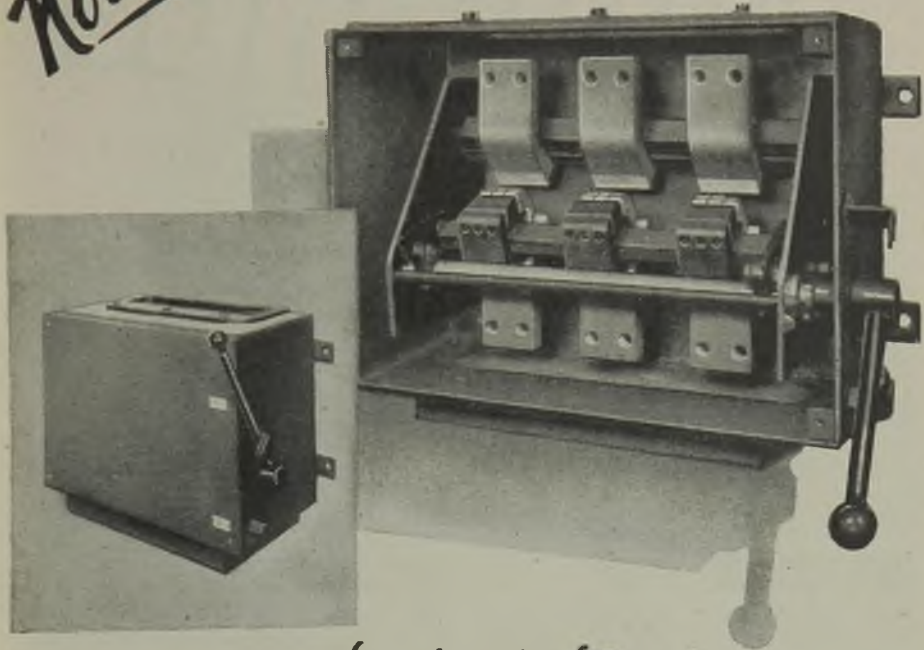
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1,200-AMPERE AND 1,600-AMPERE
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As standard items in



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FUSES : 10 TO 600 AMPERES

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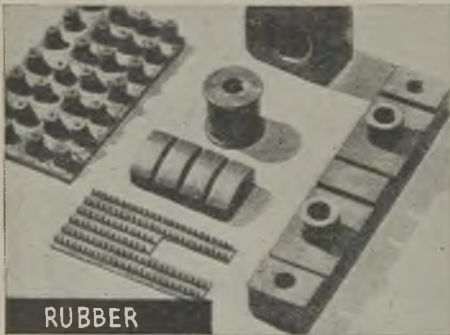
ISOLATING-SWITCHES : 1,000 TO 1,600 AMPERES

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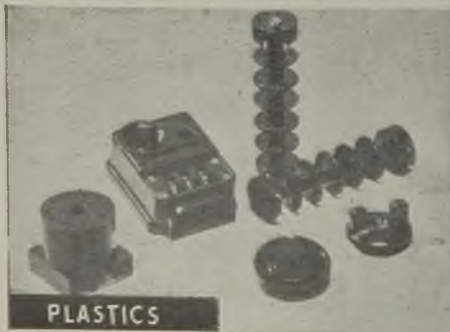
AVAILABLE FOR ALL INDUSTRIES
IN 4 MATERIALS



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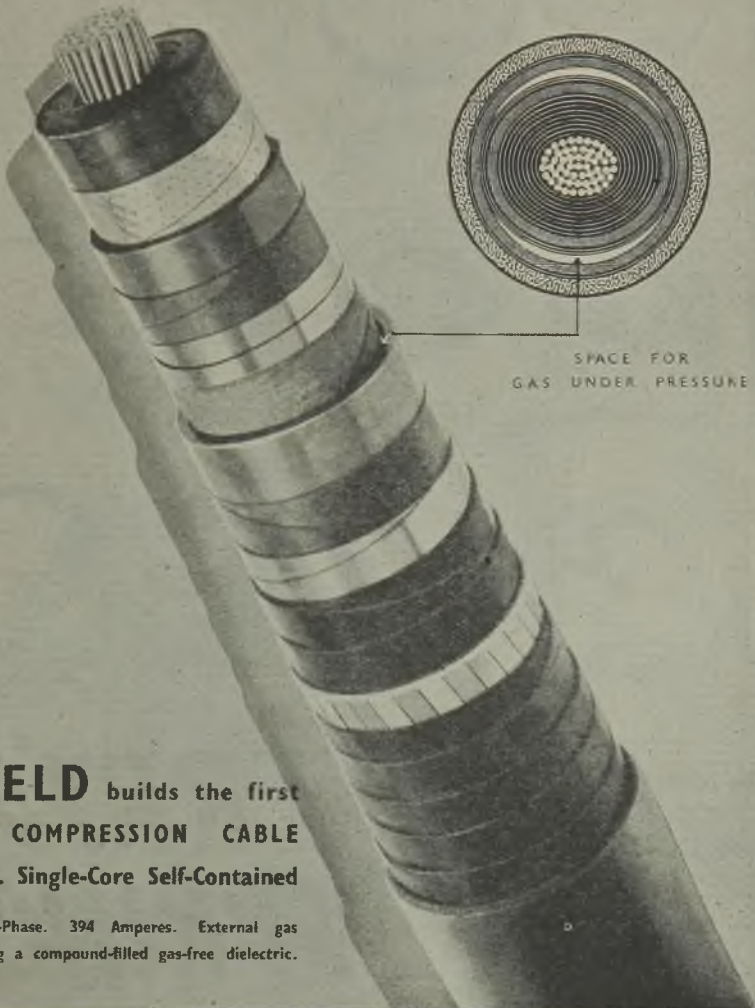
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COMPRESSION CABLE
SINGLE-CORE SELF-CONTAINED



SPACE FOR
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ENFIELD builds the first
132-kV COMPRESSION CABLE
0.4 sq. in. Single-Core Self-Contained

90 M.V.A. 3-Phase. 394 Amperes. External gas pressure giving a compound-filled gas-free dielectric.

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Spring and plain steel washers of every type and size . . . in round, square, flat section, etc. etc.

Let us know your requirements. We can fill them promptly and efficiently. Our 89 years of spring and pressworking experience enables us to offer washers that are different. We can make washers to special shape and our research department is at your disposal.

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Chapter Five SHOP LIGHTING

The need for fuel economy still forbids for the moment the full use of the tremendous sales force which the intelligent application of experience in shop lighting affords—but this, surely, is merely an incentive to get ahead as quickly as possible with the installation of the necessary fittings and plant ready for the longer evenings and the word "go!"

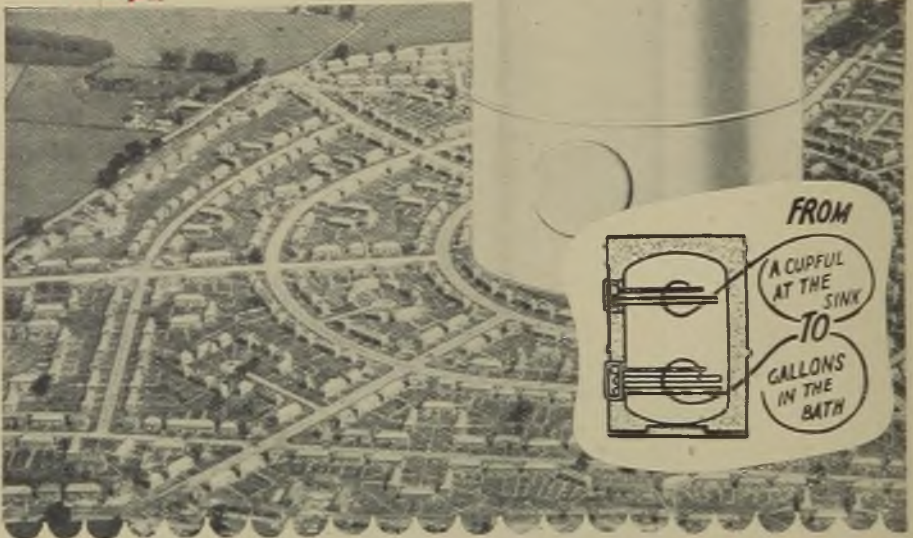
We have a lot of really modern ideas we would like to talk over with you!



R · E · A · L

Rowlands Electrical Accessories Ltd., R.E.A.L. Works, Birmingham 18

We are
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READY**



with the **Charlton** 'TWIN'



Charlton Water Heaters are getting into their stride for the peace-time programme. Not the least important is the Charlton "Twin," the two element heater ;

500 watts at the top—permanently in circuit—and 2,500 below for baths, making 3 kW in all. Sizes 15 and 20 gallons. Every house needs a Charlton "Twin" !

Our Specialist Electric Water Heating Engineers will collaborate with you
JOHNSON & PHILLIPS LIMITED
CHARLTON, LONDON, S.E.7

Telephone : Greenwich 3244 (13 lines).

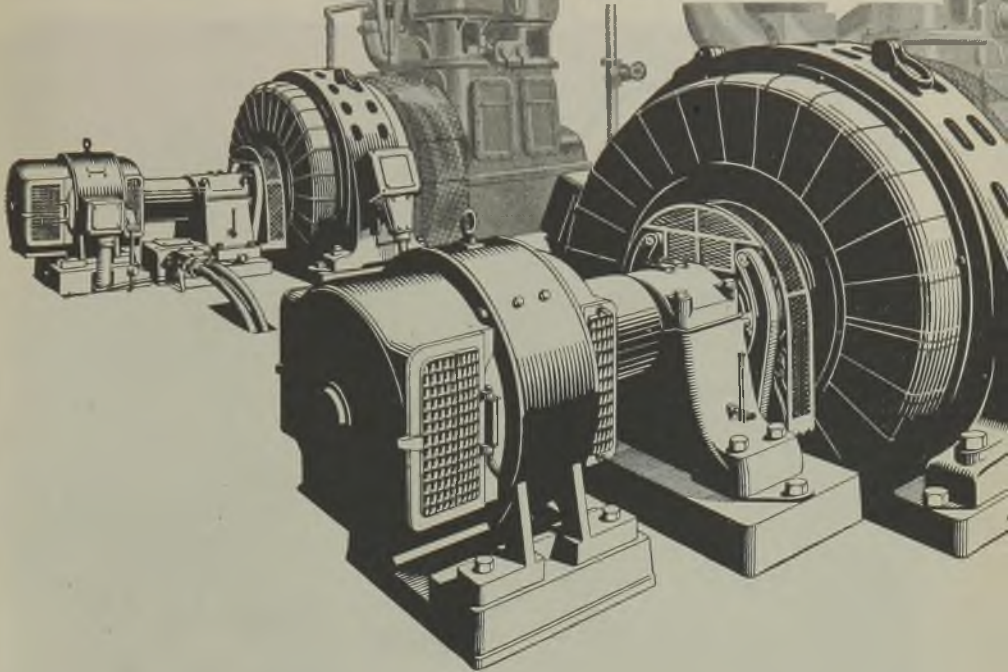
Telegrams : "Juno," Charlton, Kent



The mark that means that "little more" in quality

These are Crompton motors

Electrical Review, August 17, 1945



saved £500 a year by P.F. correction.

Two needs existed in a large works. First, equipment was required to maintain the overall power factor at an economical figure. Second, motors were required to drive two large compressors. By ordering two 560 H.P. Crompton Auto-Synchronous Motors both needs were satisfied. The motors provide highly efficient constant speed drives. At the same time they maintain an overall maximum demand of approximately 1,800 kW at a power factor of .985 lagging. They saved £500 a year on the maximum kVA demand over what it would have been with ordinary induction motors without p.f. correction.



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LECTRA HOUSE, VICTORIA EMBANKMENT, LONDON, W.C.2



is in every

**ELECTRICAL
INSTALLATION**

*that fulfils its
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good job*

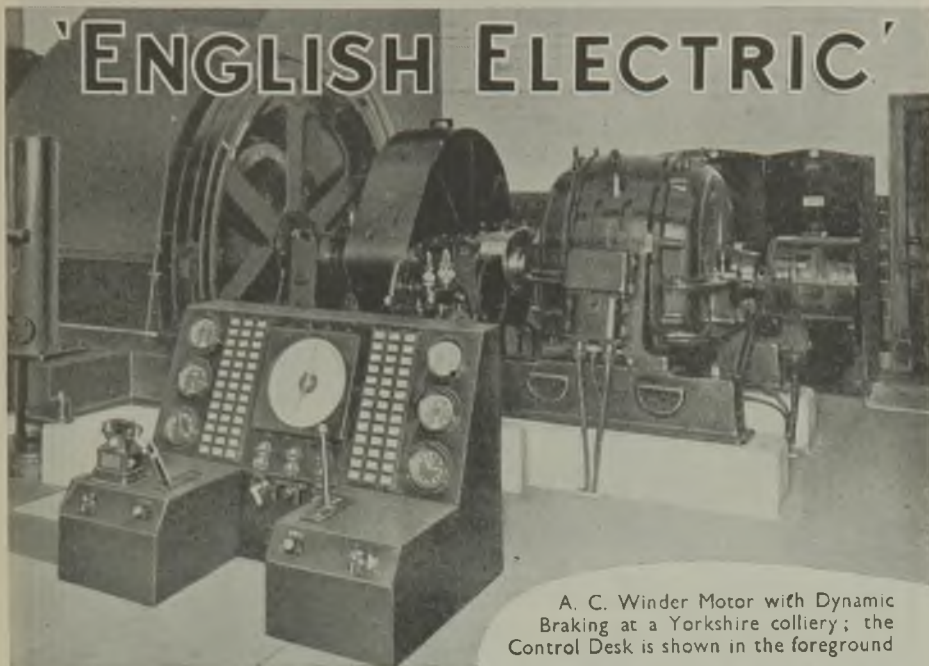
**PAPER INSULATED,
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AND OTHER**

CABLES & FLEXIBLES

for every purpose
**FACTORIES, MINES, SHIPS,
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DOMESTIC, ETC.**

THE LIVERPOOL ELECTRIC CABLE CO., LTD.

**BOOTLE
LIVERPOOL**



A. C. Winder Motor with Dynamic Braking at a Yorkshire colliery; the Control Desk is shown in the foreground

AUTOMATICALLY COMPENSATED D.C. DYNAMIC BRAKING for A.C. WINDERS

*Reduced
Brake Wear
Lower
Maintenance
Costs
Simple in
Application*

**CENTRALISED CONTROL WITH DRIVER'S
DESK** incorporating :-

- Control Levers.
- Instruments.
- Miniature Precision Depth Indicator.
- Shaft Signals.

Servo operation of Liquid Controller.

This form of Braking can be fitted to existing equipment.

Our engineers are always available to discuss your Winder problems.

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1931 "BONDERIZING" for Paint Anchorage.

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1938 "PYROGRIP" Cold cement for dressing mops and bobs used for scurfing and polishing.

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1942 "BONDERITE" 'K' for treatment of continuous steel strip and sheet production.

Other war developments which have taken place are, at present, available only to Government Factories and Contractors.

IT CANNOT BE PARKERIZED OR BONDERIZED
(Registered) (Registered)

WITHOUT *Pyrene* CHEMICALS

For **POST-WAR INDUSTRIAL INSTALLATIONS**

Tucker

SWITCHES AND ELECTRICAL ACCESSORIES



When Heavy Duty Industrial installations are under consideration turn to the TUCKER Ironclad switches and switch sockets with B 4000 Positive Active Q.M. & Q.B. switch movement in the G.44 Price List. This mechanism has been tested to even more stringent requirements than the stipulation of B.S. 816. A robust side handle watertight switch is also available.

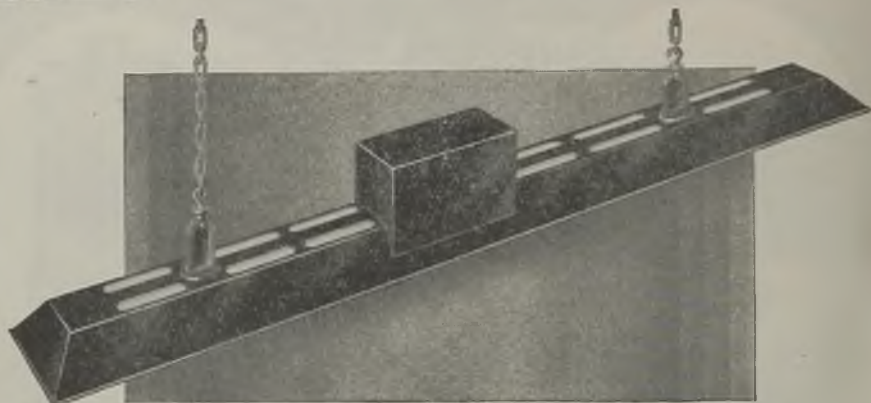
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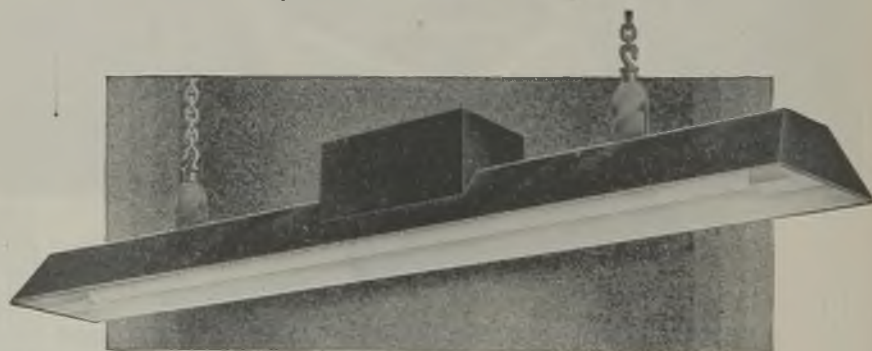
FOR 80 WATT TUBULAR
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WITH SLOTS FOR UPWARD ILLUMINATION

1748 | Lamp with Box £3 0 0 + 25%

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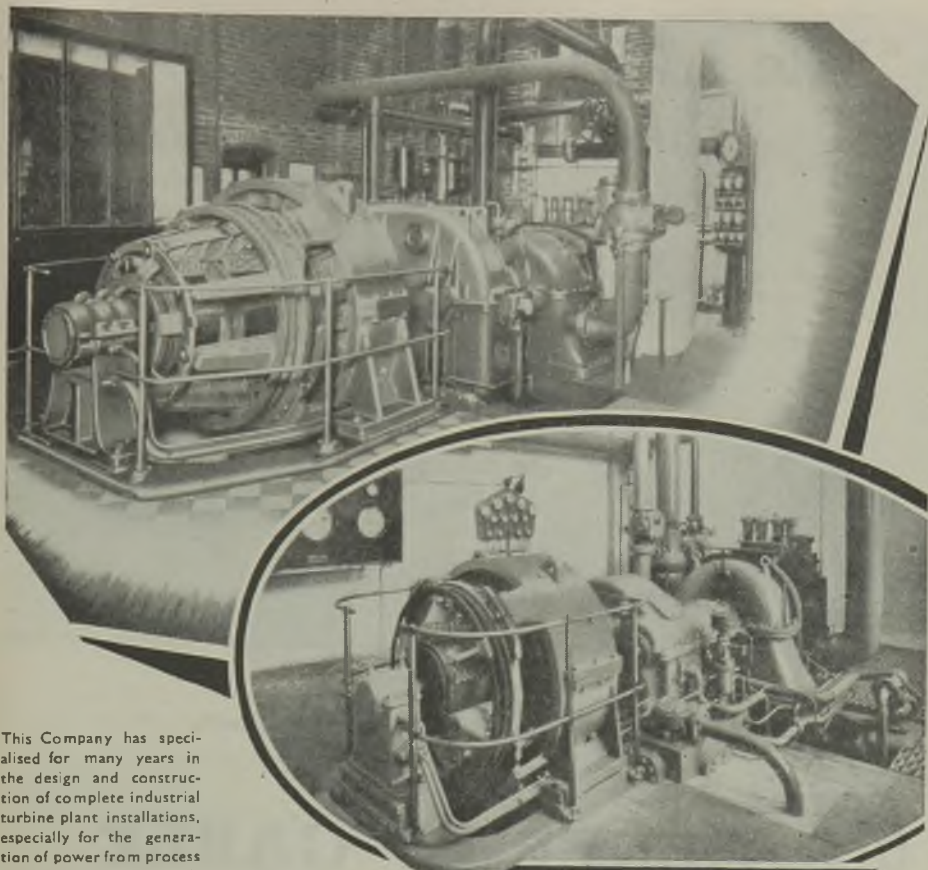
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1764 | Lamp with Box £3 0 0 + 25%

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Prices include Hooks and Patent easy wiring box on top of trough.
Fixings arranged for any make of control gear.

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The "Awlinwun" design of turbo-set with the surface condenser shell forming the turbine base-plate and the complete plant arranged for erection on one floor level, is particularly suitable for many installations where savings in space, buildings and foundations are important.

Two typical industrial installations of Allen geared D.C. turbo-generators of the pass-out type are illustrated, a 1,000 kW. set in the upper picture, and a 350 kW. set in the lower picture. These machines provide steam for works heating and process purposes, the larger set supplying 18,000 lb. per hour, and the smaller set 8,000 lb. per hour at 5 and 15 lb. per sq. in. gauge respectively.

ALLEN

TURBO PLANT

for INDUSTRIAL
POWER

W. H. ALLEN
BEDFORD



SONS & CO. LTD.
ENGLAND

"The LAST SHOT becomes the STARTING SHOT!"



says

GENERAL CABLE

V.I.R., P.V.C., T.R.S., L.C., etc., etc.

"When the last shot is fired in the Japanese war as it has in the European conflict, we shall be able to restore our full normal service for civilian customers."

"My thanks are due to them all for the patience and understanding they have shown to us during the time when war needs absorbed all our energies and nearly all our output."

"But they'll be rewarded for we've built

up an organisation here at H.Q. in Surrey (and elsewhere throughout the country) that will produce not only first-class cables but a service second to none. Our technical staff are working hard on improvements and developments that will be of tremendous interest to everybody. Meantime if we can assist you with any present problem or laboratory test, we have the equipment and the men ready and waiting to help."

**THE GENERAL CABLE
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LTD.**

LEATHERHEAD, SURREY



Telephone: LEATHERHEAD 3021/2
(Private Branch Exchange)

Telegrams:
"ISOLDE," LEATHERHEAD

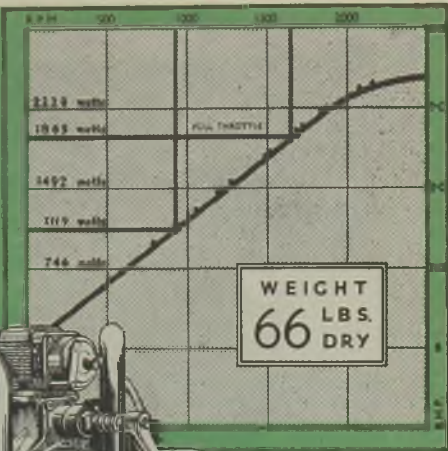
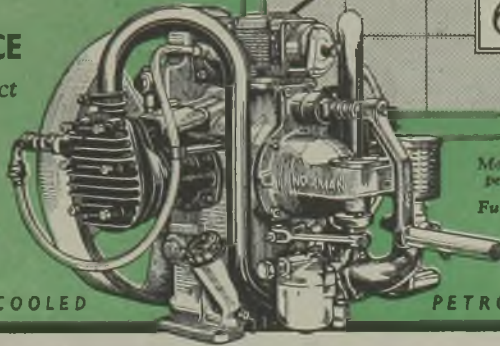
The design of Norman Aircooled Engines has been perfected during 25 years of manufacturing for a wide range of applications. Lightest engine in its own class, it is also one of the best engineered of any class. Many thousands on war service in the "front line." For battery charging sets, lighting sets, transmitters, refrigeration and air conditioning, marine, aircraft, and all portable equipment requiring up to 3 h.p. this engine is unrivalled.

**An ultra-light
POWER SOURCE**

Aircooled - Compact
Silent - Smooth
Reliable



LIGHTWEIGHT AIRCOOLED



Model T.300 and its performance graph.
Full particulars from THE NORMAN ENGINEERING Co. Ltd., WARWICK

PETROL ENGINES

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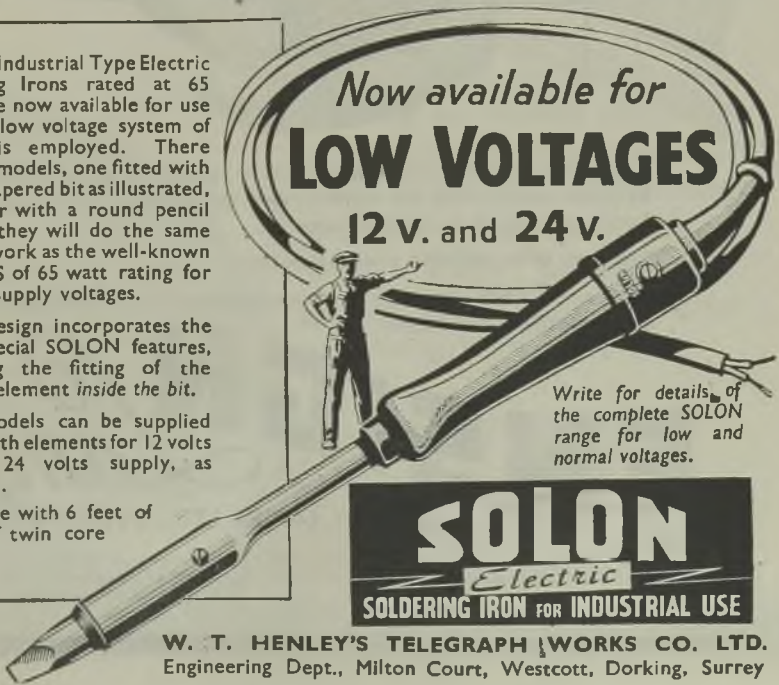
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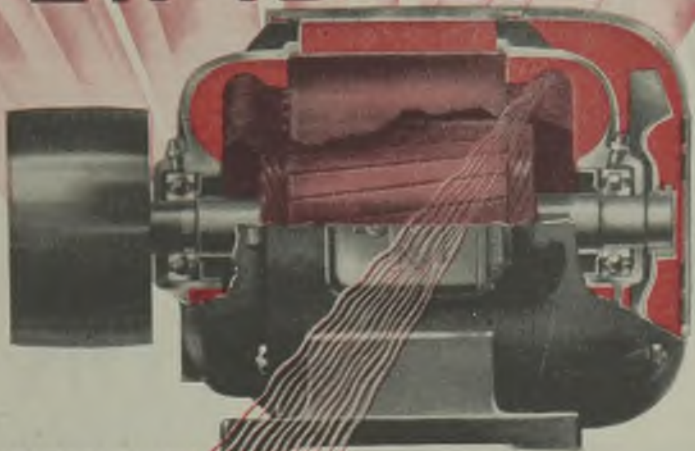
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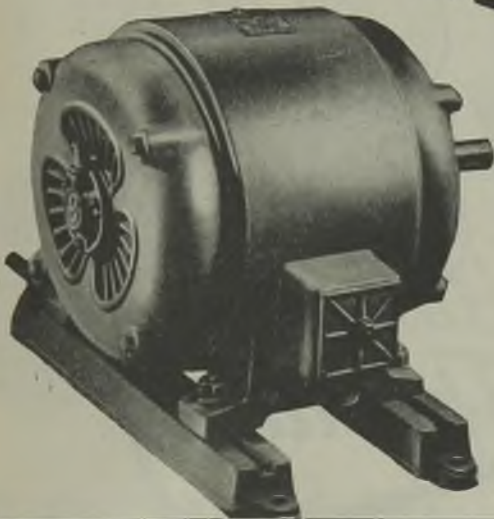


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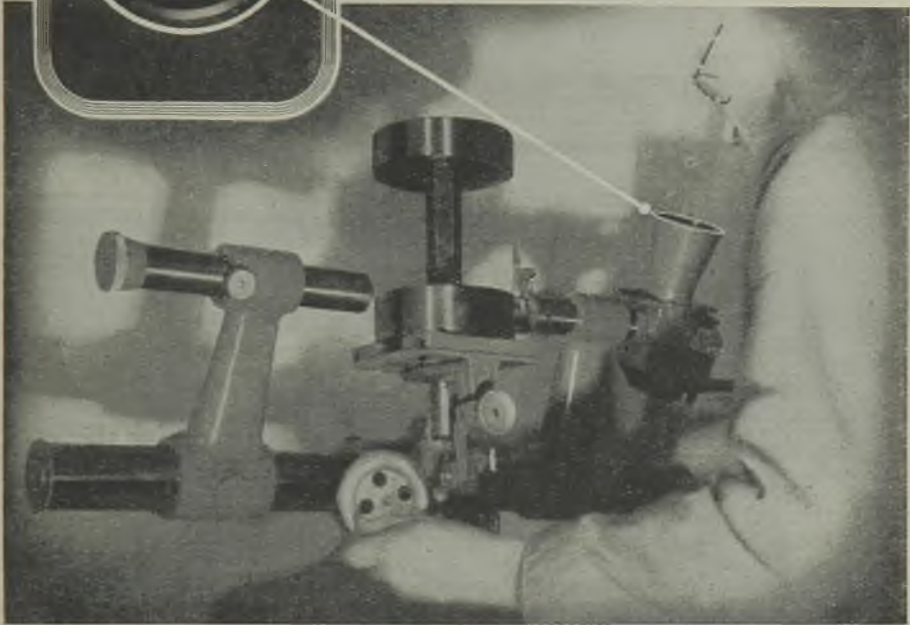
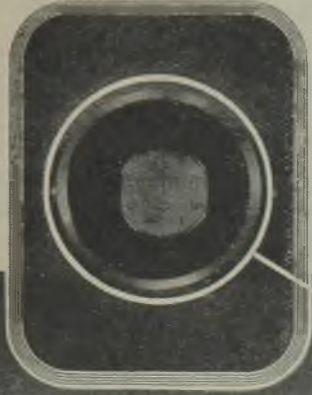
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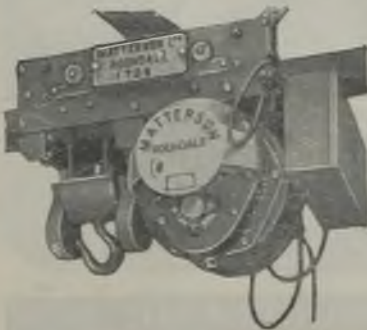
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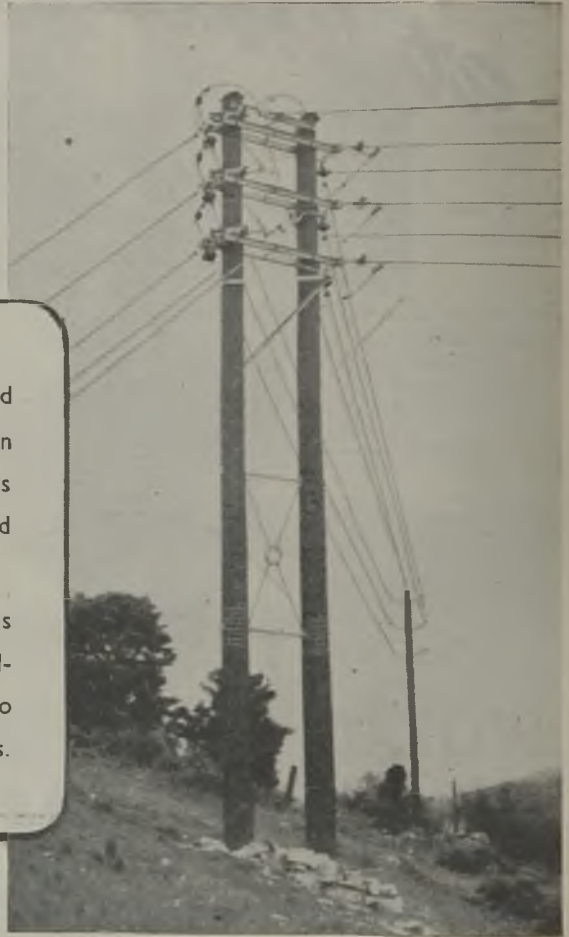
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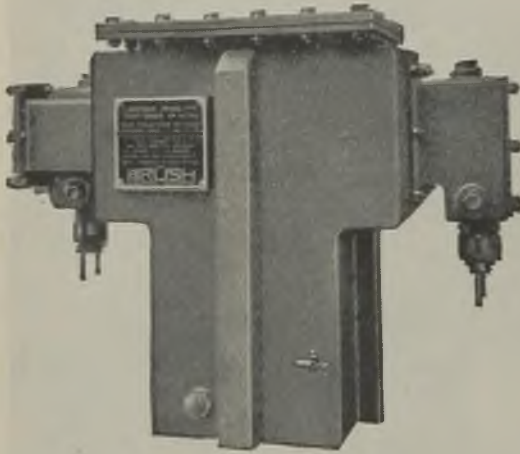
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ELECTRICAL REVIEW

August 17, 1945

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EDITORIAL, ADVERTISING & PUBLISHING OFFICES : Dorset House, Stamford St., London, S.E.1
Telegraphic Address : "Ageekay, Sedist, London." Code : ABC. Telephone No. : Waterloo 3333 (35 lines).
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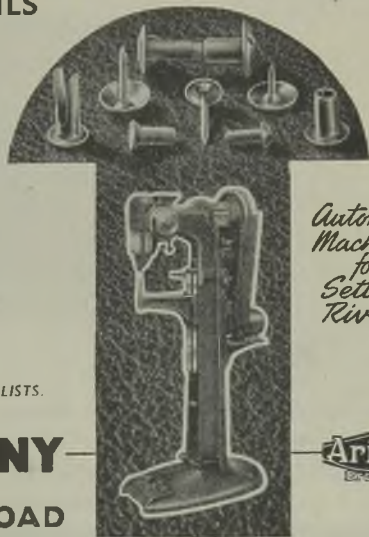
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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872



Vol. CXXXVII. No. 3534.

AUGUST 17, 1945

9d. WEEKLY

Men Wanted

Will the Situation Now Improve ?

A RATHER misleading statement recently published by the Ministry of Works, which got us into trouble with some of the electrical appliance makers, is referred to again on another page of this issue. Although this reference includes what is intended to be an apologia from the Department principally responsible for the document, it will be seen that the general situation is by no means cleared up or improved.

The fact is that, as in many other branches of industry, the electrical appliance business is being starved of labour. Not only are men still held by the Forces, but existing staffs are being depleted by calls upon men of military age, whose further deferment is disallowed, and by the loss of women who think that now the war is over they are entitled to return to their normal lives. In addition, the long-borne burden is telling upon the older men who have worked very hard during the past six years.

Effect of Far East News

It is in these circumstances that the Ministry of Works issued its notice, to the exasperation of manufacturers who spend a great deal of their time explaining to would-be customers why they cannot deliver the goods. While all this has been taking place the Pacific war has been drawing to an end and now Japan has agreed to surrender. Surely this has improved the prospects.

It is practically certain that we shall have to maintain much bigger armed Forces than we possessed before the war,

but it will be possible to demobilise many hundreds of thousands. It is essential that their release shall be orderly and at such a rate as to enable the industry to absorb them, but it is even more essential that the "key" men, upon whom the successful reconversion of industry depends, and the labour needed for the more urgent forms of production shall be given precedence. This probably means an extension or speeding-up of "Class B" releases, but the Ministry of Labour has pronounced against this on several occasions. Nevertheless the subject must be reconsidered in the light of the obvious needs.

"Nominated" Workers

There are also many people who were directed from electrical equipment factories to other branches of industry more closely connected with war production. With the end of the war many, probably most, of these men will not be required and should be free to return. Already there is a Ministry of Labour arrangement by which employers can "nominate" for return any of their workers who left them during the war for other employment. But these workers have to be willing to return. If war factories are closed they will be glad to, but all the time these factories continue there may be some reluctance. Probably they have been receiving much higher wages and it is possible that they have been enjoying better working conditions, although neither of these considerations should have so much force in the case of electrical workers

as with some from the older factories. Thus it will be seen that there is need for a revision of Government policy which may now be made in view of the fundamental change in the situation during the past week. But there are also matters upon which the employers have to ponder if they are to attract workers.

Atomic Energy

ALTHOUGH public attention has naturally been focused particularly upon the military aspects of "splitting the atom," the long-term implications are probably of even greater significance. These first fruits of atomic academic research support the faith expressed here, when discussing the potentialities of the cyclotron and of U235, that it would not be beyond the wit of man to devise means for replacing the present methods of exploiting solar energy, *e.g.*, coal and oil, if or when these fail. To regulate the release of atomic energy economically as useful power may, however, prove as difficult as it has been to give it explosive force. It will no doubt call for similar close co-operation of scientists of the Allied Nations.

Gas or Electricity

It was stated at a recent meeting of the Grimsby Council that the Housing Committee had decided that as both gas and electricity services had been laid to premises on a new housing estate both gas and electricity could be used. As this seemed to indicate a relaxation of the rule that equipment in houses on any one site must be all gas or all electric we asked the Ministry of Works if the rule had in fact been set aside. We are assured that this is not so. Although electric lighting may be installed in all houses the equipment must still be gas or electric—not both. This underlines our earlier contention that as electric cables will have to be laid anyway there is no reason for putting in gas mains.

Lincoln Cooling Water

WHEN we wrote on the subject last week it seemed that the Lincoln City Council had definitely accepted a proposal to use water from the River Witham instead of cooling towers in connection with the first part of its power station extension. But at its meeting on Wednesday last week it reversed its decision by a small majority.

The argument advanced against the proposal by the chairman of the Electricity Committee was that there was a serious risk of the water supply being inadequate. The Central Board had stipulated that if this were found to be the case the annual capital charges attributable to any superseded works (put at £3,355 for twenty years) should be excluded from the production costs at the station payable by the Board. Moreover, should plant be shut down for a period on this account, the Council would have to meet the debt charges, amounting to £4,765 a month. In the circumstances the Council's decision is understandable.

German Electrical Industry

ONE of the more important matters with which the Allied Control Commission is dealing is the German electrical industry which before the war was a serious rival to its British and American counterparts in world markets. Little is known of that branch of the Commission's work. The British representative is Mr. H. Ledward of the B.T.H. Co., while the United States is represented by Mr. C. A. Powel (Westinghouse), president of the American Institute of Electrical Engineers. Some reference to the larger German electrical works appeared in a *Times* article last week, the gist of which is given on another page of this issue. It is said in this that the two great Siemens concerns have been practically stripped of their plant and personnel, and the A.E.G. is in much the same case. On the other hand Mr. Powel has stated that the industry is still greater than it was before the war and "must be trimmed to normal peacetime production levels."

Oil for Linseed

FUEL shortage in Argentina has compelled the use of a great deal of vegetable products and their derivatives, including linseed, in power stations. The *Monthly Journal* of the British Chamber of Commerce in the Argentine Republic now reports that an agreement has been arrived at between Argentina and the United States by which American fuel oil will be shipped to Argentina in exchange for linseed and linseed oil. The unique feature of this arrangement is that the exchange is based on calorific, not monetary, value.

Mexborough Power Station

The New 60,000-kW Installation in Yorkshire

THE new generating station at Mexborough of the Yorkshire Electric Power Company is probably unique in terms of modern supply development in that it is being completed in its initial construction stage with its full complement of generating plant, there being no intention to extend the station. The plant comprises two 30,000-kW turbo-alternator sets served by four 200,000 lb. per hour boilers. The first set was put into commission a few months before the end of the war in Europe.

The station stands on a triangular site having as its boundaries the River Don on the south side, the Doncaster Road on the north-east, and the Sheffield and South Yorkshire Canal on the north-west. On the south side of the river is the main L.N.E.R. Sheffield-Doncaster line, and almost due west of the station five standing sidings have been laid from this main line to serve the station. These sidings all serve the station

boiler and turbine houses, and the four boilers are placed side by side with their fronts facing the turbines, which are aligned end to end. The turbine room is 240 ft. long and has a crane span of 50 ft. The 75-ton Arrol crane carries a 10-ton separately operated auxiliary hook. The boiler house is also 240 ft. long and is 110 ft. wide. The basement level is 52 ft. O.D. and the boiler-firing and turbine-operating floor level 72 ft. O.D. The surge tanks are carried on a gallery 54 ft. above the firing floor, and immediately above them are the storage tanks.

Boiler Plant

Each of the four boilers, supplied by the Mitchell Engineering Co., Ltd., is designed for a m.c.r. of 200,000 lb. per hour with an inlet feed-water temperature of 350 deg. F. and a steam temperature of 885 deg. F. at 650 lb. per sq. in. The economic output is



Mexborough is a riverside-operated station and it is being completed in its initial stage with its full plant capacity of 60,000 kW

via a common line over a specially-constructed bridge.

The main station building rests towards the north corner of the triangle, with its north-west side parallel to and very near the canal boundary. The boiler house is on the canal side of the station and the adjacent turbine house is on the other side of the boiler house. On the south-east side of the turbine house is a block accommodating the control room, offices, laboratories, workshops, battery, etc. About 30 yards from this block is the main outdoor switching station and distribution centre. There is a screen, pump and water-treatment house near the south corner of the station.

There is no partition wall between the

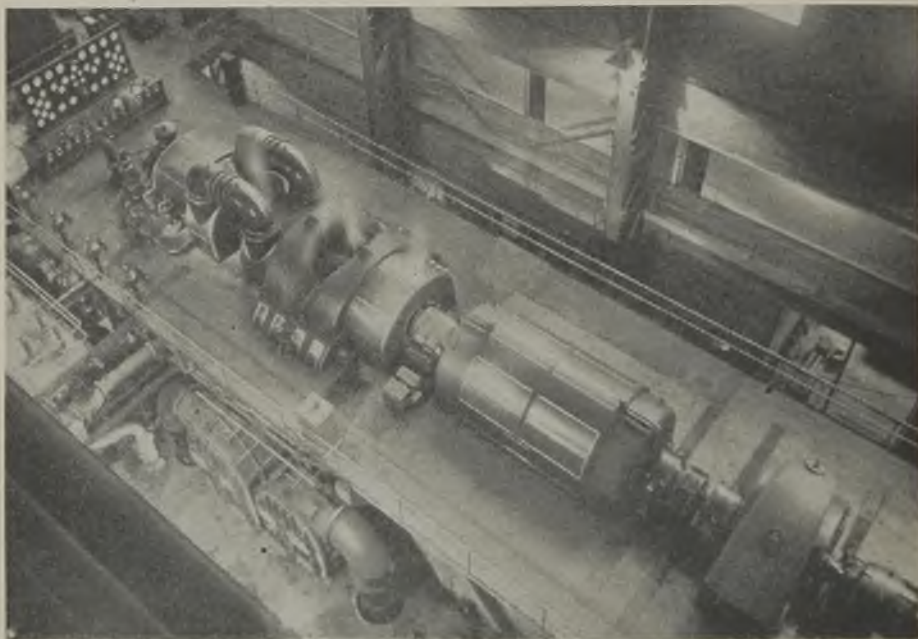
180,000 lb. per hour at 650 lb. per sq. in. and 875 deg. F. The boilers are designed for burning Yorkshire fine slack coal with an ash content of up to 20 per cent., a moisture content of from 4 to 14 per cent., and a gross calorific value of 11,500 BThU per lb. Weighing about 1,230 tons each in working order, the boilers are of the tri-drum type. The drums are solid forged. The side and front walls and the back arch are water cooled.

Each boiler has combined radiant and convection superheating, the steam first passing through the radiant section of the system at the boiler front. Tube-assembly hand holes in the superheater headers have been eliminated by the provision of nipples

on the headers to which the tubes are butt welded on assembly. The tubes of the radiant section are of chromium-molybdenum steel. A Green's horizontal gilled-tube economiser is situated immediately at the back of the boiler, and between this and the Newton Chambers needle air heater. The respective heating-surface areas, in sq. ft., of the boiler, superheater radiant section, superheater convection section, economiser and the air heater (gas side) are 15,492, 950, 3,895, 27,300, and 13,800. Each boiler is equipped with twin Illinois travelling chain-grate stokers having an overall width of 27 ft. and a length of 25 ft. Each stoker section is separately driven. Each boiler is

steam turbine. This normally runs idle; it is a simple affair with just a single wheel of low windage loss. When the turbine is required as the driving unit, it is supplied with steam at a temperature lower than that of the normal boiler superheat, *i.e.*, 650 deg. F. against 885 deg. F., from an auxiliary steam range connected to the boiler at a point between the radiant and convection superheater sections. In addition to the usual boiler mountings each boiler is equipped with a Hopkinsons "Duo" feed-water regulator and distant water-level indicator. Each boiler is equipped with 19 Hopkinsons automatic soot blowers.

All the coal is rail-borne—for the present,



The turbine room is 240 ft. long and has a crane span of 50 ft.; one of the 30,000-kW turbo-alternators as seen from the surge-tank gallery

served by one i.d. fan situated at the basement level, two f.d. fans situated at the top water-drum level, and two secondary-air fans mounted on the boiler front structure a few feet above the stoker.

Each boiler has its own nine-stage feed-water pump which has a capacity of 400,000 lb. per hour against a total generated head of 850 lb. per sq. in. The pump is normally directly AC motor driven, and these two units, pump and motor, are arranged on a common shaft, together with a stand-by

at any rate—and apart from the coal in the storage ground for about 20,000 tons towards the west corner of the site, all wagons (20-tonners) passing from the sidings over the bridge to the site continue to a rotary wagon side tippler on the canal side of the station. There is a motor-driven capstan near this point for marshalling the wagons to and from the tippler, and a built-in Avery weighing installation is included in the tippler plant.

The coal from the tippler-mounted wagons

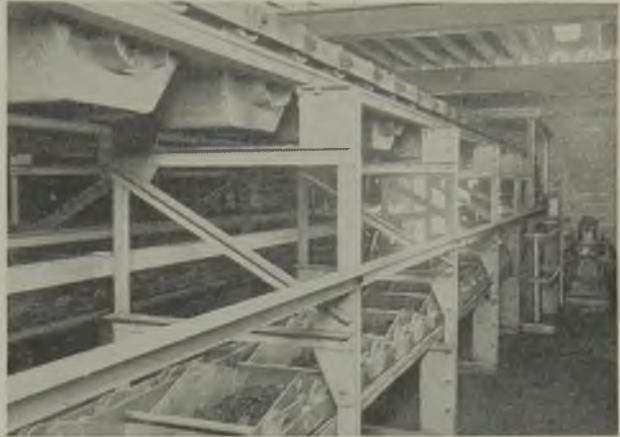
falls into a hopper serving a duplicate vertical bucket elevator which rises inside the main building to a level of about 90 ft. above the basement, over boiler house bunkers. At this high level the bucket-elevators are extended in the horizontal plane for a short distance, and at the end of the system the buckets empty their contents on to shuttle feeding conveyors which serve the boiler bunkers. Additional coal-handling plant to be installed will include a drag scraper which will take coal from the storage ground, and a further wagon tippler on the west side of the station to deliver to an inclined belt conveyor entering the boiler house in line with the bunker conveyors.

From the bunkers the coal is delivered to the stokers through traversing chutes and boiler hoppers. Ash from the travelling stokers falls into hoppers from which it is fed into lorries in the basement for disposal.

There is one chimney to each pair of boilers, and at its root are the two i.d. fans. The steel chimneys are brick lined; they are self-supporting, and each has a minimum internal diameter of 13 ft. 6 in. Their height of only 125 ft. from the basement level is purely a wartime measure; they can be extended later on, if required, to 250 ft.

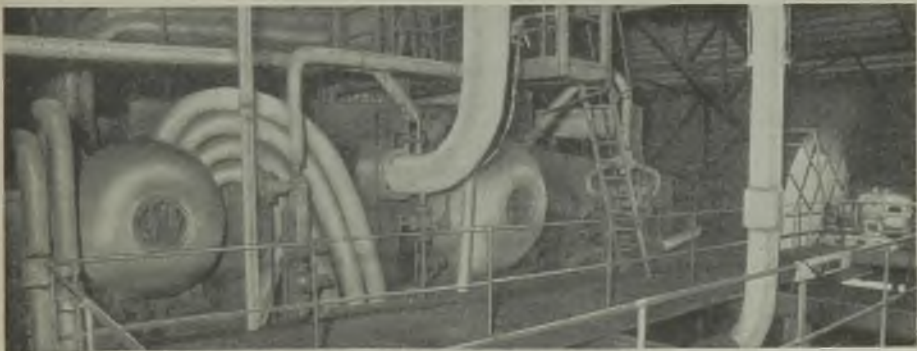
The combustion air is taken from the upper levels of the station by means of the f.d. fans

at the water-drum level to the air heater in which it passes over the external surfaces of the heat-exchange tubes. The bulk of the heated air is passed from the air heater, first through the travelling grate from underneath and *via* the coal bed to the combustion chamber, where it is mixed with the various products of combustion and is joined



At the top the coal-handling bucket elevator is extended horizontally to the shuttle conveyors over the boiler-house bunkers

in the upper regions by a stream of air from the secondary-air fans mounted on the boiler at about the air-inlet level. The flue gases from the combustion chamber go directly to the economiser and then to the air heater in which they pass through the smooth-bore tubes, and are finally discharged to the chimney, being aided in the last stage by the i.d. fan at the base of the chimney. The



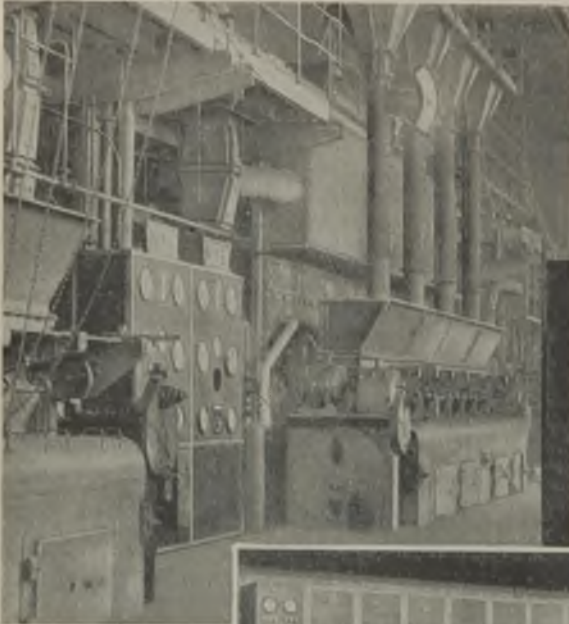
Each boiler is served by two f.d. fans situated at the water-drum level; one fan only shown

designed thermal efficiency of the boiler on the gross calorific value of the fuel and at the economic rating is 85 per cent.

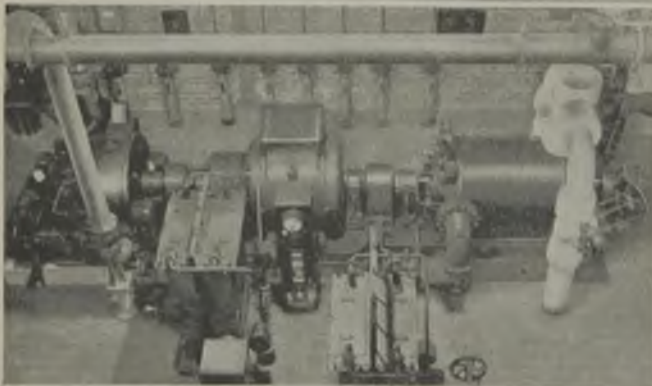
Combustion is governed by the Metrovick

system of unified control and there is a motor-generator set for each boiler comprising a 3,000-V motor, a variable-voltage generator and a constant-voltage exciter. All the boiler, fan and stoker motor armatures are solidly connected to the generator and motor fields are supplied by the exciter. The maximum generator voltage is 500.

There is a separate field rheostat for each boiler auxiliary motor by means of which the correct fan or stoker speed can be applied to any set of combustion conditions. A master rheostat governs the common supply to all the motors by regulating the generator field, and once the fields of the individual motors have been adjusted all the auxiliaries can be regulated as a whole simultaneously by one operation at the boiler control board at the firing-floor level or remotely from the station control room, where group control



The boilers are stoker fired, each unit being equipped with twin travelling chain-grate stokers. Combustion is controlled by the unified system of control; two m.g. sets and switchboards (right)



There are four nine-stage feed-water pumps, normally AC motor driven, but each pump and motor is arranged on a common shaft with a stand-by steam turbine; variable-resistance speed controller of another set appears in the photograph

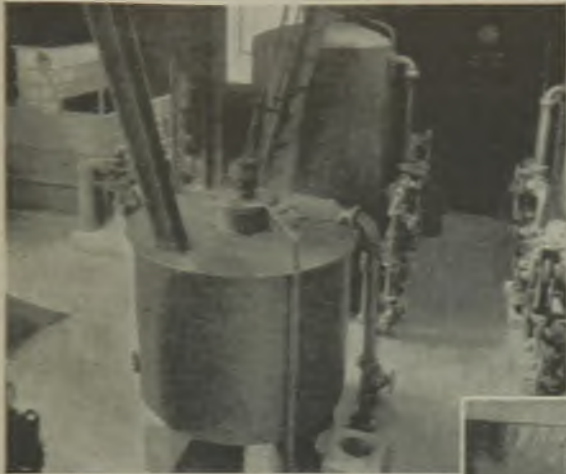
can in addition be effected.

Each English Electric alternator set has an economic output of 24,000 kW at 3,000 RPM. The stop-valve conditions are 615 lb. per sq. in. abs. and 850 deg. F, and the specified back pressure is 0.60 lb. per sq. in. absolute. There are nineteen impulse stages in the h.p. cylinder and nine reaction stages on each side of the double flow l.p. cylinder. Steam is bled from the

cylinders at four stages, two h.p. and two l.p., for supplying feed-water heaters served by drain pumps. Each set is provided with a steam-pressure limiting device, and the worm-

pump. From this pump the water goes through the first and second h.p. feed heaters, whence, at 350 deg. F., it passes to the boiler feed range. Make-up is taken from the river and the water is dealt with by Permutit chemical water-treatment plant in the circulating-water pump house.

From the storage tank the water is pumped through a hydrogen exchange bed which converts all the soluble water salts into the respective acids. Then a synthetic-resin bed absorbs the acids with the exception of carbonic acid, which is eliminated by passing the water through a de-gassing tower from which it leaves as the equivalent of distilled water. The two plants are regenerated by the



Feed-water make-up is taken from the river, and the water is first dealt with by chemical treatment plant; caustic and hydrogen tanks in centre

driven turbine governor controls the inlet throttle valves through a relay gear. There are three valves for half-load, full-load and over-load respectively, and the over-load valve by-passes the first four stages of the h.p. cylinder.

There is a single helical gear drive for the main turbine lubricating oil pump, while auxiliary oil pumps are arranged to run up automatically on a fall of the oil pressure. Each turbo-alternator set is equipped with motor-driven barring gear. The steam from each turbine is exhausted into an English Electric fabricated mild-steel single-pass condenser with a cooling surface area of 31,000 sq. ft. Serving each condenser are two condensate pumps, one AC and one stand-by DC, and two three-stage vertical-type air ejectors, each with intermediate surface condensers.

Each extraction pump is a three-stage unit, and after the second stage the condensate passes through the condensate-served section of the alternator air cooler and the inter-condensers of the air ejectors, whence it returns to the third stage of the extraction pump. Delivery from the extraction pump is through the first and second l.p. feed heaters and then to the suction of the feed-water



Immediately above the 3-kV AC circulating-water pump motor is a DC motor which takes over automatically on AC failure

application of a 2 per cent. solution of sulphuric acid to the hydrogen unit and a 2 per cent. solution of caustic soda to the synthetic-resin unit. Finally the water is slightly causticised. At 100 per cent. of the

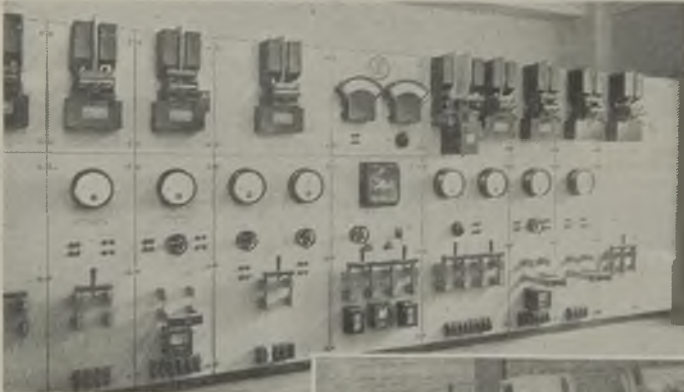
continuous rated output of the turbo-alternator, the steam used per kWh generated is just over 9 lb., and the total steam consumed per hour about 271,000 lb. at an overall efficiency of the turbo-alternator set of 33.85 per cent. Corresponding figures for 80 per cent. of the continuous rated output are about 209,000 lb. and 34.42 per cent.

The designed inlet temperature for the condenser circulating water is 70 deg. F. The water is taken from the river at the foot of the bridge and it flows through a culvert to the intake serving a pair of 35-ft. diameter Bracketts motor-driven rotary screens in the circulating-water pump house. The two Vickers-Gill circulating-water pumps are vertical axial-flow equipments, each with a capacity of 50,000 gal. per minute. A vertical-spindle 3,000-V AC motor normally drives

at a point about 1,250 ft. down stream. The pump house also accommodates two motor-driven general water service pumps for the station.

Each alternator is directly coupled to the turbine. It is cooled by a blower driven from the main shaft of the turbo set through a two-to-one reduction gear, at 1,500 RPM. The exciter is on an outboard extension of the blower shaft and hence runs at the same lower speed. Ventilation of the alternator is on the closed cooling system, there being three air coolers, two of which are served from the condenser circulating-water system and one by the condensate in conjunction with the air-ejector scheme.

The alternators generate at 11 kV, but each is directly tied to a 35,000-kVA English Electric transformer which steps up the output of the machines to 66 kV, at which voltage the main switching is effected. The machine transformers are installed at the outdoor switching station and distribution centre, and they are of the forced-oil circulation type. In each case the oil is cooled by water-

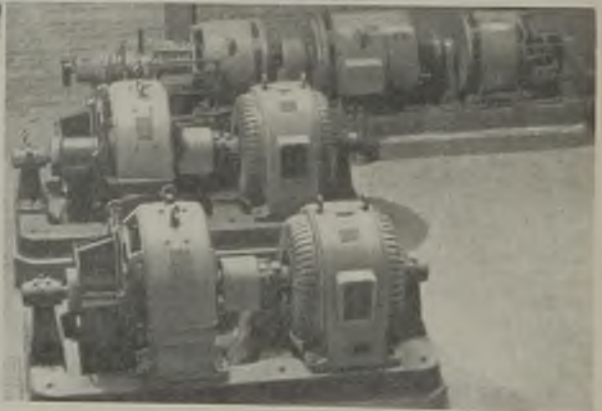


A DC supply is provided mainly for emergency purposes by a station battery and the two m.g. sets shown with a balancer-booster. Distribution board for DC emergency supply scheme illustrated above

each pump, but on the same shaft, immediately above, is a 460-V DC motor which automatically takes over in the event of an AC supply or motor failure.

Both the AC and DC motors (Mather & Platt) are remotely operated from the station control room. The DC motor normally runs idle, except that it trickle charges the station battery.

The total head across the circulating-water pumps is 19 ft. After circulating through the condenser the water re-enters the river by arrangements similar to those from the intake



cooled equipment housed in the appropriate 11-kV switchgear building. The oil pump is glandless, both the pump and the motor being housed in the same casing. Each machine transformer serves one of two sections of

single three-phase bus-bar around which the switchgear is erected and which have a separate bus-bar section switch. The main switchgear is English Electric outdoor equipment.

Each bus-bar section serves two outgoing 66-kV transmission lines forming part of the Y.E.P. main transmission system, and one of the four lines is a link with the Ferrybridge power station. Also supplied from each bus-bar section is a 15,000-kVA step-down transformer which serves one of the two 11-kV switch houses. The Reyrolle ironclad single bus-bar switchgear in each of these houses has five feeder circuit-breakers, one for an interconnector linking the two 11-kV switch houses, three serving distributors as part of the Y.E.P. 11-kV system, and one feeding a 4,000-kVA step-down transformer by which a 3-kV supply is taken back to the station proper for the auxiliaries. In each 11-kV switchgear house is a battery for switchgear operation.

The main components in each machine-transformer line between the transformer and the bus-bar are, in sequence, the transformer isolator, the potential transformer isolator, the oil circuit-breaker and the bus-bar isolator. Similarly, the main components in the 66/11-kV transformer lines are the transformer isolator, the oil circuit-breaker and the bus-bar isolator. From the bus-bar the main feeder-line components are the bus-bar isolator, the oil circuit-breaker, the feeder isolator and the potential transformer isolator.

Each 3-kV feeder back to the power station proper terminates at one of two Reyrolle cubicle type switchboards in the turbine basement from which the larger station auxiliaries are fed. A further step-down from each 3-kV switchboard is effected by a 1,000-kVA transformer which supplies a 400-V Reyrolle switchboard serving the smaller auxiliaries.

Apart from the special arrangements for supplying the boiler auxiliaries a DC supply at 460 V, three-wire, is provided mainly for emergency purposes by a 1,100-Ah battery

and two m.g. sets with a balancer-booster controlled by a Brown Boveri voltage regulator. The main purpose of the m.g. sets is to charge the battery, which is normally trickle charged continuously by the circulating-water pump DC motor in reverse. When the battery voltage drops to a certain point, however, the booster equipment automatically comes on circuit. In the event of a sustained AC motor failure the m.g. sets



The crescent-shaped board in the control room includes panels for remote boiler control

would be required to supply the circulating-water pump DC motors, in parallel with the battery.

Provision is also made for supplying the boiler stoker motors from the battery, so that on maintenance the stokers alone can be run without the necessity of running up the boiler-auxiliaries unit control system. A DC distribution board accommodates all the main switchgear and control equipment for the emergency supply scheme, and in addition it provides for emergency lighting and for the supply to the extraction-pump and turbine oil-pump motors.

In the well set out control room there is a crescent-shaped board which includes, in addition to panels for the remote control of the 66-kV, 11-kV and 3-kV switchgear, others for the remote control of the boiler unit control system. A well-appointed central control desk is also an important feature of this control room.

We are indebted to Mr. W. R. T. Skinner, general manager of the Yorkshire Electric Power Co., for permission to visit the station and to publish this illustrated description, and to Mr. J. W. R. Woolmore, resident engineer, for his assistance.

I.E.E. Section Chairmen

Brief Biographies of New Officers

THE new chairman of the Transmission Section of the Institution of Electrical Engineers is Mr. E. T. Norris, chief engineer, Transformer Department, Ferranti, Ltd. Mr. Norris, who was born in London in 1896, won a scholarship at the City & Guilds Engineering College, Finsbury, and received his technical training with the British Westinghouse Co. In 1919 he was appointed transformer designer to the Metropolitan-Vickers Electrical Co., going to Ferranti's a year later as chief assistant to the transformer designer. He became chief engineer of the department in 1932 and has been responsible for design, estimating and development



Mr. E. T. Norris
(Transmission)



Mr. Forbes Jackson
(Installations)

work, including the direction of all associated research and experimental work on transformers, voltage regulators, control relays, radio-frequency heating equipment, electrostatic precipitation, industrial automatic control apparatus, etc.

Mr. Norris is author of over 200 papers and articles in the British and foreign technical press and he acted as British delegate to the International Electrochemical Conferences at Paris, Prague, The Hague and Torquay. He has served on numerous committees of the British Standards Institution, the Electrical Research Association and B.E.A.M.A.

Besides being the inventor of the moving-coil voltage regulator, astatic voltage relays and many other devices, he designed apparatus for producing one million volts for the first time in this country in 1935, the first million-volt testing equipment built in this country, the largest power transformer built for the C.E.B. (75,000 kVA) and the largest self-cooled transformer built in this country (50,000 kVA). He is an associate of the Manchester College of Technology, a member of the Institution of Mechanical Engineers, and a fellow of the American Institute of Electrical Engineers.

The chairman of the Installations Section is Mr. Forbes Jackson, who since 1933 has been divisional engineer (electrical) to the London

County Council. Mr. Jackson received his early training with Crompton & Company, of Chelmsford, and then went to the British Thomson-Houston Co., Ltd., Rugby, first on the test bed and later as an engineer in the Traction Department. In 1922 he joined Merz & McLellan and was engaged both in their London office and in India. In August, 1914, he entered the Navy and after serving with the Royal Naval Divisional Engineers in Gallipoli was transferred to H.M.S. *Princess Royal* to take charge of the electrical equipment.

Recently Mr. Forbes Jackson has served on the Ministry of Works Post-War Building Studies Committee for Electrical Installations, and also on the I.E.E. Codes of Practice Committee.

The chairman of the Measurements Section, Mr. S. H. Richards, is chief meter examiner to the Electricity Commission. Mr. Richards, who is sixty-two, was born in Bangalore, India. He



Mr. S. H. Richards
(Measurements)



Mr. A. H. Mumford
(Radio)

received his training at the Chelsea Polytechnic and his first appointment, in 1902, was at the Board of Trade Standardising Laboratory. In 1907 he became testing superintendent to the Calcutta Electric Supply Corporation, joining Ferranti, Ltd., twelve years later as publicity manager.

From 1930 to 1933 Mr. Richards was with the Electrical Research Association and from then until taking up his appointment with the Electricity Commission in 1937 he was manager of the Southern Areas Electric Corporation, Ltd. He is a member of the American Institute of Electrical Engineers.

Mr. A. H. Mumford, chairman of the Radio Section, is at the age of forty-two staff engineer to the G.P.O. Educated at Bancrofts School and Queen Mary College, University of London, Mr. Mumford joined the G.P.O. in 1924 as assistant engineer, Radio Branch, Engineer-in-Chief's Office. He was appointed executive engineer in charge of the radio laboratory at Dollis Hill in 1933, being promoted to assistant

staff engineer two years later. He became staff engineer in charge of the Radio Development Branch in 1938 and has been responsible for the development and application of radio within the G.P.O., having been engaged in the application of the single sideband method of operation

for long-distance radio-telephony, the introduction of ultra-short-wave links into the trunk telephone network and the development of the coaxial cable carrier system, interference investigations, etc. Mr. Mumford holds a B.Sc. (Eng.) degree with first-class honours.

PERSONAL and SOCIAL

News of Men and Women of the Industry

FOLLOWING the promotion of Mr. W. R. Allcock, deputy borough electrical engineer of Stockport, to succeed Mr. G. H. Oldroyd as borough electrical engineer on his retirement, and the retirement of the mains engineer, Stockport Town Council has decided not to appoint a deputy engineer for the time being but as a temporary measure to establish a new post, that of assistant engineer, Mr. E. A. Gleaves, power station superintendent, being appointed to the position. A new station superintendent is not being appointed but Mr. A. L. Hollinshead, senior shift engineer, becomes assistant station superintendent, another new post.

Mr. V. L. Delevante, of the General Electric Co., Ltd., is returning to England after twenty years in Australia.

Mr. M. Burningham, secretary of Keith Blackman, Ltd., has been elected chairman and managing director of the company to succeed Mr. George Keith, who died in March. Mr. A. L. Ayton, assistant secretary, becomes secretary. Also following the recent death of Mr. W. B. Richards, director and general manager of the company, Mr. D. S. Woodley has been appointed technical manager and chief engineer, and Mr. D. M. Brown, commercial manager.

Dr. H. J. Gough, C.B., F.R.S., is joining Lever Brothers & Unilever, Ltd., as engineer-in-chief and will shortly take up his duties at Unilever House.

Mr. Charles A. Powel, who is reported to have been appointed chief of the Electrical and Radio Branch of the Allied Control Commission for Germany, is president of the American Institute of Electrical Engineers. During the 1914-18 war he was with the British War Mission in the United States and when the war ended he remained there and became an American citizen. He joined the Westinghouse Electric & Manufacturing Co., and has been manager of the central station engineering department, later holding the position of manager of the industry engineering department until his appointment as headquarters engineering manager.

Mr. W. H. Hand, A.C.I.S., of the Midland Electric Corporation for Power Distribution, Ltd., has been appointed deputy chief officer to the National Electricity Employers' Organisation which deals with the business of

the National Council and the National Joint Board. Mr. Hand has been employed by the Midland Electric Corporation since 1925, and since 1933 he has been associated with the work of the District Council and District Board for the No. 5 (Birmingham) District. In April, 1942, he succeeded the late Mr. G. G. Heathcock as secretary to both the District organisations.

Miss Y. Z. de Ferranti, daughter of Mr. and Mrs. V. Z. de Ferranti, of Alderley Edge, was married at St. James's, Spanish Place, London, on August 9th to Captain G. H. Heywood, son of Mr. and Mrs. N. Heywood, of Alderley Edge.

The salary scale of the city electrical engineer of Aberdeen, Mr. Alex. Gardner, has been increased from £950-£1,050 to £1,000-£1,250, and that of the transport manager, Mr. A. Smith, from £750-£1,000 to £1,000-£1,250.

Lt.-Col. Parr-Dudley, A.M.I.E.E., has been appointed manager of the London office of the Brush Electrical Engineering Co., Ltd., and subsidiaries. He obtained his training at Faraday House and with Bruce Peebles & Co., Ltd., and was subsequently on the London office staff of Petters, Ltd.

Mr. P. A. Johnson, who has been acting manager of Brown Brothers' Acton branch since the death of Mr. W. M. James in 1942, has been appointed manager. Mr. S. W. H. Hillyard has been appointed manager of the company's Belfast branch on his demobilisation, while Mr. Taylor, who has been acting branch manager for Belfast, is returning to his joint managership of Brown Brothers (Ireland), Ltd., at Dublin. Mr. J. S. Baird, who has been for the past fifteen years with Thomson & Brown Brothers, Ltd., Edinburgh, has been appointed manager of the Dundee branch.

Mr. J. E. C. Bailey, chairman and managing director of Baird & Tatlock (London), Ltd., has been elected president of the Scientific Instrument Manufacturers' Association of Great Britain.

Mr. Alec Draper, B.Sc. (Eng.), A.M.I.E.E., who as already announced has just been appointed Head of the Department of Electrical Engineering, Rugby College of Technology and Arts, is a native of Bradford where he attended the Technical College and served his apprenticeship with the English Electric Co., Ltd. In 1937 he took up the post of power representative to Bradford Corporation Electricity Department,

leaving two years later to become lecturer in electrical engineering at Rugby College, where for the past five years he has acted as head of the Services Department.

The salary of the Eastbourne borough electrical engineer, **Mr. N. Boydell**, was the cause of the reversal by the Town Council of a decision by the Electricity Committee to join the District Joint Committee of Local Authorities and Chief Electrical Engineers. If the Council joined the Committee it would have to pay its electrical engineer according to the output of the electricity undertaking. This would mean a slightly reduced salary for Mr. Boydell and it would be some time before he could qualify for more than his present rate of pay.

Mr. H. C. H. Armstead has recently resigned from his position as chief electrical engineer to the Government of Hyderabad, and is joining the home staff of Merz & McLellan.

Mr. R. E. R. Luff has been appointed a director of the Cables Investment Trust, Ltd.

Major Egbert Cadbury has been appointed a director of the West Gloucestershire Power Co., Ltd.

Obituary

Mr. P. Rogers.—We extend our deepest sympathy to Mr. Felix Rogers, secretary of the Electrical Fair Trading Council and other electrical organisations, and Mrs. Rogers in the loss of their son last week as the result of a motor accident. Mr. P. Rogers, who was twenty-four, was with Holophane, Ltd., before he joined the Army. He had served in the Middle East and Burma, being one of the original "Chindits." At the time of his death he was a warrant officer in the Intelligence Corps.

Mr. W. B. Richards.—The death is reported recently of Mr. W. B. Richards, director and general manager of Keith Blackman, Ltd., at the age of sixty-eight.

Mr. E. Goodman, A.M.I.E.E.—We regret to record the sudden death on August 8th of Mr. Ernest Goodman, borough electrical engineer of Barry, Glam.

Mr. W. G. Smith, M.I.Mech.E., A.M.I.E.E., who until his retirement in 1940 was chief mechanical engineer to the Manchester Ship Canal Co., died recently at the age of sixty-eight.

Australian Notes

By a Correspondent

THE Associated Chambers of Commerce of Australia have been requested by the Government to arrange the appointment of a central panel to handle the marketing of the first consignment of surplus army supplies of electrical, radio and signal equipment. A considerable amount of surplus army supplies is now coming on the market. New materials generally are disposed of through the trade, second-hand items being sold by public auction.

The chairman of the West Australian Industry Expansion Commission, Professor F. Mauldon, has announced that the Commission proposes to investigate the possibilities of the increased local manufacture of electrical equipment and apparatus, and the local Chamber of Manufactures has appointed a committee to report upon the matter, its main concern being to determine what goods can be manufactured locally, and to investigate markets, not only local, but in countries adjacent to Australia.

Future of Adelaide Undertaking

Giving evidence recently before the Royal Commission on Electricity Supply, the South Australian Crown Solicitor, Mr. A. Hannan, said that it would cost the State about £8,000,000 to acquire the Adelaide Electric Supply Company, but he considered that a measure of control similar to that exercised in Queensland might be undertaken by the Government. Such control would include the fixing of prices, limitation of dividends and payments to reserve

and the obligation to extend the supply to country areas.

Restrictions on the use of electricity are being tightened again in Western Australia, where coal reserves are almost non-existent. The recent strike at the Collie Mines resulted in a temporary black-out in most parts of the State, and seriously affected many industries. New electricity supply regulations have been introduced, and it is stated that these will be effectively enforced and offenders prosecuted immediately.

The South Fremantle Station

The total value of tenders for the erection of a new power-house at South Fremantle will amount to approximately £1,700,000, of which £592,360 will be spent within the State. The Metropolitan-Vickers Electrical Co.'s tender for two 25,000-kW turbo-alternators and condensing plant (£345,902) and a 25,000-kW frequency changer (£108,804) and that of International Combustion, Ltd., for boiler-house equipment (£1,162,726) were accepted. Tenders received from foreign countries were not considered.

The Minister for Trade and Customs, Senator Keane, has announced that import licences issued in future will carry, with a few minor exceptions, a validity of twelve months, as experience has shown that the average time to fulfil many overseas orders is greater than the eight months previously allowed.

CORRESPONDENCE

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

Concerning Trams

SURELY the letter of your correspondent Mr. A. R. Grierson contains some rather peculiar logic in the first paragraph? He "suggests" that the tram is "rather a dangerous vehicle" and adduces as proof the fact that it "has to be" fitted with a lifeguard. By the same chain of reasoning, we might conclude that a safety razor is the most dangerous instrument with which to shave, since it "has to be" fitted with a protective guard, and that the open razor, lacking this feature, is a more suitable plaything for the beginner.

So far as compulsion is concerned, the law first required tramcars to be fitted with lifeguards at a time when it required all other mechanically-propelled street vehicles to be preceded by a man walking in front holding a red flag; which "suggests" an even greater degree of danger. If we amend Mr. Grierson's statement to read that the tram is a vehicle which *can* be fitted with a lifeguard, an admirable extra precaution which it is possible to add to an already safe vehicle, we shall be nearer the truth. Undoubtedly all buses would have the same feature, even more desirable in their case, were it not that their design (requiring steering gear close to the front) renders it impracticable.

But it is not necessary to resort to "suggestions" in order to find out which is the most dangerous vehicle. The last recorded figures for London show that trolley-buses (for an equal mileage) ran over and killed almost exactly 53 per cent. more persons than trams. It is very easy to see why, when it is considered that they are constantly swooping up to crowded pavements. The tram on the other hand is mechanically kept at a safe distance from the unwary.

London, N.W.10.

N. H. BETT

REGARDING Mr. Grierson's letter in your issue of July 20th there are several statements which require to be put in their proper perspective. Firstly, although its wheels are enclosed, the tram is fitted with lifeguards because of early regulations which have not been imposed on other vehicles, despite their exposed wheels. On

this account Mr. Grierson's criticism is misdirected, to say the least.

By citing a few scattered incidents, he attempts to imply that trams are dangerous. Statistics of trolley-bus operation in London will certainly prove the contrary, and a vehicle running on a definite path is manifestly less culpable than one which swerves indiscriminately from the kerb to the wrong side of the road. Furthermore, the tram utilises all its wheels for driving and braking and has achieved acceleration and deceleration as high as 4.5 MPH per second in the United States.

The danger to cyclists is illusory if the slightest care is exercised; I have cycled in cities for years and find trackless vehicles far more dangerous than any tramlines. The conduit system was purely an expedient necessitated by the objections to overhead wires; strangely enough, these objections vanish as soon as the number of wires is doubled!

The allegation of noise at crossings is a puerile form of complaint, and, in any case, the use of rails ensures smooth running with low power consumption. This, and the longevity of the rolling-stock, should be appreciated by Mr. Grierson from his experience of the London suburban railways. The running cost of a trolley-bus is comparable to that of a motor-bus, and thus certainly not cheaper than that of a tram, apart from the latter's larger capacity.

Frequently, as in Scotland, tramway abandonment introduces petrol and not trolley-buses; this constitutes, in the interests of the electrical industry, a cogent reason for the retention and improvement of the tramways.

Glasgow.

FAIRPLAY.

The Henry

THOUGH not a partisan of either side, I feel that one of the arguments in the leaderette in your issue of July 27th is faulty: "Moreover, a unit called after an individual becomes a noun in its own right"—agreed—"and its plural may be formed with an 's'"—*not* agreed.

The latter part of the sentence should read (logically) "and its plural should be formed according to the ordinary rules"

which, for nouns ending in "y" following a consonant, are to change the "y" to "ie" before adding the "s."

Stammore, Mdx.

J. A. STEDMAN.

Sales and Service

IT appears that ironmongers have been criticising electrical contractors and while many contractors are not beyond criticism, I feel that the summing up in your leader is to the point.

As an electrical contractor I have no hesitation in stating that ironmongers, hardware merchants and chain stores should not be permitted to sell electrical apparatus of any kind, simply because the majority of such people are not in a position to advise or give service. Granted that many reputable

contractors do not have showrooms because the situation of their premises does not lend itself to that purpose—but there are compensations for purchasers, other than discounts.

I would agree with the ironmongers that on certain electrical machinery the margin is definitely too small to allow for any service that may be required. The ironmonger is, however, cute enough not to handle that type of apparatus and as the margin on ordinary domestic apparatus is fair he has little to shout about. If I could sell sufficient domestic electrical apparatus I should leave electrical contracting severely alone and the National Federation of Ironmongers is barking up the wrong tree.

Glasgow.

ALEX MILNE.

Wartime Electrical Imports

Huge Increase in Quantity and Value

DETAILS have been published by the Board of Trade of the imports of electrical machinery and apparatus into this country during the war years, from which it is clear that there has been an enormous increase since 1939 both in quantity and value, particularly

Goods imported under lend-lease or mutual aid arrangements are included in the figures. An upward trend of imports in 1941 was due to the substitution of lend-lease for "cash and carry" early in the year, while imports in the last two months of 1942 and the first two of

I—GOODS AND APPARATUS

Description	Number			Values		
	1939	1943	1944	1939	1943	1944
Electric wires and cables	—	—	—	£ 216,307	£ 1,793,477	£ 3,513,636
Radio apparatus	—	—	—	1,002,883	3,321,763	16,221,730
Telegraph and telephone apparatus	—	—	—	121,402	647,349	685,336
Carbons, furnace	178,000	1,001,771	374,206	61,158	735,608	380,583
" other (thous.)	125,738	390,717	345,158	21,895	151,587	121,722
Electrical lighting appliances, etc.—						
Lamps (thous.)	36,821	59,175	64,220	88,802	542,751	625,357
All other descriptions	—	—	—	293,031	24,382	148,567
Primary batteries and parts, other than carbons	—	—	—	204,710	261,105	214,983
Electrical instruments	—	—	—	276,022	100,250	217,923
Totals	—	—	—	2,808,315	8,182,811	23,666,100

II—ELECTRICAL MACHINERY, ETC.

Description	Quantities (tons)			Values (£)		
	1939	1943	1944	1939	1943	1944
Motors (other than traction)	1,314	18	350	255,763	9,231	129,715
All other electrical machinery	557	2,047	8,871	154,554	1,185,361	4,368,801
Vacuum cleaners	254	—	—	113,692	—	85

during last year. For space reasons we cannot reproduce the figures for the whole of the seven years covered, and so in the tables reproduced above we give those for the last two years and include the 1939 figures for purposes of comparison.

1943 were very low in consequence of the diversion of shipping for use in the North African campaign.

Last year's high value for electrical goods was largely the result of heavy imports of wireless apparatus for operational purposes.

DC Controller Design

Influence of Motor Characteristics

IN designing resistances for the control gear of DC motors technical particulars of the associated motors are required for accurate designs. These comprise an open-circuit or magnetisation curve at normal full-load speed and characteristic curves showing the relationship between armature current, torque and speed.

Characteristic curves supplied by the motor makers seem generally to be based on the results of brake tests, but the author's experience is that such curves, especially those relating to series motors, do not always extend sufficiently far either in the upper or lower regions. With series motors there is a practical difficulty in obtaining figures for the lower regions on account of their load-speed characteristics.

The most constant property of DC motors is the open-circuit characteristic at normal full-load speed. If the figures for a fairly wide range of motors—corrected so that the voltage drop at full load is the same proportion of the line volts in all cases—are plotted as percentages of normal full-load values, it will be found that the curves are practically identical. Accurate figures for plotting are easily and quickly obtained, even under adverse test-bed conditions, and all the data required for general resistance design can be obtained from the open-circuit characteristic.

Four types of DC motor are in common use: (1) Series, having a field winding consisting entirely of series ampere-turns, as commonly used on crane motions; (2) compound, with a field winding that incorporates usually 20 per cent. of shunt ampere-turns to limit the maximum speed at light loads

(also known as a series motor with shunt-limiting winding), this type having as its commonest application the hoisting motion of cranes; (3) ordinary compound, with 80 per cent. of shunt and 20 per cent. of series ampere-turns—a proportion that gives about 15 per cent. of compounding; and (4) shunt motor.

In control gear calculations ohmic values are conveniently expressed in terms of a basic resistance of $R = \frac{V}{I_m}$, where R is the ohmic resistance (including that of the motor itself) in circuit to pass full-load armature current I_m with the motor at rest and where V is the line volts. For series motors the ohmic resistance of the motor may be taken as $0.09R$. In crane work the great majority of motors lies within the range of 2 and 60 BHP. The figure of $0.09R$ for the larger motors is no doubt rather high, but as an appreciable amount of ohmic resistance is always added to that of the motor in the way of cables, trolley wires and contact resistance, it can be regarded as sufficiently accurate for general design purposes for all motors within this range.

For series motors with shunt-limiting windings, the ohmic resistance of the motors may be taken as $0.07R$; for ordinary compound and shunt motors $0.05R$ is more appropriate. In collating design data for general application,

the values of the various quantities are plotted or recorded as percentages of normal full-load values. The same significant figures are obtained by considering a motor with a full-load armature current of 100 A for connecting to a 100-V supply.

Calculations for deriving the curves showing

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B.Eng.

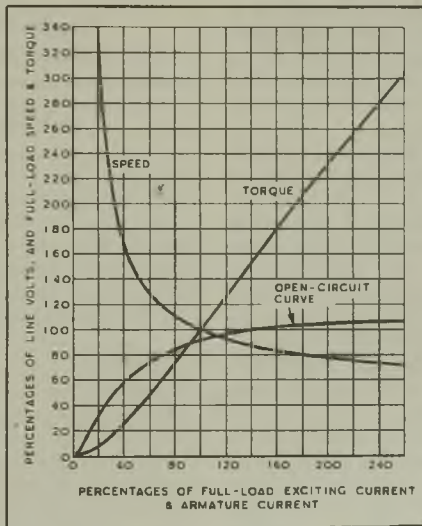


Fig. 1.—Speed-current, torque-current and open-circuit curves for series motors

the relationship between armature current, torque and speed are based on the three following fundamental properties of electric motors: (1) The back e.m.f. generated by the armature is equal to the difference between the line voltage and the resistance drop in the armature circuit; (2) with any given value of flux, and hence exciting current, this back e.m.f. is proportional to the speed, the converse also being true; (3) the torque is proportional to the product of the flux and the armature current.

Open-Circuit Curve

A typical open-circuit curve for a series crane motor taken at normal full-load speed is shown in Fig. 1. For a 100-V, 100-A motor having a motor resistance of 0.09R, the voltage drop, *i.e.*, with 100 A flowing in the field coils, is 9 V and therefore the back e.m.f. generated under such conditions is 91 V. The open-circuit curve must pass through the point 91 on the volt scale and 100 on the exciting-current scale. If the open-circuit curve is obtained on a motor having a smaller ohmic resistance than 0.09R, say 0.07R, in order to correct the curve to a basis of 0.09R for the ohmic resistance permanently in circuit the ordinates of the experimental curve need only be reduced in the ratio of 91 to 93 to make allowance for any external ohmic resistance.

Before the figures for plotting the speed-current and torque-current curves can be calculated, a back-e.m.f. characteristic curve must first be plotted to show the relationship between the back e.m.f. generated by the armature and the armature current at normal full-load speed. Referring to the open-circuit curve of Fig. 1, since the volts are plotted as a percentage of the line volts, it is evident that the back-e.m.f. characteristic of a series motor is the same as the open-circuit curve.

In plotting the speed-current curve a series of figures is taken on the current scale and the back e.m.f. is calculated by subtracting the voltage drop from the line volts, the volts corresponding to the current values selected being read off the back-e.m.f. characteristic curve. The speed expressed as a percentage of normal full-load speed (n.f.l.s.) is then obtained by multiplying 100 by the back e.m.f. and dividing by the volts read off on the back-e.m.f. characteristic curve. Thus, taking 10 A on the current scale, the voltage drop is $(10 \times 0.09) = 0.9$ V, the back e.m.f. is $100 - 0.9 = 99.1$ V,

the volts generated at n.f.l.s., as read on the open-circuit curve, are 12 and the speed is $100 \times \frac{99.1}{12} = 826$ per cent. of n.f.l.s.

Again, taking 60 A on the current scale, the voltage drop is $(60 \times 0.09) = 5.4$ V, the back e.m.f. is $100 - 5.4 = 94.6$ V, the volts generated at n.f.l.s., as read on the open-circuit curve, are 73.8 and the speed is $100 \times \frac{94.6}{73.8} = 128.1$ per cent. of n.f.l.s.

A speed-current curve for series motors plotted from figures obtained by this method of calculation is shown in Fig. 1. Points on the speed-current curve can be obtained for very low and very high values of armature current which it would be inconvenient, if not impracticable, to obtain by means of a brake test. When a series motor on the hoisting motion of a crane is hoisting the empty hook with all the controller resistance cut out, the motor current is generally about 20 per cent. of full load. Fig. 1 shows that the speed attained is 330 per cent. of n.f.l.s. which agrees very closely with actual test figures.

Torque-Current Curve

No figures for the flux are available for plotting the torque-current curve, but since the figures for the open-circuit curve are taken at n.f.l.s., the flux is evidently proportional to the back e.m.f. generated by the armature. For our 100-V, 100-A machine, 91 V is generated with 100 A in the field coils, so the full-load flux is proportional to 91. With 60 A flowing in the field coils 73.8 V is generated and, since the torque is proportional to the product of current and flux, it follows that the torque when 60 A is flowing in the motor, is $\frac{60 \times 73.8}{91} = 48.7$ per cent. of full-load torque.

The torque-current curve in Fig. 1, which is plotted from a series of figures obtained by this method of calculation, shows that when the motor current is 20 per cent. of normal full-load (*i.e.*, the current required by a series crane hoisting motor to hoist the empty hook) the torque is about 6 per cent. of full-load value, which is commonly accepted for this condition of loading.

For a series motor with shunt limiting winding and a motor resistance of 0.07R, the open-circuit curve is obtained from that in Fig. 1 by increasing the ordinates in the ratio of 93 to 91. The first step is to plot the back-e.m.f. characteristic. When the

armature current is zero, the excitation, due to the shunt winding only, is 20 per cent. of full-load value. The open-circuit curve shows

torque-current curves are then obtained in the same way as for series motors, the figures for plotting the two curves being calculated by a reference to the back-e.m.f. characteristic.

The curves so derived are shown on Fig. 2, in which, as the open-circuit curve and the back-e.m.f. characteristic are very nearly identical in their upper regions, the open-circuit curve has been lowered in the diagram in order to avoid confusion. About 6 per cent. of full-load torque is required to hoist an empty crane hook, at which the corresponding speed is about 210 per cent. of n.f.l.s. This is very close to the generally accepted view that a series motor with a shunt limiting of 20 per cent. of full-load ampere-turns will limit the speed of a hoisting

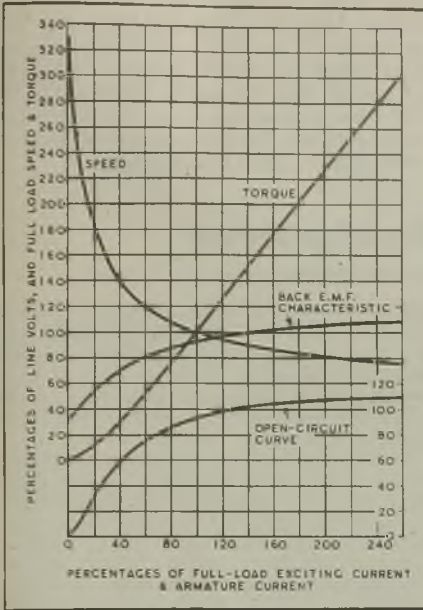


Fig. 2.—Curves derived by reference to back-e.m.f. characteristic

that 31 V is generated. The point 31 on the Y axis, i.e., the vertical line drawn through the zero value of the armature current, is one point on the back-e.m.f. characteristic, so is also the point 93 on the volt scale and 100 on the excitation scale. To obtain other points, take a series of values on the excitation scale and multiply those values by 0.8 (the proportion of series ampere-turns of the total). To the figure thus obtained add 20—the percentage of shunt ampere-turns—in order to obtain the actual excitation.

The volts opposite the excitation figure on the open-circuit curve plotted against the value of the armature current, from which the figure for the actual excitation is derived, gives another point on the back-e.m.f. characteristic. Thus taking the figure of 60 on the excitation scale, $60 \times 0.8 = 48$, and $48 + 20 = 68$ per cent. of full-load excitation, at which value the volts generated is 80 on the open-circuit curve; 80 on the volts scale plotted against 60 on the armature-current scale gives the required point on the back-e.m.f. characteristic. Speed-current and

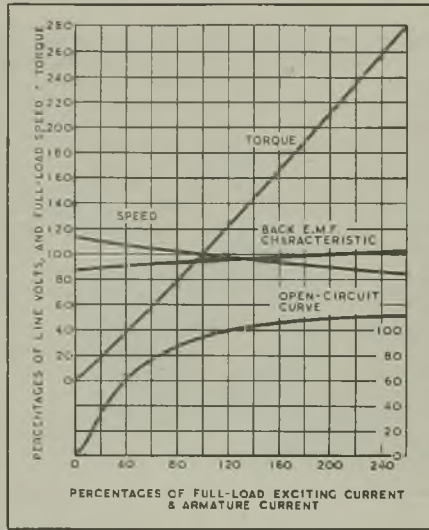


Fig. 3.—Curves for ordinary compound motor

motor of this type with no load to about twice n.f.l.s.

Curves for an ordinary compound motor, with a motor resistance of 0.05R are shown in Fig. 3. These are obtained by the same procedure as for the series motor with shunt limiting winding. Similar curves can also be obtained for shunt motors, but these are only of academic interest for the present purpose.

Information given by the back-e.m.f. characteristic is required for working out the grading of starting and controlling resistances. The others are required for calculations in connection with more complicated schemes such as potentiometer and

dynamic and diverter control. For plotting the open-circuit curve the motor need only be driven at some definite speed, preferably by means of an induction motor connected to the public supply mains and of approximately the same horse-power, in which case the speed can be taken as uniform throughout the test.

The only information required besides the volts, exciting current and speed is the exact value of excitation to produce normal full-

load flux and the resistance of the motor when hot, both readily obtainable. The author has compared figures obtained by brake tests with those obtained by the theoretical method described above and finds that they are practically identical. Although the effect of armature reaction is ignored, experience has shown that the curves obtained by the theoretical method are at least as accurate as those obtained by drawing curves through points plotted from brake-test figures.

Supply of Equipment

Explanation of a M.O.W. Statement

IN the *Electrical Review* of June 29th there appeared a note, based on a communication from the Ministry of Works, reviewing the position with regard to the availability of labour and materials for the production of equipment for housing and other building work. The Ministry placed this equipment in three categories:—A. Materials and components of which there were stocks in the hands of manufacturers or producers. B. Materials and components for which there was adequate manufacturing capacity, labour and materials immediately available to meet all probable requirements, including orders for stock. C. Materials and components the supply of which was insufficient to meet present demands in full.

All those concerned with the ordering of equipment were urged to place orders for supplies in Categories A and B immediately to meet their future requirements and build up stocks. As regards Category C supplies it was urged that only immediate requirements should be ordered.

Position of Electrical Appliance Manufacturers

Included in Category B were a number of electrical accessories and appliances, among them fires and water heaters, and these were detailed in our note. This brought some of the manufacturers down upon our heads. They vigorously asserted that they were quite unable to fulfil further orders on account of labour shortage. Not only were their men not returning to them from the Forces and elsewhere, but they were still losing their present staff through calling-up for the Services or mines.

We took the matter up with the Ministry of Works which passed it on to the Priorities Department of the Board of Trade and eventually from this Department we received a reply. In this it was said that "the difficulties which manufacturers are experiencing in the matter of obtaining sufficient supplies of labour to cope with current demands are fully appreciated." But the letter goes on to say that the notice "was made chiefly with the

idea of giving a general view of the position which is likely to arise and of encouraging orders being placed with manufacturers where stocks are known to be in existence or where it could reasonably be anticipated stocks would become available as soon as the labour situation improves."

This interpretation of the notice is ingenious but the reasonable conclusion to be drawn from the actual wording of the document was that it presented things as they were—not as they would be when the labour situation improved. And we cannot think that the concluding paragraph of the letter sets matters straight. It reads:—"Moreover, if any reference was to be made to electrical appliances in the general notice, referred to, it is thought manufacturers would have had a greater grievance if potential customers had been unnecessarily discouraged by placing an article in Category C. That is why where there is any doubt about a particular article it is better to list it in Category B."

Anyhow manufacturers have been inundated with orders with which they cannot deal and have asked us to explain the Ministry of Works assertion. The whole trouble seems to have arisen from the fact that while an inquiry was made among manufacturers as to their ability to keep abreast of the requirements for the slowly-proceeding housing schemes the notice did not make this limitation clear. It appeared to apply to all requirements for equipment, *i.e.*, for existing buildings as well as future ones.

Replanning London

"The Greater London Plan" Exhibition now being held at the Institution of Civil Engineers, Great George Street, Westminster, shows to the public Professor Abercrombie's scheme in simple form. It will be open until September 16th.

The report of the London County Council Town Planning Committee on the County of London Plan, 1943, together with a report of the Council's Finance Committee, is now available, either directly or through any bookseller, from P. S. King & Staples, Ltd., Orchard House, 14, Great Smith Street, S.W.1, price 2d.

COMMERCE and INDUSTRY

Enemy-owned Patents. Allocation of Government Factories.

Electricians' Claim Disallowed

RECENTLY members of the Electrical Trades Union employed by shipbuilding firms claimed that the allowance of 2d. per hour above the national new work plain time rate payable to skilled electricians employed on maintenance work should be taken into account in the calculation of overtime, night-shift, Sunday and holiday allowances. The matter was considered by the National Arbitration Tribunal which has issued an award (No. 751) finding against the claim.

Chiswick Homes Exhibition

At a "Homes and Housing" Exhibition held recently at the Chiswick Town Hall great interest was shown in a model electric kitchen designed by the borough electrical engineer, Mr. A. E. Jeans. Its clean appearance, compactness and workability were especially commented on. Many organised parties of school children visited the exhibition, and E.D.A. films were shown daily. A questionnaire resulted in much valuable discussion. The exhibition was opened by General Sir Frederick Pile.

Transport Classes

The Institute of Transport announces that transport classes in the London area will be available during the 1945-46 session at the City of London College, Electra House, Moor-gate, E.C.2; Ealing Technical College, Warwick Road, Ealing, W.8; Kennington Commercial Institute, Kennington Road, S.E.11; and the North-Western Polytechnic, Prince of Wales Road, N.W.5.

Enemy-owned Patents

The Chartered Institute of Patent Agents (Staple Inn Buildings, High Holborn, W.C.1) has made a number of recommendations regarding the treatment of enemy-owned patents and patent applications. It is considered that no action should be taken to deny Convention rights to enemy nationals after the war but that they should not be granted a moratorium in connection with applications pending at the outbreak of war or in respect of lapsed British patents. There should be no extension beyond the ordinary term for enemy subjects to file Convention applications here. Enemy-owned British patents retained in force by British licensees should be taken over by the Custodian

of Enemy Property with power to assign patents to exclusive licensees. The dating of patents filed under an extended Convention period allowed by moratorium to be, for the purposes of Section 17 of the Patents Act, twelve months from the date of basic application. Section 27 (2) (d) (Abuse of Monopolies) should apply after the date of sealing of the British patent where delayed Convention filing is allowed under a moratorium or Emergency Act.

Radio in Civil Aviation

The third Commonwealth and Empire Conference on Radio for Civil Aviation commenced at the Ministry of Civil Aviation in London on August 7th and is expected to last about a fortnight. The first conference



A corner of the model electric kitchen at the Chiswick "Homes and Housing" Exhibition

of this organisation took place in London in February, 1944, and the second at Ottawa in November, 1944, its objects being the standardisation of radio equipment for use on the ground and in aircraft as well as rules and regulations applicable thereto. Firm proposals have not yet been formulated, attempts to secure agreement on operational requirements being still in progress, but a programme of development has been drafted. Delegates are attending from Australia, Canada, the Colonial Office, India, New Zealand, Newfoundland, Southern Rhodesia, the United Kingdom, Union of South Africa, the United States of America, and the U.S.S.R., with technical advisers.

Restoring German Industry

A survey of the position of Germany's industrial undertakings from its special correspondent in Berlin was published in *The Times* of August 9th. The writer says that a

surprisingly large amount of machinery survived the bombing of the Ruhr and it is possible to look for 50 or 60 per cent. of production "within a calculable time." In Berlin, on the other hand, not only did factories suffer heavily from bombing, but the Russians removed as much as 90 per cent. of the machinery, plant and raw materials.

Out of 50,000 people employed by the two great Siemens concerns (Siemens & Halske and Siemens-Schuckert), which are in the British sector and used to supply 80 per cent. of Germany's electrical equipment, only 250 are now working—on the production of such things as rakes, wooden buckets and wheelbarrows, in themselves urgently needed. It is the same with other international undertakings like the A.E.G. and Telefunken. One specialised factory of the Osram Gesellschaft has been completely removed, with its technicians, with

no longer necessary to submit schedules of Service or home civil orders with applications for licences for lead. Instead, each application must be accompanied by a statement certifying that the material is needed to cover orders for products, and that in the case of applications for virgin metal full allowance has been made for expected intake of scrap. Certain restrictions on the release of lead for export remain in operation, and schedules of export order must continue to be submitted. Lead will, however, be released in future for the production of some additional classes of manufactured goods for export to all countries.

Investigating the Apparatus Market

To get some idea of the probable demand for domestic electrical apparatus as and when supplies become available the Northmet Power

Company has provided in all its showrooms a board on which consumers are invited to write their probable requirements. They are not committed in any way to purchase but they reserve for themselves the option of acquiring the apparatus when it is available. The demand for the different classes of apparatus varies to some extent from district to district, but the most sought-after appliance seems generally to be the vacuum-cleaner; as a limited number of these is already being produced a few of the consumers at the top of the list have already received models. Nearly as popular is the refrigerator and there



A consumer writing down her requirements of electrical apparatus at the Northmet showrooms at Stevenage

the result that the undertaking is completely unable to produce electric lamps. The Russians have been asked to release two Siemens managers, known anti-Nazis, and to return 3,000 machines; this, the correspondent says, would provide employment for 8,000 men.

Electricity supply is being given first priority but severe rationing will be necessary for some time. Supplies are being obtained from the Russian eastern zone, but it is hoped that increased supplies will be available from Bavaria and the Rhineland.

"Electrical Review" Index

Readers who require the index to Vol. cxxxvi (January-June, 1945) of the *Electrical Review* should apply for copies to the Publisher, *Electrical Review*, Dorset House, Stamford Street, S.E.1.

Lead Supplies

Applications to the Non-Ferrous Metals Control for licences to acquire lead for U.K. consumption will in future be considered by the Control without restrictions in respect of the type of article to be manufactured. The statutory provisions regarding the acquisition and disposal of lead are still in force, but it is

is a surprisingly long list of people who want ironing machines. There appears to be a good demand for cookers, washboilers, kettles and water-heaters, but fires are asked for in comparatively small numbers only, and inquiries for washing machines are not as numerous as might be expected.

Limitation of Supplies

The Board of Trade has issued a list of amendments to the Home Trade Register. Copies are obtainable from H.M. Stationery Office, price 1d.

More Government Factories Allocated

Twenty more Government factories, with a total area of about 4½ million sq. ft., have been allocated by the Board of Trade for future civilian production. Including those already announced in recent months, 74 Government factories, with an aggregate area of approximately 20 million sq. ft., and representing employment for about 200,000 workers, have now been allocated for civilian industry. Negotiations for other factories are in progress. The latest list includes the following:—

Factory (556,000 sq. ft.) at Swinton, Mx-borough, Yorks, allocated to the General

Electric Co., Ltd., for the production of electric cookers and household appliances; at Doncaster (109,485 sq. ft.) to Crompton Parkinson, Ltd., for electrical equipment; at Grantham (176,000 sq. ft.) to Aveling-Barford, Ltd., for contractors' plant, large-scale cooking apparatus, agricultural machinery, etc.; at Newport, Mon. (201,000 sq. ft.) to Standard Telephones & Cables, Ltd., for transmission equipment, rubber wire and plastic cables; at Wolverhampton (150,200 sq. ft.) to Henry Meadows, Ltd., for i.c. engines, transmissions, gear boxes, etc., and general mechanical engineering work; at Blythe Bridge, Stoke-on-Trent (507,242 sq. ft.) to the Projectile & Engineering Co., Ltd., for colliery equipment, mechanical loading equipment and refrigerators; at Chassis Works, Manchester (220,000 sq. ft.) to the Rubber Regenerating Co., Ltd., for the reclamation of rubber; at Slateford, Edinburgh (45,900 sq. ft.) to Green & Faulconbridge, Ltd., for precision tools; and at Alloa (40,100 sq. ft.) to the Harland Engineering Co., Ltd., for fabricated sections for housing, ferrous and non-ferrous sheet metal fittings.

Philips Factory for Scotland

It is expected that production will begin before the end of the year at the Philips factory now almost completed at Wellhall Road, Hamilton, Lanarkshire. For this Scottish extension of the concern's activities a new company, Philips Hamilton Works, Ltd., is being formed. The new factory, which will extend over 13 acres, has been specially built for radio production. It is the third large manufacturing unit to be developed by the company in Great Britain, the two others being at Mitcham and Blackburn.

Electricity Supply Apprentices

Armature winders, electricians, electrical fitters, fitters and turners (mechanical), meter repairers and meter and instrument testers, whose apprenticeship has been interrupted by war service are covered by a training scheme which has been prepared by the National Joint Industrial Council for the Electricity Supply Industry, in conjunction with the District Joint Industrial Councils, and approved by the Ministry of Labour and National Service. The period of training required to be served by an apprentice to complete his apprenticeship will be the unexpired period of the original apprenticeship reduced by one-third of the period of war service provided that the reduction does not exceed one-third of the unexpired period. The training will be in the employer's establishment and, if found practicable, in a technical school or other approved centre. Where during his war service an apprentice has worked at his trade, the time worked will count as part of his apprenticeship. Payments will consist of wages paid by the employer and of allowances paid by the State. Apprentices in their last year when commencing war service will be recognised as journeymen on their return to civil employment.

B.S. Specifications

Motors and Generators.—A revision of B.S. 1156, AC and DC motors and generators for Government Department requirements, has recently been issued. It applies to all machines

up to 660 V and up to 300 HP, kW, or kVA, but excludes fractional HP machines and shipborne or airborne machines. The main feature of the revision is the addition of a section dealing with equipment for tropical conditions, with special reference to materials and tests.

Cables for Switchboard Panel Wiring.—B.S. 1231 has just been issued for cables, flexible cables and cords for switchboard (metering and control) panel wiring at voltages not exceeding 250 V. The insulation is polyvinyl chloride (P.V.C.) and the specification prescribes the dimensions of the conductors and standardises seven colours for the insulation. Voltage tests are also specified.

Switchboards and Motor Control Equipment.—With a view to facilitating the supply of switchgear and motor control equipment to meet the requirements of the Services, B.S. 1220 has been issued for low- and medium-voltage DC single-phase or three-phase equipment with total load not exceeding 300 kW, kVA, or HP per panel. It does not apply to equipment for special purposes, nor to shipborne or airborne equipment. A special feature is a section dealing with tropical design and the treatment required to provide protection against damage due to corrosion, insects and mould growth in damp tropical climates.

Copies of these specifications can be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1.

Trade Announcements

The Martindale Electric Co., Ltd., has closed its temporary office at West Grinstead and all communications should now be addressed to its head office and works at Westmorland Road, London, N.W.9 (telephone: Colindale 8642/3).

The Electrical Apparatus Co., Ltd., is transferring its Yorkshire office from Sheffield to 21, Park Street, Leeds, 1 (telephone: Leeds 22438) on August 30th.

The new address of the Society of Motor Manufacturers & Traders, Ltd., is 148, Piccadilly (Hyde Park Corner), London, W.1 (telephone: Grosvenor 4040; telegraphic address: "Movendum, Audley, London").

TRADE MARKS

THE following applications have been made for trade marks. Objections may be entered within a month from August 8th.

Design and TANNON. Nos. 633,454-5 respectively, Class 9. Electrical instruments and other apparatus not included in other classes; sound recording, receiving, transmitting, reproducing, generating and amplifying instruments and apparatus; photo-electric apparatus; instruments and apparatus for testing, inspecting, measuring and indicating; ozonising apparatus; electrical conduit and conductors therefor; junction boxes, etc., and parts and fittings (not included in other classes) of such goods.—Guy R. Fountain, Ltd., Tannoy Works, Canterbury Grove, West Norwood, S.E.27.

SENTERCEL SELENIUM RECTIFIERS (design). No. 635,803, Class 9. Electric current rectifying instruments and apparatus.—Standard Telephones & Cables, Ltd., Connaught House, 63, Aldwych, London, W.C.2.

Electricity Supply and Research

Co-operation of Engineers, Economists and Statisticians

THERE is a growing realisation that research is the basis of all progress. What has been the attitude of the electricity supply industry to organised research? The bulk of the undertakings support the co-operative organisation, the E.R.A., which in addition to what may be described as "laboratory" work (though many of the tests are carried out in the field) has recently extended its activities into branches which at first sight seem to be outside the province of electrical research in its orthodox sense.

One of these has been named "electricity supply technology," but one may use a more comprehensive term and speak of electricity supply economics, with the following principal subjects: (1) Load research, (2) cost research, (3) consumer research, and (4) general economics.

Load Characteristics

The first is concerned with ascertaining the characteristics of the various component loads on supply systems, so as to enable estimates to be made of the plant capacity that is required, present and future, to carry them.

The aim of the second is to establish scientific bases for assessing the costs of supplying given load components, thus enabling economic decisions to be made: for instance, in adjudicating among rival proposals on methods of domestic electrification. This work may be likened to the scientific costing of manufacturing processes, undertaken not only to provide bases for pricing, but also to develop most economic methods; and as in a manufacturing concern costing and pricing are carried out by entirely different departments, so in electricity supply the calculation of the cost of supplying a given load is completely independent of possible subsequent considerations on tariff charges.

Consumer research, the third subject, offers great scope to the application of modern statistical methods, especially scientific sampling. With domestic consumers, in particular, we are confronted with apparently unwieldy masses of individuals, whose study can, however, be made easy if appropriate samples are selected. There are other problems, such as the consideration of load conditions and economic factors in the choice of plant.

By P. Schiller When referring here to electricity supply, the scope is by implication more or less confined to the sphere of distribution. For it is recognised that in respect of generation the scientific method, including research, has been applied to a much larger extent than in connection with the perhaps more complex and less tractable problems (other than of a purely engineering nature) arising out of the distribution of electricity. In this field, vital questions are still under debate, mainly for lack of indisputable data, which can emanate solely from scientific research. Hitherto, most of the contributions of facts and opinion have originated from spare-time efforts on the part of supply engineers whose official duties have kept them busy with anything but research.

An industry of this size can afford to employ a band of specialised research workers whose whole-time effort could be devoted to the study of these unsolved supply problems.* In addition to engineers, there should be economists and statisticians, all working under the guidance of committees formed by representatives of the supply industry, the familiar set-up in which co-operative research is organised by the E.R.A. A beginning has been made and it is expected that it will find growing support.

* In certain other countries there existed before the war special university chairs in electricity supply economics.

Development in South Africa

THE chairman of the South African Industrial Development Corporation, in a recent survey, said that since 1910 the production of electricity has increased 1,000 per cent. It stood in 1943 at 6,638,361,000 kWh, which cost £14,782,500 to produce at an average selling price of 0.534d. per kWh. He believed this was the lowest in the world. It was only two-thirds of the price in 1910. He also said that the power station near Vereeniging was the greatest in the Southern Hemisphere.

Some stress has been placed on the need for national electricity publicity in South Africa. Apart from the load building schemes of the municipalities it cannot be said that the electrical industry has yet engaged in national propaganda. This plan would include cooking demonstrations, press advertising, etc.

Views on the News

Reflections on Current Topics

ALTHOUGH I have always considered that infinitely-variable control of cooker hot-plates is greatly to be desired and that, as in the case of the oven thermostat, its universal adoption is only a matter of time, I must confess that I have only just tried it out on my own cooker. With the new type of "Simmerstat" which Sunvic Controls, Ltd., has just introduced, it is an easy matter to provide the refinement on any model of cooker. Personally I had a little bother fitting the unit but that was my fault for not using the specially long bush supplied for cookers with unusually thick switchplates. Anyhow it is on now and I could fix another in a very few minutes.

* * *

To get the best results from this system of control I imagined that a radiant type of hot-plate should be used, so that as my own cooker has solid plates, I was a little doubtful as to the probable effect. The response to the control is, however, quite satisfactory and my wife would certainly not be without the unit now. Actually it is possible to get better simmering control than with gas, for with the latter there is always a risk, if it is turned too low, that it may blow out. On the grill-boiler, when used for grilling, the unit is not so satisfactory since the elements are, of course, either on or off and the foodstuff is consequently cooked only in spasms. The cost of the "Simmerstat" is only a few shillings more than a three- or four-heat switch and if it were generally adopted some at least of the extra cost could be recouped from the simplification of the hot-plate design which would then become possible. Hot-plate maintenance should also be reduced since the unit prevents possible damage through overheating.

* * *

A correspondent has sent me a document which is an exception to the rule that clients never give sufficient information to contractors. It is headed "Description of symptoms of (so-called) fuse system of this house" and it discusses a peculiar state of affairs. Slightly abbreviated, it reads as follows:—

"Perhaps the most obvious symptom is the unfailing regularity with which the main fuse (wired, as you will, at 15, 30, 45, or even 60 amps) burns through after intervals ranging from 10 minutes to 4 days. Occasionally, to be spectacular, the fuse box explodes under your hand as you throw the main switch after repairing the fuse; this makes everything very exciting. If this does not happen to you, and since you cannot reasonably be expected to stay in this house for four days, the following experiment

may be found instructive. Extinguish as many of the lights in the house as you can, and put on the cellar light *only*. Remove the **LEFTHAND** fuse from the box, switch on again, and an understrength glow will emanate from the switched-on bulb; if any other switches in the house are on, the strength of the glow may be reduced to extinction—however, the meter may be observed slowly to revolve. A leakage to earth in the mains would account for this, but whether it would account for the other phenomena I have not the experience to venture to say. It might account, however, for the fact that it is always the *main* fuse which burns through, never the 'local' fuses (all carefully wired at 5 amps). The local fuses are opposite the main staircase in the hall. What, precisely, the function of most of the other fuses littered in odd corners of the cellar and the house is, I cannot venture to say.

"*Further Note.*—I have just tried taking all these fuses out—they all turned out to be local fuses of one kind or another. When I took out all these fuses, all the local fuses, and, in fact, all the fuses in the house *except* the **RIGHTHAND** main fuse and the two local cellar fuses, the cellar light glowed dimly, as before. When I removed the cellar fuse also, the meter still slowly revolved, although not a light in the house was burning or could burn!!!"

* * *

I have just seen the latest report of Mr. C. Owen Silvers, general manager of the Wolverhampton transport undertaking, which strikingly illustrates the benefit which the town has derived from its trolley-buses. The policy of employing these instead of motor-buses has resulted in the electricity undertaking receiving, in thirty years, £564,666, and the local rates have benefited to the extent of £407,497—had motor-buses been used this latter figure would have been no more than about £25,000. Also, when the tramways were abandoned the transport undertaking contributed practically £100,000 more than its statutory obligation towards the reconstruction of roads. There has never been a deficit on the operation of the transport system, and no assistance has been obtained from the rates.

* * *

In the Dominions the tram has not fallen so much into disfavour as in this country but there are indications, I see, that where a change is contemplated the trolley-bus is looked upon as its natural successor. Wellington City Council has decided to adopt this type of vehicle for future developments and at Dunedin, also in New Zealand, the City Council is recommended to carry out the complete replacement of trams by trolley-buses, following a series of reports. In Brisbane, Australia, an experimental service is being instituted.—REFLECTOR.

New Zealand Market

Changes Brought About by the War

IN a "Review of Commercial Conditions in New Zealand" by Mr. R. Boulter, C.M.G., Senior Trade Commissioner in the Dominion (published for the Department of Overseas Trade by the Stationery Office, Is.), the growth of self-sufficiency immediately before and during the war is emphasised. Another matter to which attention is drawn is the way in which war conditions have altered sources of imports. The preoccupation of the United Kingdom with the production of war materials and inter-Allied planning caused New Zealand to look towards nearer suppliers or those in a position to supply, and Lend-Lease arrangements also had their influence. Large quantities of goods have been imported from the United States, including electrical machinery and radio equipment.

Domestic Appliances

As regards the manufacture of goods in New Zealand, exigencies of war have put a brake upon the production of some classes and the factories have been devoted to other purposes more closely associated with the war. Among the factories thus affected have been those producing domestic electrical appliances of many kinds. In the middle of 1942 a complete prohibition of the production of all classes of domestic electrical equipment was imposed and it was only relaxed last year to allow of the production of limited numbers of electric cookers, kettles, irons, percolators, washing machines and refrigerators.

In addition to radio accessories there are firms in New Zealand producing installation equipment and the newer industries include the manufacture of domestic refrigerators, washing machines, vacuum cleaners, cranes and hoists, storage batteries and components, and carbon brushes. The manufacture of transformers up to 15-kVA capacity was started by one firm in 1942; last year another factory was established to undertake the production of transformers of capacities up to 100 kVA. Some of the essential mechanical equipment for cranes, hoists and passenger lifts still has to be imported. A new project is the manufacture of transformers up to 600 kVA and motors up to 25 HP.

It is anticipated that imports of a wide variety of consumer goods, particularly those for personal or household use, will be eliminated or considerably reduced and a larger proportion of imports will in future consist of raw or semi-manufactured materials. There will be a larger demand for industrial machinery to equip new, or extend existing, industries and there will also be larger calls for machinery and materials for public utilities. It is thought that Australia will participate to a larger extent

in the trade, and competition from the United States over a wider field is likely.

Proposals are under consideration for finding work for returning Service men, and among the activities contemplated are housing and the expansion of public buildings, railway extensions and further hydro-electric development to meet the need for more power. As regards housing, Mr. Boulter says that most of the necessary materials are being produced in the Dominion, but some classes, including electrical conduit and wire, must be imported. He also says that it is doubtful whether local industry can fully meet the demands for other equipment such as lighting fittings and electric cookers.

The railway extension plans include the reconstruction and electrification of the line from Wellington through the Hutt to Masterton; the extension to Levin or Otaki of the present electric line between Wellington and Paekariki; the electrification of the suburban circular line round Auckland; and the diversion and electrification of a short line near Dunedin. Electric locomotives and electric motor coaches are imported complete. In the case of tramway undertakings the bodywork of the cars is manufactured in the workshops but the electrical equipment, wheels, axles, etc., is imported. The introduction of trolley-buses in Wellington, Auckland and Dunedin is under consideration.

Home Lighting

AN official recommended practice of home lighting has been issued by the Illuminating Engineering Society of America. The report, developed and prepared by the Society's Committee on Residence Lighting, appears in the June issue of *Illuminating Engineering* and will be available soon as a separate 40-page illustrated booklet constituting an authoritative guide for the lighting of all of the major rooms and various domestic tasks.

The recommendations, based on the findings of specialists of many years' experience, are claimed to represent the most comprehensive and official study of this subject yet published. In addition to the fundamentals of adequate lighting, the report covers such subjects as colour and its relation to light, fluorescent and filament sources in the home, built-in lighting, position of lamps, and includes also a table of foot-candle intensities recommended.

Each room is studied separately and specific recommendations made for its lighting, including drawings of suggested light fixtures. Thirty-six illustrations graphically demonstrate the aesthetic and seeing conditions achieved by these recommendations, which should be of especial value to architects, interior designers and decorators, and many others. The booklet is available from the Illuminating Engineering Society, 51, Madison Avenue, New York 10.

Oil and Fibre

Results of Recent Tests

THE following notes relate to methods that were successfully adopted in a recent investigation into the failure of insulating oil. Six weeks after filling up with new oil, which complied with all B.S. requirements¹, some circuit breakers in a large industrial plant started to give off a gas of acrid smell. At the same time corrosion could be observed on metallic parts. The gas appeared to condense on the upper parts of the switches, forming oily deposits, and the soft rubber parts not immersed in the oil became hard and brittle.

All oil containers when drained showed a heavy deposit of a tar-like consistency. On the fibre linings the sediment was hard, like asphalt. In one container several pounds of deposit had accumulated. Samples taken from the oil in the switches showed the following results compared with unused oil:—

By **E. W. Steinitz**,
F.Inst.Pet.

in the usual way showed matter insoluble in petrol ether (or what is called "asphaltenes" in the usual analysis report) of from 50 to 72 per cent. a great proportion of which deposits were found on further examination to be of a resin-like kind or of cellulose-like behaviour. This is not uncommon and is usually due to insulating material or varnish having been partly dissolved by the oil. In the present case no varnish or other coating had been used on the metals and the only insulating material was a lining of so-called "fibre," of which there was about 9 sq. ft. per switch with an average thickness of $\frac{3}{8}$ in. The only explanation of the trouble appeared to be that this insulating material had inter-reacted with the oil.

Many different materials are described as "fibre." One is "vulcanised fibre," that is, cotton fibre or layers of paper specially made

	Acid value mg of KOH per gm.	Sap. No. mg of KOH per gm.	Water, per cent.	Breakdown voltage
Oil, unused	nil	below 1.0	nil	over 40,000
Oil, used	3.4	9.3	1.4	6,500

A useful procedure in cases of this kind (which in practically all cases leads to success) is first to look for other reasons than the oil as the origin of the trouble.

The temperature of the oil was very low. It was as a rule near 50 deg. C., which is common for insulating oils. Only occasionally did it rise to 80 deg., but even if the temperature had continuously been near 100 deg., oil with the properties given should have stood up perfectly. Heavy deposits usually suggest bad management and often it has been found that containers have not been cleaned for years, even when heavy dust is present in the surrounding air, and that when filling with new oil, deposits have not been removed. The "gassing" of a switch together with corrosion of metal parts in most cases suggests frequent arcing, which itself leads to accumulation of heavy deposits.

None of these explanations applied in this case, as in the works in question everything is done to keep the equipment in perfect working order. The switches are kept in the "on" position nearly all the time and no arcing takes place.

Examination of the sediments and deposits

for the purpose and parchmented and cemented by the application of sulphuric acid and heat. Great care is taken in the latest stages of the manufacture of this product to remove all traces of acid. Other kinds of fibre are made from synthetic resins or other plastics laminated together with fillers like fabric or used in a pure state.

In the case under review the fibre turned out to be couched cardboard, *i.e.* boards built up from several layers of paper and cemented together by a binding material and the application of heat and pressure. In addition to cellulose the paper contained resins (glues) and ground wood or mechanical pulp. The finished product is very porous and hygroscopic. In normal conditions the water content is about 15 per cent.

In order to prove a possible inter-reaction of this fibre with oil, a new piece of the insulating material was inserted in a sample of new switch oil in a retort, the temperature of which was kept at about 80 deg. C. by means of a water-bath. The results were convincing. Lively "gassing" started at once and after four days the acidity of the oil passed the 1.0 mg of KOH per gm. mark.

The explanation was that the air laden with water bubbling out of the fibre in association with the various materials of the fibre working as catalysts had a strongly deteriorating effect upon the oil. Products of decomposition condensed in the cooler part of the retort.

The words "catalytic" and "catalyst" are often misused to conceal the impossibility of explaining certain phenomena; they exaggerate the influence of one material on another, but in this case all conditions are set for genuine catalytic influences. The fibre consists of very fine particles of wood, cellulose and glue, between which air and water is contained, so that catalytic inter-reaction with the oil takes place.

Sludge Test

In order to study further the possible influence of the fibre on the oil, a complete sludge test under special conditions was made under the conditions prescribed by B.S.S. 148-1933, which requires the heating of the oil for fifty hours to 150 deg. C. in the presence of a piece of a copper foil, which is supposed to act as a catalyst. In addition to the foil, a piece of the fibre weighing ten grams was inserted. The reaction was so strong that 150 deg. could not be reached at once as the operation had to be stopped at 80 deg. for several hours. The sludge value obtained after fifty hours of heating and aerating was 0.45 whereas the same oil in the regulation tests had given a value of below 0.1 per cent.

More recently additional tests have been made. Five samples of new transformer oil were kept in open beakers for six months at room temperature, which during the tests was between 15 and 25 deg. C. The first beaker contained oil only, the second a piece of copper foil immersed in the oil, the third different pieces of mild steel, copper and brass, the fourth a piece of the fibre described above and the fifth a similar piece of fibre which had been dried at 110 deg. C. until no more decrease in weight was observed, and then de-aerated. The acid values (mg of KOH per gm.) after six months of exposure were: For oil only, traces; oil and copper foil, 0.06; oil with different metals, 0.08; oil and fibre, 0.42; oil and fibre treated, 0.14.

It appears to be proved that transformer oils and over-refined oils in particular are far more sensitive to changes in the properties of insulating materials than they are to the presence of metals. Metals have a catalytical influence on the oils in a far less degree than

cellulose. Other materials which contain impurities in finely dispersed form will, of course, be far more detrimental. Many breakdowns of transformer oils can be traced to the influence of insulating material or material used for gaskets and the like.

The conclusions to be drawn at present from our experiences can be summarised as follows:—

(1) The use of insulating material of the type described should not be encouraged. If it is to be used it must be dried and de-aerated before the first immersion in the switch oil. The present tendency of the electrical industry to use pure cellulose or suitable plastics for insulating parts submerged in oil is in line with the latest research work of leading Institutions.

(2) A revised sludge test or stability test for transformer oils which has been repeatedly suggested by the Institution of Electrical Engineers² should include a second catalyst, preferably a fibrous material to be used in addition to the copper foil. The Massachusetts Institute of Technology uses a piece of specially prepared cellulose for the purpose and its results are in line with the experiences referred to in the present article.³

References

- ¹ E. W. Steinitz. *Petroleum*, Vol. V, No. 8, p. 138. *Power and Works Engineer*, November, 1944, p. 247.
- ² *Electrical Review*, May 15th (p. 623) and 22nd (p. 645), 1942.
- ³ I. C. Balsbough, A. G. Assaf and J. L. Ouchey; *Ind. Eng. Chem.*, 1942, 34, p. 92. Assaf and Gladdy, *ibid.*, Analytical Ed., 1939, 11, p. 164. Balsbough, Assaf and Pendleton, *ibid.*, 1941, 33, p. 1321. Balsbough, Howell and Assaf, *ibid.*, 1940, 32, p. 1497.

Imports from Italy

IT was announced in Rome on August 2nd that Allied control over Italian export trade has been withdrawn and henceforth the Italian Government and Italian firms will be free to conduct direct transactions with foreign firms. British importers are reminded that trading with the enemy restrictions have not yet been lifted in respect of trade with Italy, so that it is not yet possible to conclude a contract with the Italian Government (or Italian private traders). Inquiries may, however, be made of Italian exporters as to availabilities, terms of sale and prices of goods. British importers are also reminded that when transactions are permitted, import licences will be required for all goods imported into the United Kingdom from Italy which do not come under an open general licence. Import licences will not, in general, be granted for goods not, for the time being, licensed from other countries.

ELECTRICITY SUPPLY

Lincoln Chooses Cooling Towers. North Wales Rating Representations.

Arbroath.—ELECTRICITY CHOSEN.—When the question of whether gas or electricity should be adopted for street lighting at a site for temporary houses was discussed, the manager of the municipal gasworks put forward the case for gas. There was, however, no amendment to a recommendation by the convener of the Housing Committee (Mr. B. K. Ritchie) that electricity should be employed. Mr. Ritchie expressed the view that the street lighting of the future would be by electricity.

Bristol.—STREET LIGHTING CONTROL.—The City Council has the installation of automatic control of electric street lighting under consideration. Interested firms can obtain particulars from the city engineer.

Colchester.—IMPROVED RESULT.—The 1944-45 year's working of the Corporation electricity undertaking resulted in a surplus of £4,106 compared with a deficit of £1,736 in the previous year. This was reported to the Town Council on August 1st by the borough treasurer (Mr. L. J. Barrell). Sales of 43.3 million kWh produced an income of £323,009, equal to an average of 1.793d. per kWh. The cost per kWh sold was 1.288d. as compared with 1.242d. in 1944. The gross profit was £81,757 (£80,445). Councillor L. Worsnop, chairman of the Electricity Committee, said that the coming winter was going to be one of the most difficult the Department had had to face.

Douglas (Isle of Man).—PURCHASE OF COOKERS.—The Electricity Committee has authorised the electrical engineer to purchase 40 cookers at an estimated cost of £1,100.

Erith.—REBATE.—At a meeting of the Town Council on August 1st Councillor G. W. H. Luck announced a rebate of 4 per cent. to electricity consumers for the four quarters to the end of March last. He said that this meant giving back to the consumers about £6,000.

Lichfield.—NEW SHOWROOM.—The Corporation Electricity Committee is to select a site for the erection of a new showroom.

SUPPLY TO ESTATE.—An electricity supply is to be given to the Shenstone Wood estate at a cost of £2,680.

Lincoln.—COOLING WATER ARRANGEMENTS.—At a meeting on Wednesday last week the City Council decided, by 13 votes to 11, to have cooling towers for the power station extension. The present decision reversed that of a month ago when the Council agreed to an alternative scheme, involving the use of water from the River Witham, after consultation with the Central Electricity Board.

Alderman Rayment said that the C.E.B. would impose stringent conditions if the Farran scheme was accepted. One provided that if, as a result of experience, it was necessary to abandon the river cooling scheme entirely and replace it by a cooling tower scheme, the annual costs and charges attributable to the redundant expenditure on any superseded works should be excluded from the costs of production at the station payable by the Board. The cost of the Farran South Delph scheme was estimated to be £49,000. If for any reason the river

scheme had to be abandoned before the expiration of the loan period, the Corporation would have to pay approximately £3,355 annually for the unexpired period of the loan. For any period during which the whole of the plant stood idle because of the abandonment of the river cooling scheme, the Corporation would incur a liability of approximately £4,765 a month for debt charges. In the event of only a portion of the plant being rendered unusable, this figure would be proportionately reduced. This contingency would not arise in the winter.

Morecambe.—SUBSTATION.—The Corporation Electricity Committee is to provide a substation at Happy Mount at a cost of £2,435.

North Wales.—RATES AND WATER POWER.—The North Wales and South Cheshire Joint Electricity Authority agreed unanimously at its last meeting to continue representations to the Electricity Commissioners with a view to the principles of rating relief embodied in the Hydro-Electric Undertakings (Valuation for Rating) (Scotland) Act, 1945, being made applicable to similar undertakings in North Wales.

SUPPLY DEVELOPMENTS.—At the same meeting a report on the work of the North Wales Power Company during the war was presented. With regard to post-war development, it was stated that the company was in consultation with the C.E.B. as to the best method of transmitting the output from the proposed new stations. Active consideration was being given to schemes for services to villages and townships which had been held up by the war, about 150 in all. Mr. G. K. Paton, chief engineer, said that the company had been connecting about twenty farms a month since the end of the war with Germany.

Portland.—LOANS.—The U.D.C. Electricity Committee has obtained sanction to borrow £1,463 for supply improvements in the Underhill and Tophill districts, and is seeking sanction to borrow £550 for supply to the Weston housing site.

Reigate.—ELECTRICITY ACCOUNTS.—After providing for loan charges and income tax, and allowing a 20 per cent. rebate to consumers in the March quarter, there was a net profit of £8,360 on the 1944-45 year's working of the Reigate Electricity Department (engineer and manager, Mr. C. Rowbotham, M.I.E.E.). Total sales were 13.1 million kWh and the income from electricity was £104,605.

In a statement on the accounts at the last meeting of the Town Council, Alderman W. L. Lorkin, A.M.I.E.E., chairman of the Electricity Committee, pointed out that the charges made for street lighting had been revised and showed a considerable reduction on those operating in 1939. Some of the individual reductions amounted to nearly 50 per cent. Recently the contribution to the Central Administration Fund was raised to £2,750 per annum and this sum, added to the reduction of street lighting charges, benefited the Corporation to the extent of approximately a 3d. rate. In addition, the standing charge of the domestic tariff had

been lowered by 20 per cent. and meter rents had been abolished. All this had been achieved at a time when many undertakings had found it necessary to increase their tariffs.

St. Marylebone.—**UNDERTAKING'S FINANCES.**—The Electricity Committee reports that the surplus for the year is £68,850 and with the sum of £24,463 recovered in respect of income tax, the deficiency is reduced to £56,467. The Committee hopes that, with a continued growth of output and the recovery of a further sum of £15,000 in respect of income tax, the deficiency will be substantially if not wholly cleared by the end of the current year.

PROPOSED OFFICES.—The Committee has asked the architects to undertake preliminary work so that the scheme for offices, etc., at Blandford Street may be completed as soon as possible.

Scarborough.—**SUPPLY TO TEMPORARY HOUSES.**—The Corporation Electricity Committee has agreed to spend £4,600 on supplying electricity to temporary houses, provided the Housing and Town Planning Committee reimburses the Electricity Committee in respect of any debt outstanding on electricity mains which might become redundant if the temporary houses are removed. The Housing and Town Planning Committee has agreed.

Sheffield.—**KITCHEN EXHIBITION.**—The Electricity Committee has authorised the general manager to make arrangements for an electric kitchen exhibition from November 12th to December 1st.

Southport.—**EXTENSIONS.**—The Electricity Committee is to extend the feeder from Nelson Street substation to Lancaster Road substation at a cost of £3,490 and provide a supply to bungalows at Balmoral Drive (£2,105) and Pinfold (£2,006).

West Hartlepool.—**ELECTRICAL DEVELOPMENTS.**—Subject to the consent of the Electricity Commissioners the Town Council intends to spend over £26,000 on electricity developments, including five new substations.

Overseas

Australia.—**MOTIVE POWER IN INDUSTRY.**—According to figures published recently by the Commonwealth Statistician, the total rated horse-power of motors driven by electricity is 1,700,477, while the installed horse-power of all types of power in ordinary use aggregates 1,978,509 and the rated horse-power of engines in reserve or idle is 250,348.

Canada.—**ACQUISITION OF UTILITIES.**—The Government of British Columbia, in fulfilment of its plans to take over power utilities, is to buy three power companies and eleven subsidiaries.

Eire.—**PROGRESS AT POULAPHOUCA.**—The work of installing the second 15,000-kVA turbine, which arrived about a month ago, is in progress at Poulaphouca. The E.S.B. staff has already completed the erection of its framework and is beginning the preliminary work on its 16-ton propeller. The only other important operations that remain to be undertaken are those connected with the crescent-shaped control room. At the moment no power is being generated at Poulaphouca, the first 15,000-kVA turbine, which had been functioning since December last, now being dismantled for

inspection. During the heavy May-June rainfall it operated continuously for 16 hours daily. The subsidiary Golden Falls 4,000-kW turbine is also out of service, as steel sluice gates, are being fitted replacing the emergency wooden ones. It is expected that output will be resumed next month.

India.—**ACQUISITION OF CALCUTTA UNDERTAKING.**—The Municipal Corporation of Calcutta has decided to acquire the city electricity supply when the contract period under the current licence expires in 1948. The Corporation has applied to the Provincial Government for sanction.—*Reuter.*

New Zealand.—**SUPPLIES CURTAILED IN NORTH ISLAND.**—When sudden overloading occurred in the North Island recently drastic action was taken to curtail supplies, which were cut off in a number of districts for periods of an hour or two. In the Hawke's Bay E.P.B. area a 50 per cent. reduction was ordered, this being eased to 10 per cent. later in the day. In the case of the Auckland E.P.B. power was cut off for 15 min. in each feeder area. Since May 31st consumers throughout the Island have been asked to reduce their consumption by at least 10 per cent. from Monday to Friday and by 5 per cent. on Saturday.

TRANSPORT

Durham.—**CONTROL OF TRANSPORT UNDERTAKINGS.**—The County Works Committee and Parliamentary Committee are to discuss the possibility of the Council's taking control of the transport undertakings in the county.

London.—**TUBE SERVICES INTERRUPTED.**—Through a failure of the power supply from the Brimsdown generating station all Tube trains were brought to a stop last Saturday on the Piccadilly line between Finsbury Park and Cockfosters and on the Northern line between Archway, Mill Hill and Barnet. The breakdown lasted from soon after seven in the evening to about midnight.

Northumberland.—**TROLLEY-BUSES.**—The County Council is opposing a Bill promoted by Newcastle-on-Tyne City Council seeking powers to run trolley-buses on additional routes. Discussions are to take place between the two authorities regarding the running of trolley-buses over county roads.

Wolverhampton.—**Year's Profit.**—The gross surplus for 1944-45 on the trolley-vehicle account of the Corporation Transport Department was £138,893 and on the motor omnibus account £51,628, a total of £190,521. After deducting interest and other charges there was a net surplus of £33,696, of which £10,000 has been paid in relief of the rates and £21,491 has been set aside for deferred maintenance, etc., the remaining £2,205 going to the reserve fund.

Mr. C. Owen Silvers has completed thirty years as general manager of the Department and his report contains a survey covering that period, showing that revenue has increased from £59,816 to £669,453, the reserve fund from £53,987 to £190,691, passengers carried from 13 million to 91 million, route miles operated from 20 to 220, and the number of employees from approximately 200 to 1,000, while outstanding loans have been reduced from £209,497 to £94,351.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Bakelite, Ltd.—At the recent annual general meeting Mr. H. V. Potter, managing director, in a report on the wartime activities of the company, said that many problems had to be faced in adapting the characteristics of moulding materials, synthetic resins, sheets, rods, tubes, etc., to meet the demands of the various Services. Radio and telephone communication equipment relied largely on Bakelite insulating materials, and improved materials played a vital part. Amongst many kinds supplied were materials compatible with poison gases and explosives, parts of shells, mines and bombs, and special reinforcing materials made for wooden aircraft. New factories were established in Lancashire, North Wales, Derbyshire and Hertfordshire, and production had been almost doubled. It was the company's intention to enter new fields of plastics, and the manufacture of vinyl plastics to replace rubber for electrical cable covering and tubing, a wartime activity, would be continued and expanded, the manufacture being concentrated in a new factory on a new site.

Greenwood & Batley, Ltd.—As an indication of the company's main activities during the war the chairman (Col. H. A. Micklem) in his speech at the annual meeting gave the following short list of goods manufactured:—5,628 machine tools, 898 locomotives and electric trucks, 406 steam turbines, 156 cordite presses and rolling mills, 3,542 high-frequency generator sets, 2,441 electric generators and motors, about 900,000,000 .303 in. Mark 7 cartridges, about 5,000,000 15 mm. cartridges, 8,500,000 20 mm. cartridge cases, and about 500,000 20 mm. projectiles. He said that for many years it had been the company's practice to undertake a considerable amount of development work for various Government Departments and it was in the position of having designs, patterns and experience immediately available when the rearmament drive started. One interesting development was in connection with the control gear for cordite extrusion presses.

Rheostatic Co., Ltd.—The directors have decided to issue 70,000 ordinary shares of 4s. each at 8s. a share and 40,000 6 per cent. cumulative preference shares of 10s. each, at 11s. a share. The ordinary shares are offered to existing ordinary shareholders in the proportion of one new share for every £1 nominal of ordinary stock held, and the preference shares are offered to preference stockholders in the proportion of two new shares for every £2 10s. nominal of preference stock now held.

The Telephone & General Trust, Ltd.—The Jamaican House of Representatives has approved the Governor's proposal for the sale of the island's telephone system to the company's subsidiary, the Jamaica Telephone Company. —*Reuter.*

The Anglo-Portuguese Telephone Co., Ltd. is paying a final dividend of 5 per cent. making 8 per cent. (same) on the "A" shares. The

net profit for 1944, after providing for taxation, was £52,338 (£52,126).

Gabriel, Wade & English, Ltd., are paying a dividend of 6 per cent. and a bonus of 4 per cent. for the year ended May 31st, the same as for the previous year. The net profit before deduction of tax was £94,702 (£91,309).

The British Vacuum Cleaner & Engineering Co., Ltd., is paying a final dividend of 17½ per cent., again making 30 per cent. for the year to September 30th, 1944. The net profit was £83,954 (against £88,640 for the previous year).

Waste Heat & Gas Electrical Generating Stations, Ltd., announces an interim dividend of 2½ per cent. (same) on the ordinary stock in respect of the half-year ended July 31st.

The Mid-Southern Utility Co. is again to pay interim dividends of 2½ per cent. on the "A"; 1½ per cent. on the "B," and 2½ per cent. on the "C" stock.

The Ayrshire Electricity Board is to redeem the £721,320 Ayrshire (Local Authorities) Electricity 4½ per cent. redeemable stock. 1945-55, on November 11th.

The Cawnpore Electric Supply Co., Ltd., is to increase its final dividend from 5 to 7 per cent., making 13 per cent. (7 per cent.) for the year.

The Northampton Electric Light & Power Co., Ltd., is to pay an interim dividend of 4 per cent. (same).

The Rushden & District Electric Supply Co., Ltd., is maintaining its interim dividend at 4 per cent.

The Greengate & Irwell Rubber Co., Ltd., has declared an interim ordinary dividend of 1s. 3d. per share (same).

The Farnham Gas & Electricity Co., Ltd., is again paying an interim dividend of 3½ per cent.

The Northmet Power Co. has declared an interim dividend of 3 per cent. (same).

New Companies

Falco Electrical Appliances, Ltd.—Private company. Registered July 30th. Capital, £100. Objects: To carry on the business of electrical and general engineers, etc. Directors: W. Hogg Smith, Polmont House, Polmont, Stirlingshire; H. C. W. Bennetts, 90, Kitts Moss Lane, Bramhall, Cheshire; and G. S. Bone, 42, Salisbury Crescent, Summertown, Oxford. Registered office: Mortimer House, Mortimer Street, W.1.

Radio Precision, Ltd.—Private company. Registered July 30th. Capital, £2,000. Objects: To enter into an agreement with Radio-Belgique Société Anonyme, 81, Chester Square, S.W.1, and to carry on the business of consulting engineers and contractors in communications, broadcasting, television and electronic developments, etc. Directors: P. P. Eckersley, 32, Hans Road, S.W.3 and P. P. E. Hubert, 32a,

Plas de l'Industrie, Brussels. Secretary, C. J. Burt. Registered office: 81, Chester Square, S.W.1.

Endroborn, Ltd.—Private company. Registered July 19th. Capital, £100. Objects: To carry on the business of manufacturers of, and dealers in, fluorescent, electrical and other lamps, reflectors, switches, cookers, signs, illuminations, wireless valves and fittings, etc. Subscribers: G. Conrad, 103, Phyllis Avenue, New Malden and C. H. Treble, 15, Maybank Avenue, Sudbury, Wembley. Solicitors: Clifford Turner & Co., E.C.

Newton Electric, Ltd.—Private company. Registered July 20th. Capital, £100. Objects: To carry on the business of wholesale and retail merchants, manufacturers and factors of electrical goods, including refrigerators, ice cream making machines, radio and television apparatus, cookers, washers, neon signs and lamps, etc. H. Rothman, 123, Lapwing Lane, Manchester, is the first director. Registered office: 22, Cromford House, Cromford Court, Manchester.

Wemverley Manufacturing Co., Ltd.—Private company. Registered August 2nd. Capital, £200. Objects: To carry on the business of electricians, mechanical, electrical and radio engineers, etc. Directors: W. Drew, 8, Yerbury Road, N.10; T. V. Tye, 35, Sunnydene Gardens, N.9; and R. C. Taylor, 18, Kendal Gardens, N.18, the address of the registered office.

J. O. Grant & Taylor (London), Ltd.—Private company. Registered August 3rd. Capital, £5,000. Objects: To acquire the business of electrical engineers and contractors carried on by C. Lane and W. H. J. Hammond, at 6, Dyers' Buildings, E.C.1. Directors: J. A. Crowe, The Gables, St. George's Hill, Weybridge; W. H. J. Hammond, 148, Broadfield Road, S.E.6; and two others. Registered office: 6, Dyers' Buildings, Holborn, E.C.1.

Hartley Sharp & Co., Ltd.—Private company. Registered July 26th. Capital, £2,000. Objects: To carry on the business of electrical, wireless, electro-medical and general engineers, etc. Directors: C. Sharp, 88, Broadmead Road and P. Sharp, Granville, Broadmead Road, both Woodford Green. Registered office: 1-5, Broad Street Place, E.C.2.

Companies Struck Off the Register

The following companies were struck off the Register on August 7th: Craven Radio & Service Co., Ltd.; Electric Agencies, Ltd.; Nuvoion Electrics, Ltd.; and Radio Sales & Cycle Co. (Bristol), Ltd.

Companies' Returns Statements of Capital

Edmundsons Electricity Corporation, Ltd.—Capital, £11,500,000 in 400,000 7 per cent. cumulative preference stock £1 units, 1,513,685 6 per cent. cumulative preference stock £1 units, 486,315 6 per cent. cumulative preference shares of £1 each, 6,750,000 ordinary stock units of £1, 850,000 ordinary shares of £1 each, and 1,500,000 shares of £1 each. Return dated June 22nd. £400,000 7 per cent. cumulative preference stock, £1,513,685 6 per cent. cumulative preference stock and £6,750,000 ordinary

stock taken up. £3,570,400 paid. £5,093,285 considered as paid. Mortgages and charges: £4,010,511.

(Note: The company has deposited with its bankers £2,400,000 4 per cent. debenture stock as collateral security for loans if required, up to a like amount. No loans existed on March 31st).

Brentford Electric Supply Co., Ltd.—Capital, £100,000 in £1 shares. Return dated March 20th. 90,000 shares taken up. £90,000 paid. Mortgages and charges: Nil.

Increase of Capital

Circuit Electrical Co., Ltd.—The nominal capital has been increased by the addition of £1,000 beyond the registered capital of £500. The additional capital is divided into 1,000 4 per cent. redeemable preference and participating preference shares of £1 each, without voting rights except in special circumstances.

Mortgages and Charges

R. J. Kemp & Co., Ltd.—Assignment on July 5th of proceeds of contract, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd.

Dowsing Co. (Electrical Manufacturers), Ltd. Assignment on July 11th of proceeds of contracts, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Receiver Released

Pollson, Ltd.—A. E. Hepburn, Abford House, Wilton Road, S.W.1, ceased to act as receiver and/or manager on July 30th.

Bankruptcies

J. J. Symons, carrying on business as "The Zodiac Peerless Electric Lamp Co.," 25, Denmark Street, Charing Cross Road, London.—Order made July 10th for his discharge subject to his consenting to judgment being entered against him by the Official Receiver for £585, with £1 10s. costs. (£585 paid to the Official Receiver in lieu of entering up judgment).

T. Maund, electrical engineer, lately carrying on business at 80, Wellington Road North, Heaton Norris, Stockport, as "The Beacon Electrical Co."—Order made July 4th refusing discharge.

G. C. Spong and J. H. Trussell, trading as "C.C.S. Trading Co.," electricians, 30, Western Mail Chambers, Cardiff. (Separate application of J. H. Trussell.)—Order made July 2nd for discharge subject to debtor consenting to judgment for £10 being entered against him by the Official Receiver, with £1 10s. costs.

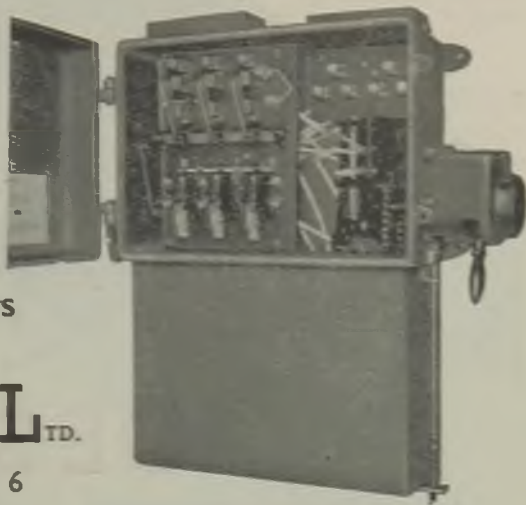
C. R. G. Webb, electrical engineer, trading as "Southern Electrical Mechanical Co.," 146a, Eastern Road, Brighton, and formerly carrying on business at 94, St. George's Road, Brighton.—First and final dividend of 9 $\frac{1}{2}$ d. in the £ payable August 17th at the Official Receiver's Offices, 8, Old Steine, Brighton.

R. H. Watkin, radio dealer, trading as "Cornish Radio Exchange," 100, Trelowarren Street, Camborne, and lately carrying on business at Plain-an-Gwarry, Redruth, and at Commercial Road, Hayle.—First and final dividend of 2s. 6 $\frac{1}{2}$ d. in the £ payable August 13th at the Official Receiver's Offices, 12, Princess Street, Truro.

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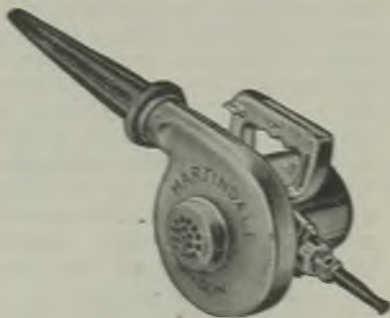
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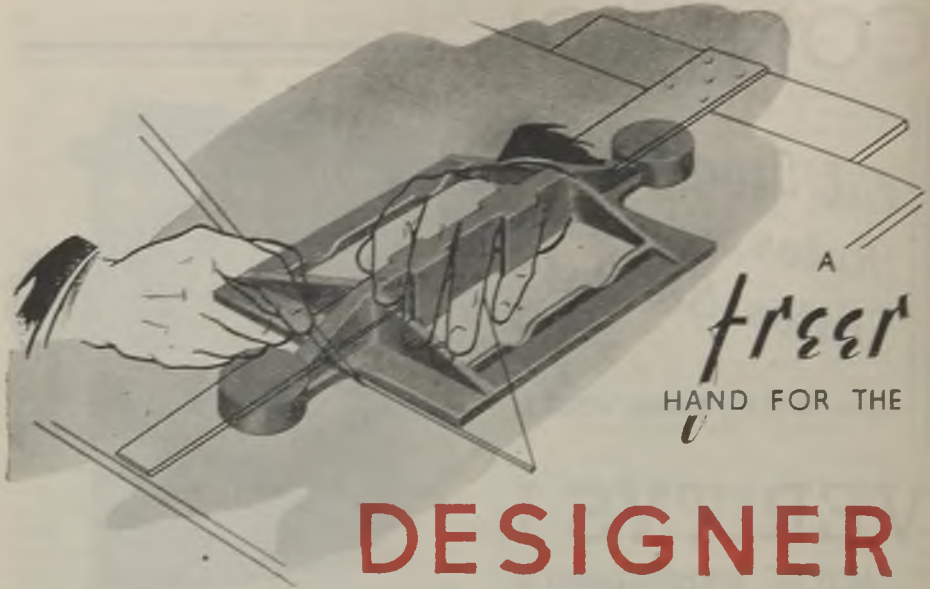
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STOCKS AND SHARES

TUESDAY EVENING.

THE news that the Japanese had submitted to conditional surrender brought about an upswing of prices which followed upon an earlier advance due to the entry of Russia into the Japanese war, and to the devastating effects of the atomic bomb. The slump that occurred as a result of the change of Government was largely wiped out. Prices in all the markets went better, those stocks connected in any way with the Far East being particularly buoyant. Previous buying had restored in some measure the falls that took place after the Socialist success at the polls. This week opened to find markets in cheerful mood, though the cautiously-minded did not forget that the King's Speech, on Wednesday in this week, might provide surprises.

Socialisation Stock

Nationalisation, it has been said, does not spell confiscation. It is assumed to mean, of course, that the State will take over variously-indicated services and industries, and pay for them. But on what basis, and what shape of payment will be given in exchange, are two points of baffling perplexity that worry the investor. The obvious *quid pro quo* for stocks and shares would be a Government issue, and speculation is already busying itself with talk of a possibly lowered Bank Rate, together with an offer of a Housing 2½ per cent. Loan at 100. For about thirteen years, save for brief periods, the Bank Rate has remained at 2 per cent., and the national credit has steadily improved, under conditions of tight monetary control, to 2½ per cent., or thereabouts.

Railways and Traction

Southern Railway 5 per cent. preferred, quoted at 76½ in our issue of July 27th, dropped to 63 on nationalisation fears, but has recovered to 70. The 5 per cent. preference stock at 110½ is ten points lower than it was three weeks ago. London Passenger Transport prior-charges are down, and the "C" stock at 60 has fallen 2½ points on the week. The deferred stock of the British Electric Traction is higher by 70 points at 105, but the 8 per cent. preferred ordinary at 170, a price which seldom changes, is down 20. Thomas Tillings are a lively market, and at 53s. 6d. have gained 6s. since a week ago.

Electricity Supply

Electricity supply shares have regained part of the losses they suffered in consequence of the General Election results. The London shares are a firmer market, City Lights, for example, being better at 29s. 6d. British Power & Light shares are 6d. up at 28s. 6d. Yorkshire Electrics, which fell 8s. to 36s. 6d., have recovered 2s. of the loss. Edmundsons rose ¼ to 27s. 6d. Two Scottish companies' shares show improvement, Clyde Valley at 37s. 6d.

and Scottish Power at 36s. 6d. In the overseas group, the Indian shares keep good, Calcutta Electrics being 67s. (Calcutta Trams hardened to 79s.). Victoria Falls Power at 92s. 6d. are half-a-crown better. Tokyo Electric sixes at 28½ rose 4 points on news of the Japanese surrender offer.

Equipment and Manufacturing

When the first shock of the General Election had worn off, the falls in prices of shares in the manufacturing group attracted notice and capital. Tube Investments regained 8s. 9d. to 5¼, Henley's 2s. 6d. to 28s., British Insulated & Callender's 4s. 6d. to 46s. Brush ordinary have gone back to 9s., Chlorides to 85s. De la Rue fell to 9½, and are now 10½. Crompton Parkinsons from 27s. 6d. have rallied to 31s. 6d. General Electrics are ¼ up at 92s. and Ever Ready at 41s. have regained 1s. Ransome & Marles rose to 85s.

Miscellaneous Movements

A. C. Cossor shares are 1s. 6d. better at 39s. Philco remain at 12s. Electrical & Musical at 33s. have added a florin to their last week's price. Cable & Wireless stocks are better, the ordinary at 88½, and the 5½ per cent. preference at 111½. Globe Telegraphs keep dull at 41s. Great Northern Telegraphs at 33½ are 5½ above the recent lowest. Atlas Electrics eased off to 7s. Power Securities are lower at 27s. Shares in the "heavy" list fell sharply on the new Government's policy of nationalising the coal industry. Babcock & Wilcox went down from 59s. 6d. to 52s., but were quickly rallied to 55s. on buying said to come mainly from the north.

Falk, Stadelmann

Falk, Stadelmann & Company will pay a dividend, on August 21st, making 10 per cent. for the year ended March 31st last. This is an increase of 2½ per cent. on the annual dividend paid for the four years 1941-1944 inclusive. The balance-sheet is clean; patents have been written down to £100. The lowest price of the ordinary shares of recent years was 12s. 4½d. in the dark days of 1940. Ten years ago it rose to 44s. 6d. At the present price of 37s. the yield, on the increased dividend, is 5½ per cent.

Telegraph Construction

Tuesday in this week, August 14th, was the last day for holders of Telegraph Construction to apply for the new shares to which they were entitled. The proprietor of the old issue was offered one new share at 50s. for every two old shares held. The new shares rank practically *pari passu* with the old, which stood at 63s. 9d. on July 24th, and are now 54s. ex rights. The market in the new shares started at 7s. premium, dropped to 2s. 6d. premium, and rallied to 4s. premium. The company is doing extremely well. Dividends of 10 per cent. are paid annually on the ordinary shares, allowing a yield of 4 per cent. at 50s.

Hot-punching Bakelite

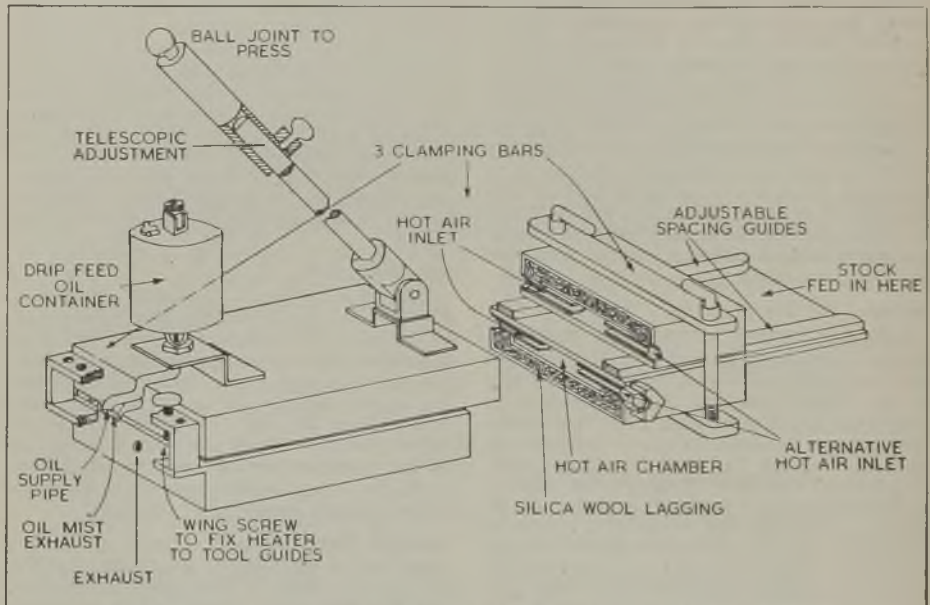
Continuous Preheating of Laminated Stock

SPECIAL grades of laminated bakelite sheet, generally ranging from 0.01 to $\frac{3}{16}$ inch thick, are manufactured for punching in presses similar to those used for metal stamping. Certain grades suitable for low-voltage insulation under oil, or for making components not subject to humidity, can be punched cold. But to preserve the highest electrical properties hot punching is preferable at from 100 to 140 deg. C.

An improved way of maintaining the laminated stock at the required temperature while it is being punched consists in passing the strip through an air-heated guideway attached to the punching tool. The strip is heated by physical contact with the air chests forming the guideway, which is of such length

during the punching operation. In addition, the exhaust may be used to spray a fine oil mist on to the tool, which would only be necessary for special jobs and would defeat one of the advantages of the process. There are means of adjustment for strips of different widths and thicknesses as well as standard tool fences for use with the heater. The principles involved are very simple and there is scope for wide variation in the design to adapt the equipment for use under most conditions likely to be encountered in practice.

The following results were obtained with a heater placed above the press so taking up no floor space and unlagged for demonstration purposes, the heater having a loading



Diagrammatic representation of method of preheating laminated bakelite strip

and is so heated that the strip attains the required temperature before reaching the tool.

Heated air exhausted from the chests is not wasted, but is blown on to the tool, both punch and die, which it keeps warm and free from swarf. The warmed strip coming into contact with the warm tool is not chilled

of $7\frac{1}{2}$ kW and being automatically controlled for heating 40 cu. ft. of free air per min. up to 500 deg. C.:

Thermostat set at 300 deg. C. Vol. of air used, approx. 10 cu. ft. of free air per min. Temperature of tool heated by warm exhaust air 65 deg. C. Temperature of air chest surfaces in contact with strip 300 to 110

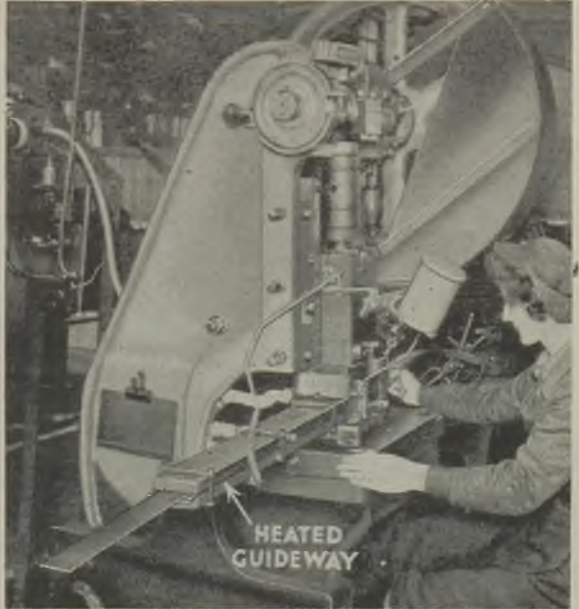
deg. C. Length of air chests, 27 in. Width of strip, $2\frac{3}{8}$ in. Thickness of strip, $\frac{1}{16}$ in. Rate of feed, 8 ft./min. No. of strokes of press, 30-50/min.

This heater is capable of supplying hot air to four presses of this size. The advantages of this new method may be summarised as follows: The temperature of the punching stock may readily be controlled. The stock is heated once only and not above the optimum punching tempera-

ture. The process is covered by British patent, which has been acquired by

Electrically heated punching press in works of Pye, Ltd., at Cambridge

ture; blistering of stock and the need to reheat are eliminated. The tool is heated and maintained at the correct temperature, thus preventing chilling of the stock. Swarf is automatically cleaned from the tool. There are no fumes or smell. The operation is clean and congenial to the operator; it is continuous, handling is reduced and output increased. Times studied on particular items have shown the output to



Bakelite, Ltd., who propose to make it freely available to interested manufacturers.

NEW BOOKS

Conference Leader Training. By Edward S. Maclin and Paul T. McHenry. (77 pp.) National Foremen's Institute, Deep River, Conn., U.S.A. (Obtainable through F. J. Burns Morton, Hillsborough, Clarendon Road, Hinckley, Leics.) Price \$2.

The "conference" of the title of this book is a gathering of works supervisors to discuss their day-to-day problems. It is explained how qualified leaders can be trained to help the members to analyse problems that are common in their various jobs.

Electroplating. By S. Field and A. Dudley Weill. Fifth edition. Pp. 483; figs. 95. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, London, W.C.2. Price 15s.

The fifth edition of this well-known textbook follows closely in time upon the fourth edition, published in 1943. Some attempt has been made by the authors to include recent work in order to keep the book up to date, although the additions seem to have taken the form of summaries rather than exhaustive accounts.

Among the new material is an account of the selenium rectifier for low-voltage DC supply, and an amplification of the section on alloy

deposition. Hard chromium and heavy nickel deposition, and electrolytic polishing are also dealt with. Opportunity has been taken to supplement the sections on the chemical analysis of plating solutions, by including the experimental details for the determination of addition agents in nickel plating baths, the tests for mercury in the alkaline zinc bath, and the analysis of lead solutions.

Generally speaking, the new edition maintains the standard of the earlier ones. Nevertheless, it is to be hoped that when circumstances permit, it will be possible to give fuller treatment to the more recent developments in this field.—J. R. I. H.

Rubber in Engineering (267 + xviii). Prepared by members of the staff of Imperial Chemical Industries, Ltd., and issued by the Advisory Service in Plastics and Rubber, Ministry of Supply.

Copies of this volume are being circulated to Service Departments and manufacturers in connection with the activities of the Services Rubber Investigation Panel. It is intended to be of primary assistance to engineers rather than rubber manufacturers.

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.

- A**KTIEBOLAGET Vibro - Betony. — "Electro-magnetic vibration motors." 11134/43. July 2nd, 1942. (570874.)
 British Thomson-Houston Co., Ltd. — "Machines for mounting filaments of incandescent electric lamps and the like." 16415/42. November 26th, 1941. (570803.) "Dynamo-electric machines." 18211/42. December 31st, 1941. (570838.) "Elastic-fluid turbines." 1312/44. January 25th, 1943. (570890.)
 British Thomson-Houston Co., Ltd. (General Electric Co.). — "Heating apparatus." 4830. March 15th, 1944. (570822.)
 British Thomson-Houston Co., Ltd., and A. P. Castellain. — "Reversible ratchet mechanisms." 18000. November 1st, 1943. (570817.)
 British Thomson-Houston Co., Ltd., R. Pohl and P. Mathews. — "Voltage control of AC generators." 9133. June 7th, 1943. (570872.)
 Chloride Electrical Storage Co., Ltd. (C. C. White). — "Separators for electric accumulators." 16884. October 14th, 1943. (570894.)
 English Electric Co., Ltd., E. Jones and D. N. Hunter. — "Method of and fluid for use for marking polyvinyl chloride material." 21763. December 28th, 1943. (570915.)
 H. Fraenkel, H. T. Pasmore and Automatic Coil Winder & Electrical Equipment Co., Ltd. — "Connectors for electrical instruments." 15696. September 24th, 1943. (570879.)
 General Electric Co., Ltd., R. L. Breadner and C. H. Simms. — "Sealing closure members to glass envelopes." 4809. March 15th, 1944. (570920.)
 International Polaroid Corporation. — "Coated light polarising material and process for manufacturing the same." 12335/42. November 15th, 1941. (570837.)
 J. Jany. — "Apparatus for X-ray photography or cinematography." 13463/42. September 18th, 1941. (570922.)
 H. W. K. Jennings (B. F. Sturtevant Co.). — "Separators for removing solid particles from gases." 20837. December 13th, 1943. (570910.)
 Soc. Anon. Landis & Gyr. — "Automatic regulator of temperature or other variable conditions." 11436/43. July 22nd, 1942. (570850.)
 G. Liebmann and Cathodeon, Ltd. — "Arrangement for adjusting small clearances between electrodes in discharge tubes." 14912. November 20th, 1941. (570834.)
 Mavor & Coulson, Ltd., and J. B. Mavor. — "Mining machines." 19446. November 20th, 1943. (570904.)
 P. A. H. Mossay. — "Hand-operated electrical regulating devices." Cognate applications 17812/43 and 20535/44. October 28th, 1943. (570936.)
 L. H. Pearson. — "Thermo-electric controls." 10205. June 24th, 1943. (570806.)

J. A. Sargrove. — "Methods of manufacturing electrical apparatus such as electronic communication apparatus and the like." 14129. August 30th, 1943. (570877.)

W. Scott. — "Speed-controlling means for direct-current electric motors." Cognate applications 16903/43 and 19997/43. October 14th, 1943. (570895.)

Siemens Electric Lamps & Supplies, Ltd., and J. N. Aldington. — "Projection apparatus using electric - discharge lamps." 196. January 6th, 1942. (570921.)

Henry Simon, Ltd., G. W. Calvert and G. B. Lett. — "Electrical connections of heating pads used in repairing pneumatic tyres." 13934. August 26th, 1943. (570876.)

F. Turnbull. — "Electrical terminals for electrical heating elements and the like." 19654. November 24th, 1943. (570819.)

Wardle Engineering Co., Ltd., and D. H. Ogley. — "Apparatus for raising, suspending and lowering elevated beacon, warning or other lights on their supports." 13691. August 23rd, 1943. (570855.)

Forthcoming Events

Tuesday, August 21st.—*Stockport.*—Mersey Hotel, 7.30 p.m. Association of Supervising Electrical Engineers (Manchester Branch). "The Electrically Heated Autoplate," by G. H. Parker.

Saturday, August 25th.—*Manchester.*—I.E.E. North-Western Students' Section. Annual summer visit (ladies invited). Meet outside Engineers' Club, 2.10 p.m. to travel by coach to the Park Green Mills of William Frost & Sons, Ltd., Macclesfield, thence to Rex Cinema, Wilmslow.

Tuesday, September 4th.—*Coventry.*—Coventry Electric Club. Open forum on "The Future of the Electrical Industry," Supply: F. W. Godden, A.M.I.E.E. Contracting and installation: G. S. Nott. Retailing and marketing: G. R. Marson. Manufacturing: N. M. Hill, M.I.E.E.

Wednesday, September 5th.—*London.*—At Institution of Mechanical Engineers, Storey's Gate, 6 p.m. Institution of Heating and Ventilating Engineers. "Thermionic Valve Control of Heating and Ventilating Installations," by S. B. Jackson.

Saturday, September 8th.—*Wakefield.*—Association of Mining Electrical and Mechanical Engineers (Yorkshire N.W. Branch). Presidential address by J. M. Langley.

Saturday, September 15th.—*Manchester.*—Engineers' Club, 3 p.m. Association of Supervising Electrical Engineers (Manchester Branch). "Motor Control Gear," by Mr. Mathieson.

Friday, September 21st.—*Manchester.*—Reynolds Hall, College of Technology, Institution of Electronics (N.W. Branch). "Theory, Design and Application of Magnetron Valves," by R. G. B. Gwyer, M.A.

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.—September 6th. Sydney County Council. Boiler feed pumps for Pyrmont "B." Spec. 758.

September 7th. Brisbane City Council. Three miles of multicore control cable. General manager.

September 10th. N.S.W. Public Works Department. System protection for 66-kV and 132-kV lines, Southern Electricity Supply.

November 2nd. Melbourne and Metropolitan Tramways Board. Pumps rectifier equipment. Tender No. 1251. Controller of Stores.

December 19th. Victorian Electricity Commission. Three water-driven turbo-generators and accessory plant for Kiewa. Spec. 45-46/3.

Birmingham.—August 29th. Electric Supply Department. Distribution transformers. (August 10th.)

September 12th. Electric Supply Department. Domestic apparatus. (See this issue.)

Bradford.—August 29th. Corporation. Static transformers. (August 3rd.)

Brierfield.—September 20th. Electricity Department. Switchgear equipment and transformers. (See this issue.)

Brighouse.—August 31st. Town Council. Transformers and switchgear. (August 3rd.)

Glasgow.—August 31st. Corporation Lighting Department. 500 lanterns for electric lamps. Specs., etc., from the Lighting Department, 20, Trongate.

Scotland.—October 15th. North of Scotland Hydro-Electric Board. 132-kV transmission lines. (August 10th.)

Sheffield.—August 27th. Electricity Department. Three 1,000-kVA 11,200/3,300-V transformers. (August 3rd.)

West Hartlepool.—August 27th. Town Council. Paper-insulated cables. (August 10th.)

West Riding.—September 1st. Standing Joint Committee. Electrical work in connection with adaptations at the West Riding Constabulary Headquarters, Wakefield. Specifications and forms of tender from the West Riding architect, County Hall, Wakefield.

Wilton.—August 25th. Borough Council. Supply and erection of a public lighting installation in the borough. Borough surveyor, Municipal Offices, Fugglestone House, Wilton.

Orders Placed

Australia.—Sydney County Council. Accepted. 16,000 yd. three-core 0.015 sq. in. oil-filled pressure paper-insulated lead-alloy sheathed, reinforced and waterproof cable for 33-kV operation, together with joints, etc., and leakage indicator system (£54,546).—British G.E.C. 4,500 yd. three-core 0.025 sq. in. p.i. screened lead-alloy sheathed and armoured cable for 33 kV, together with compounds (£18,999).—

Standard Telephones & Cables Pty. 3,000 yd. 0.3 sq. in. four-core p.i. lead-alloy sheathed and armoured cable and 500 yd. 0.3 sq. in. single-core p.i. and lead-alloy sheathed cable for 660 V (£7,577).—Gilbert Lodge & Co. Pty. (Tenders, Melbourne).

Barrow-in-Furness.—Electricity Committee. Accepted. Switchgear modifications: Shipyard substation (£117).—B.T.H. Co. Abbey substation (£245).—Metropolitan-Vickers.

Durham.—County Council. Accepted. Electric mixers at Chester-le-Street and Stockton Institutions (£451).—Lancashire Dynamo & Crypto.

Newcastle - on - Tyne.—City Council. Accepted. Equipment for the trolley-bus undertaking:—Bracket arms (£460).—British Insulated Callenders Cables' Traction poles (£5,891).—Stewarts & Lloyds. Copper wire (£2,024).—Thomas Bolton & Sons.

St. Marylebone.—Electricity Committee. Accepted. Cable laying (£2,492).—John Mowlem & Co. Meters for one year at existing rates.—Chamberlain & Hookham and Ferranti.

Tasmania.—Hydro-Electric Commission. Accepted. Four single-phase 5,000-kVA transformers, 11/110 kV, making a 15,000-kVA three-phase bank with one spare unit.—Hackbridge Electric Construction Co.

Hobart City Council. Accepted. 500-kW mercury arc rectifier and a 300-kW rectifier.—Hewitt Electric Co.

Woolwich.—Accepted. Electricity Committee. Cable.—Siemens Bros. (£998) and Standard Telephones (£876).

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.

Altrincham.—New hospital (180 beds); H. S. Fairhurst & Son, architects, 55, Brown Street, Manchester, 2.

Ashby-de-la-Zouch.—Cottage hospital (£50,000); clerk to the Cottage Hospital Committee, Ashby-de-la-Zouch, Leicestershire.

Ashton-under-Lyne.—Works extensions, Wellington Street; J. C. Carlson, Ltd., Newman Street Mills.

Atherstone.—Houses (32), several sites, for R.D.C.; H. N. Jepson, architect, Midland Bank Chambers, Nuneaton.

Barrow-in-Furness.—Reconstruction of Central Station; L.M.S. Railway Co.

Bath.—Central bus station, Manvers Street, and training college for women teachers, Newton Park; J. Owens, city engineer, Guildhall.

Blackpool.—Works offices for Airey Construction Co., Ltd.; Fairbrother, Hall & Hedges, architects.

Bridge of Allan (Stirlingshire).—Houses (50); town clerk, Burgh Chambers.

Birkenhead.—Works extensions; Wright & Beyer, engineers, Old Bidston Road.

Houses (30), The Dell, Derby Road and Hoylake Road sites, for Town Council; Lloyd & Cross, Ltd., 68, Argyle Street.

Chesterfield.—Rebuilding church; Rev. R. S. Boden, St. Augustine's Vicarage, Derby Road.

Coulson.—Factory, Chipstead Valley Road; Alfred Cox (Surgical), Ltd.

Darlington.—Houses (28), Parkside site; W. Dickinson, builder, Darlington.

Dartford (Kent).—Houses (78), Princes Road estate; J. J. Hurtley, Town Clerk, Council Offices.

Depwade.—Houses (36), four sites; A. F. Scott & Sons, architects, 23, Tombland, Norwich.

Fifeshire.—Houses (250) for County Council; county clerk, Cupar.

Gateshead.—Completion of administrative block, Queen Elizabeth Hospital (£20,000), and houses (90), Highfield estate; borough engineer.

Glasgow.—Works extensions, Uist Street; C. Wishart Hall & Co.

Extension of Possilpark tram depot; Corporation transport manager, Bath Street.

Halesowen.—Houses (24) for Town Council; A. T. Butler, architect, 31, Priory Street, Dudley.

Hinckley.—Houses (48) for U.D.C.; Hinckley & District Building Trade Employers' Association, Ferndale, Hill Street.

Isle of Ely.—Staff accommodation at County Hospital, Doddington; R. D. Robson, county architect, March, Cambs.

Liverpool.—Houses (1,000), shops, maisonettes and garages, Speke estate; Unit Construction Co., Ltd., builders, Bentham Drive.

Flats, Hurst Street (£125,842); C. J. Doyle, Ltd., contractors, 15, Victoria Street.

London.—St. PANCRAS.—Working-class flats, Queen's Crescent; Waggett & Bradford, surveyors, 25, Victoria Street, London, S.W.1.

SHOREDITCH.—Flats (85), Stonebridge estate, Haggerston; borough architect, Town Hall, Old Street, London, E.C.1.

WANDSWORTH.—Reconstruction of block of flats, Nelson's Row, Clapham (£16,190); William Willett, Ltd., contractors, Sloane Square, London, S.W.1.

Manchester.—Additions, motor works, Strangeways; J. W. Beaumont & Sons, architects, Danlee Buildings, 53, Spring Gardens.

Market Drayton.—Houses (120); J. B. Cooper, architect, 177, Corporation Street, Birmingham, 4.

Middleton.—Extensions, Fielding Mill, Fielding Street; Yorkshire Dyeing & Proofing Co., Ltd., 37, Peter Street, Manchester, 2.

Morpeth.—Houses, Lynemouth, for the R.D.C.; Mauchlen & Weightman, architects, 12, Saville Row, Newcastle-on-Tyne.

Bungalows, Benwell Hill Road; Rochester & Kirk, Ltd., builders.

Newcastle (Staffs).—Secondary School, Ashwells; Priest-in-Charge, St. Patrick's Church, Newcastle, Staffs.

Residential flats, Westlands estate; Architects' Department, Estate Office, Bournville Village Trust, King's Norton, Birmingham, 30.

Newcastle-on-Tyne.—Houses (133) at Longbenton and Blakelaw; city architect, 18, Cloth Market, Newcastle.

North Riding.—Prefabricated huts at Clifton Without Junior and Infant School; county architect, County Hall, Northallerton.

Northenden.—Works extensions, Bradnor Road, for C. H. Johnson & Sons; J. H. Sellers & Son, architects, 78, King Street, Manchester, 2.

Northumberland.—Farm institute, and modern and primary schools, Bellingham; county architect, County Hall, Newcastle-on-Tyne.

Norton (Yorks).—Conversion of rectory into flats (£6,000); R.D.C. surveyor.

Rothbury.—Conversion of Coquetdale Cottage Hospital into nursing home (£3,000); trustees.

Salford.—Additions, soap works, Lower Kersal; Cussons, Sons & Co., Ltd., Kersal Vale.

Scunthorpe.—Houses (40), for U.D.C.; R. M. Phillips, contractor, Brigg.

South Shields.—Houses (22), Grosvenor Road, etc.; J. W. Ridley, builder, Park Lane, Sunderland.

Stoke-on-Trent.—Houses (78), Chell Heath; C. Cornes & Sons, builders, Lichfield Street, Hanley, Staffs.

Sunderland.—Houses (100), Springwell Farm, for Town Council; J. Clark & Son, builders, New Seaham, Co. Durham.

Houses, Grindon Lane, for A. V. Clerey & Son, builders, 14, Frederick Street.

Brewery, High Street East, for R. Fenwick & Co.; J. Potts & Son, architects, John Street.

Tamworth.—Houses (41), Glascote and Wilnecote, for R.D.C.; Asphalt & Public Works, Ltd., builders, Norwich Union Chambers, Congreve Street, Birmingham.

Torquay.—Transformer house, Daison Quarry; Western Counties Brick Co.

Tynemouth.—Two secondary schools and county college; borough engineer.

Wallingford.—Houses (24), Didcot, for R.D.C.; F. H. Floyd, architect, St. Nicholas House, West Mills, Newbury, Berks.

Walsall.—Houses; Sabin & Young, builders, Pelsall Lane, Rushall (41); Wilson Towers & Co., Tettenhall, Wolverhampton (36) and Midland Building Trust, 188, Lodge Lane, Birmingham (29).

Wallsend.—Factory; Malone Instrument Co., Ltd.

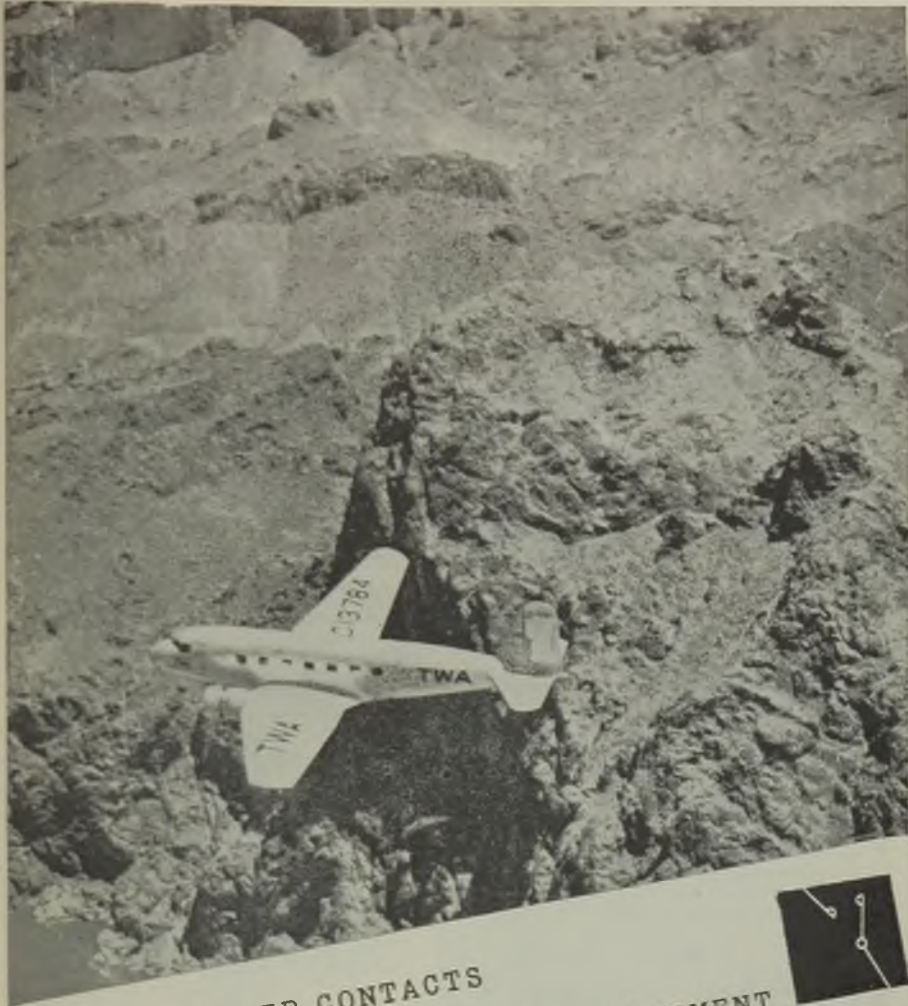
Warwickshire.—Maternity home, Kenilworth Road, Leamington (£11,500) and maternity home, Ashlawn Road, Rugby (£100,000); county architect, Warwick.

Watford.—New hospital (£1,000,000); St. Bartholomew's Hospital Committee, London.

West Bromwich.—Houses (48), for Town Council; Bradie & Co. (Wolverhampton), Ltd., 29, Clarence Street, Wolverhampton.

West Hartlepool.—Houses, near Newlands Avenue, for W. Pearson & Son, builders, Stranton.

Weymouth.—Completion of houses, Hereford Road (£18,650), for Town Council; James Bros., contractors, Weymouth.



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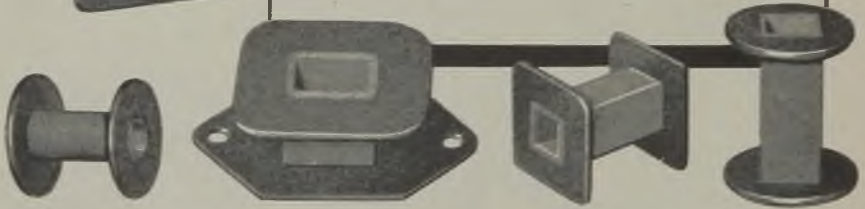


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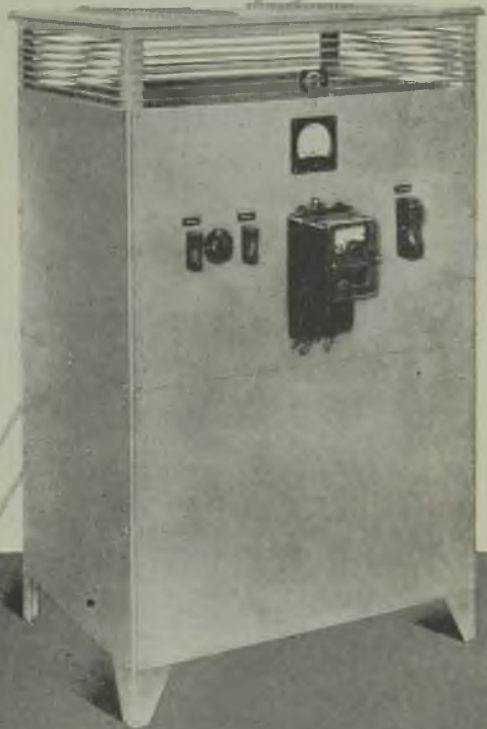
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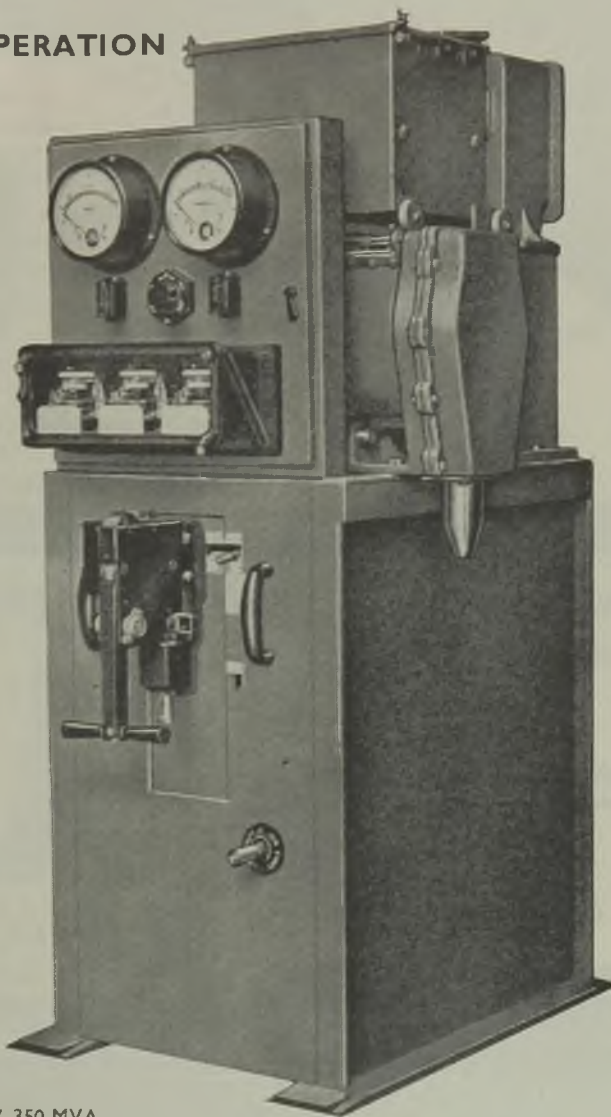
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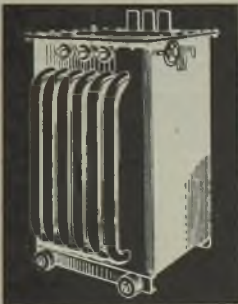
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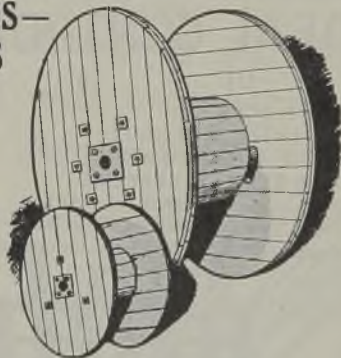
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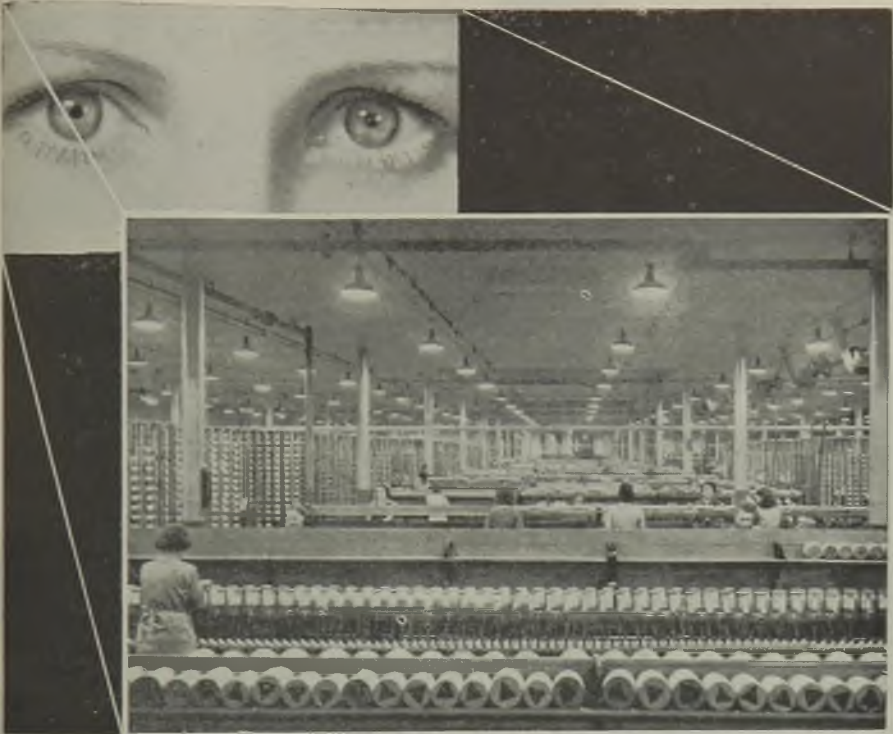
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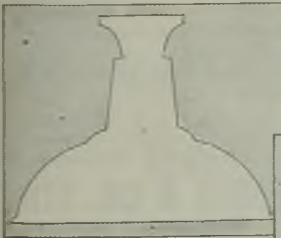
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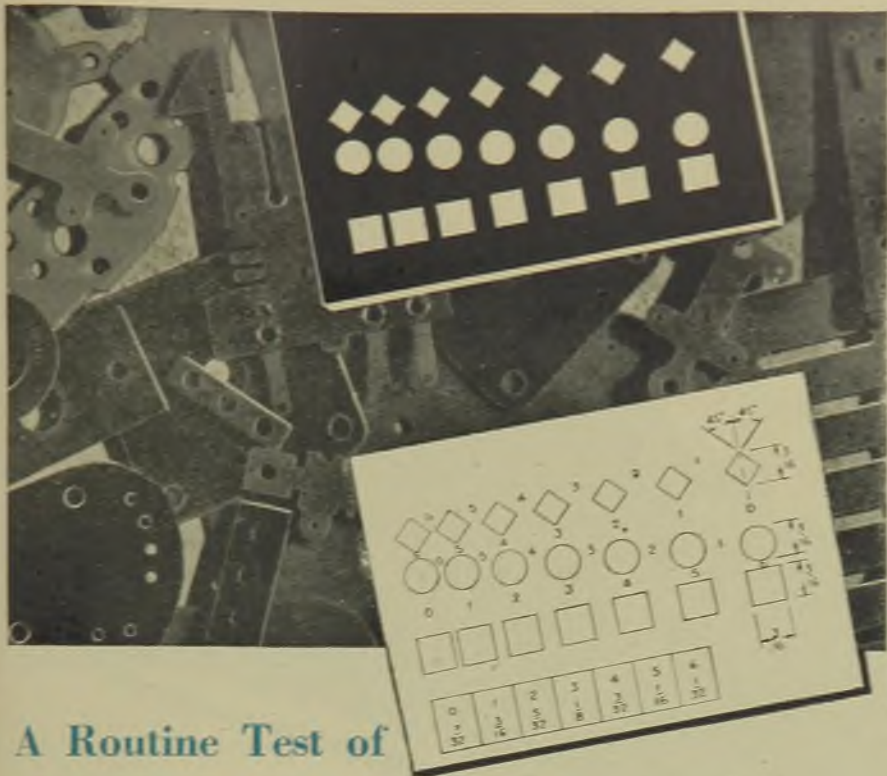
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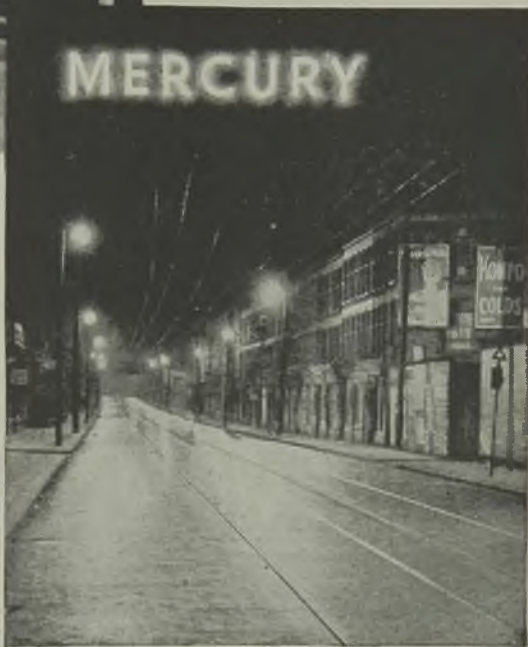


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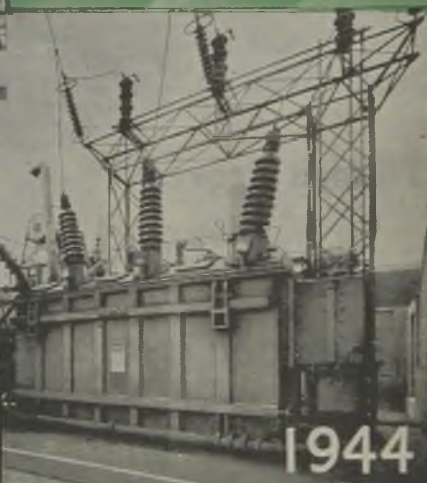


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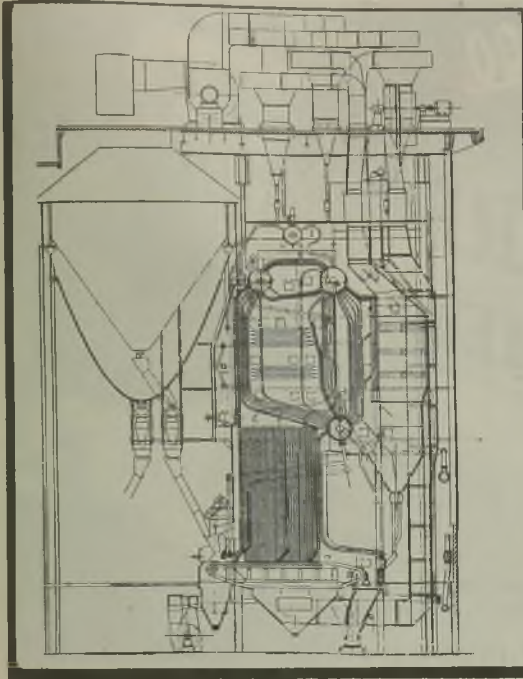


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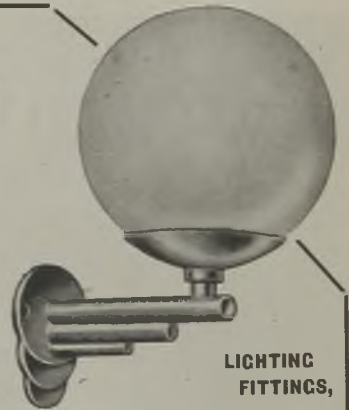
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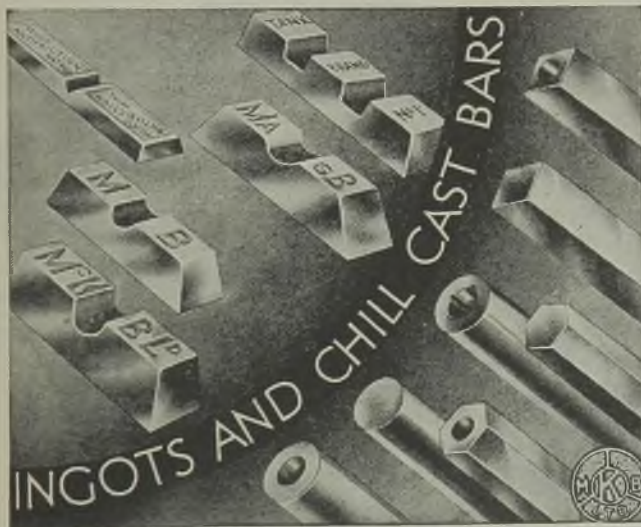
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McKechnie Non-Ferrous Ingots are uniform in composition and therefore easier to melt and handle. Produced by a perfect plant under constant supervision to the correct analysis, the McKechnie range of Non-Ferrous Ingots covers the entire need of the Brass Foundry. McKechnie Chill Cast Bars are closer in structure than Sand Cast Bars and possess greater homogeneity and resistance with an absence of segregation. They are clean, concentric and sound.

Apart from the saving on tool costs and labour which naturally follows the use of Chill Cast as against Sand Cast Bars the saving in scrap and turnings is very considerable.

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MCKECHNIE BROS. LTD.

Brass, Aluminium Bronzes & High Strength Brass Rods, Stampings & Non-Ferrous Ingot Metal Manufacturers

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The Aircraft Carrier Deadly, dangerous—that is the Carrier. Secure, safe—that is “Pyrotanax”; the mineral insulated, copper covered cable. And that’s why “Pyrotanax” cables are used in Carriers*—those highly organised instruments of destruction which, paradoxically, demand the highest degree of safety and security in their equipment.

* *And other Naval Craft.*

**FIRE RESISTANT • UNAFFECTED
BY OIL, WATER, CONDENSATION,
ACCIDENTAL OVERLOAD OR GROSS
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Telephone : ABBey 1654

BIRMINGHAM OFFICE : 2 Moor Street, Birmingham 4
Telephone : Midland 1265

GD.17

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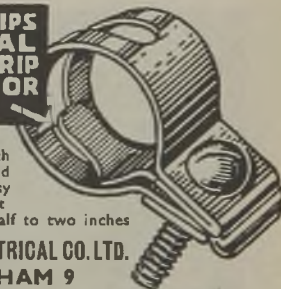


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**EARTHING CLIPS
WITH SPECIAL
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INTO TUBE OR
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Note the tongue which ensures perfect and permanent contact. Easy to fix. Nuts cannot turn. All sizes from half to two inches

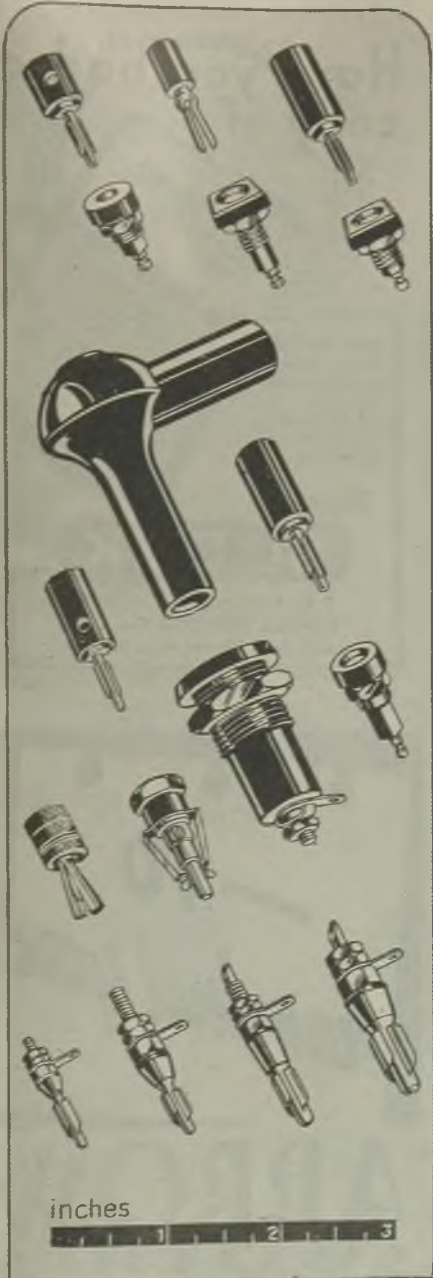
**THE DONOVAN ELECTRICAL CO. LTD.
BIRMINGHAM 9**

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*Trustworthy
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**Oil Proof Petrol Proof Non Inflammable Non Ageing
DURATUBE & WIRE LIMITED
Fagg Road - FELTHAM - MIDDLESEX**



BELLING & LEE LTD
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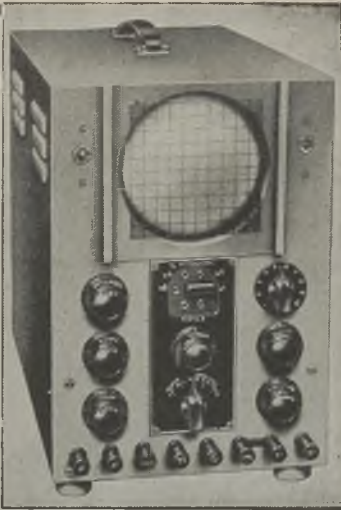
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 Save the headache and ask
W.B&G
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Don't give yourselves unnecessary headaches over that job which is a worry to you, but which is just bread and butter to us! We have solved a few thousand presswork problems in our time!

We work in all metals and to most specifications.

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VISUAL TWO - DIMENSIONAL de-
lineation of any recurrent law.

RELATIVE TIMING OF EVENTS and
*other comparative measurements with
 extreme accuracy.*

PHOTOGRAPHIC RECORDING of
transient phenomena.

SIMULTANEOUS INDICATION of
two variables on a common time axis

Completely embracing all the above func-
 tions, the unique Cossor DOUBLE BEAM
 Cathode Ray Tube as embodied in Model 339
 Oscilloscope, is inherently applicable to all
 problems arising in the

**RECORDING
 INDICATING and
 MONITORING**

of effects and events in Electrical engineer-
 ing; and in Mechanical engineering when
 the effects can be made available as a voltage.
 Recurrent traces are studied visually and
 transients may be photographically recorded
 with Model 427 Camera.

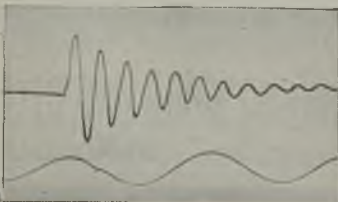
A. C. COSSOR Ltd

Instruments Dept.

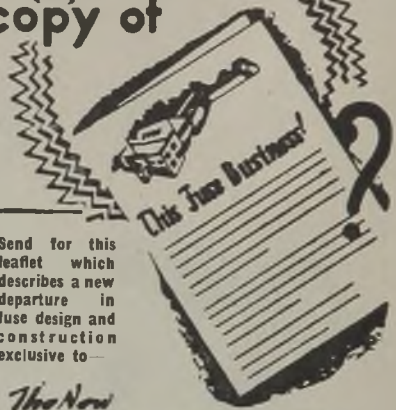
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Phone : CANonbury 1234 (30 lines).

Grams : Amplifiers Phone London.



Have you had a
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Send for this
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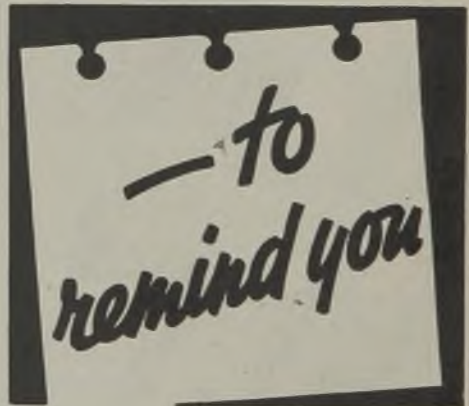
5 to 100 amp.

Fuses

Edward Wilcox & Co. Ltd.

Sharston Road, Wythenshawe, Manchester

dml269



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 SWITCHES**

Arrow Electric Switches Ltd.
 HANGER LANE, LONDON, W.5



**Remember
the name-
you'll want
it again**



**TESTED SUPER STEEL
CONDUIT**

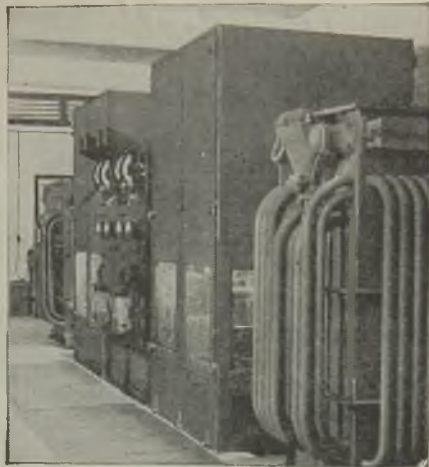
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SMETHWICK, BIRMINGHAM**

Telephone Smethwick 1511 (5 lines)

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Typical Hewittic Rectifier for Industrial Supply

CONVERTING A.C. to D.C.

The simplest, most reliable converting plant made, backed by over 30 years of rectifier experience; robust, easily installed, occupying minimum floor-space, **operating unattended** (even in the largest installations), with high efficiency (down to the lowest loads) and corresponding economy in operation.

— FOR —

All forms of Electric Traction,
D.C. Industrial Drives,
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Systems,

Battery Charging for Electric Vehicles,
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—for every application where D.C. is
required from A.C. supply.

**OVER 750,000 kW IN
WORLD-WIDE SERVICE**

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WALTON-ON-THAMES, SURREY**

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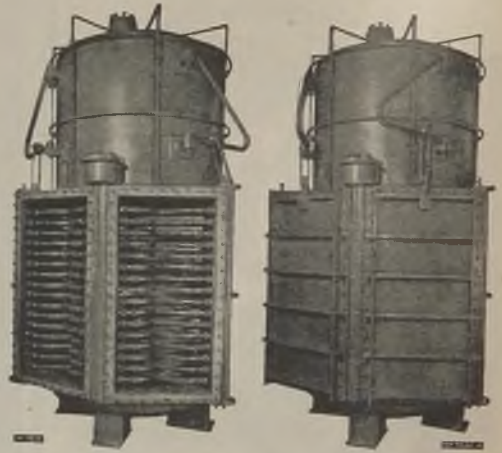
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MODERN POWER STATION EQUIPMENT

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DE-AERATORS; LOW AND
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STEAM EJECTOR AIR PUMPS
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THE MIRRLEES WATSON
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SMALL TRANSFORMERS

LIGHTING : INDUSTRIAL : RADIO

Chokes, resistors, magnet
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Approved for Services use.

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V.I.R. & THERMOPLASTIC, BRAIDED, LEAD COVERED & SHEATHED

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Head Office : 156-170 Bermondsey Street, LONDON, S.E.1
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"FLUXOMATIC"
THE NEW CHARGING SYSTEM!

Railway Engineers and all users of traction Batteries have, for many years, sought a battery charging system that is automatic in operation.

The Davenset Fluxomatic System has provided the answer.

Without manual control, a constant pre-determined current is maintained against a rising battery voltage.

The charging rate, having been pre-set, is unaffected by normal mains fluctuations, and the regulation of the charge current is entirely automatic, irrespective of the battery voltage.



The advantages of these features, coupled with a reduction in the re-charging time, will be apparent to all battery users, and we shall be glad to send full particulars and diagrams on application.

E. PARTRIDGE WILSON & CO. LTD.
 MANUFACTURING ELECTRICAL ENGINEERS
 DAVENSET ELECTRICAL WORKS, LEICESTER.

**CONTACTOR TYPE STARTERS
 FOR A.C SERVICE**

IGRANIC ELECTRIC CO. LTD. specialise in the manufacture of Contactor Type Starters for all types of Electric Motors for all classes of Service. Equip your electrically driven machine with the correct control gear to protect your motor and machine by specifying IGRANIC.

Illustration shows type 1080 Combined Stator and Rotor Starter.



IGRANIC ELECTRIC CO. LTD.
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SECONDHAND A.C. MOTORS AND STARTERS FOR IMMEDIATE DELIVERY

A.C. 400/440 volt. 3 phase, 50 cycle Motors for sale

H.P.	R.P.M.	Make	Type	Lying at
200	735	Bruce Feebles	Slipring	Inverkeithing Depot
40	720	Brook	Slipring	Ellison starting gear
Two 10	1000	Brook	Squirrel Cage	Ellison starting gear
1	480	Brook	Squirrel Cage	
Two 2	1500	Brook	Squirrel Cage	
H.P.	R.P.M.	Make	Type	Lying at
200	735	E.E.C.	Slipring T. Enclosed	Sheffield Works
100	600	Brook	Slipring	Ellison starting gear
110	600	Brook	Slipring	Ellison starting gear
65	725	B.T.H.	Slipring	Ellison starting gear
25	750	Brook	Slipring	Ellison starting gear
25	470	Brush	Slipring	Starting gear
5	950	Brook	Squirrel Cage	
2	710	B.T.H.	Squirrel Cage	
5	720	Brook	Squirrel Cage	
1	480	Brook	Squirrel Cage	
H.P.	R.P.M.	Make	Type	Lying at
110	600	Brook	Slipring	Preston Depot
25	750	Brook	Slipring	Ellison starting gear
				Ellison starting gear

A.C. 350 380 volt. 3 phase, 50 cycle Motors for sale

H.P.	R.P.M.	Make	Type	Lying at
60	580		Slipring	Barrow Depot
45	950	Brook	Slipring	
11	950	Brook	Squirrel Cage	Ellison starting gear

Telegrams:
"Forward,
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THOS W. WARD LIMITED
ALBION WORKS - SHEFFIELD

Telephone:
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(15 lines)

LONDON OFFICE:—
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BRITON FERRY
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SCOTSTOUN, GLASGOW, W.4



Window
Lights
will
go up
soon!

WRITE FOR "HARCORAY" BROCHURE
ILLUSTRATING COMPLETE RANGE OF
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SHOWCASE LIGHTING.

Harcourts
LIMITED

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THE LARGEST BUYERS OF
HEATING ELEMENTS BUY FROM

Wireohms Ltd.

PEASHILL ROAD
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WHO SUPPLY ALL TYPES OF ELECTRIC
ELEMENTS FOR MANUFACTURERS

**PRESSED STEEL
SCREWED FITTINGS**

Flexible Metallic
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CONDUIT
FITTINGS



FITTER & POULTON LTD

VINCENT PARADE
BALSALL HEATH
BIRMINGHAM 12

CONDENSING PLANT

Surface and Jet Types

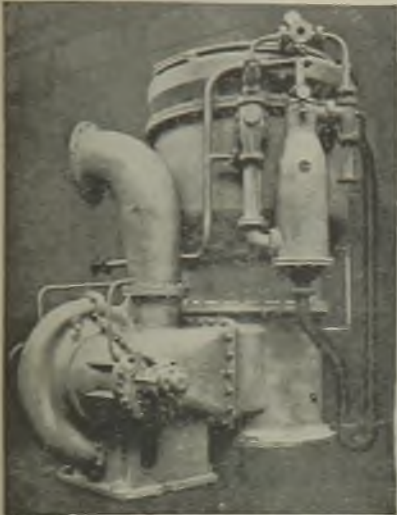
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AUXILIARY EQUIPMENT

from

Turbine Flange to Boiler Check Valves

The illustration shows a Hick Hargreaves Low Level jet type Condensing Plant with "Hivac" Ejector and split casing Extraction Pump working in conjunction with a 5,000 kW. Turbo-Alternator.



HICK HARGREAVES

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Phone :
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Grams :
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*No sore points
with operators--*



*-- when
the blades are
MACROME
treated!*

MACROME LTD. (Dept. A8.) ALCESTER, WARWICKSHIRE

ALSO AT LONDON, GLASGOW, MANCHESTER, LEEDS, SOUTHAMPTON, BIRMINGHAM

Do you use "distilled" water?

Permutit "Deminrolit" Process cuts cost as much as 95%

ANALYSES OF WATER BEFORE AND AFTER TREATMENT BY PERMUTIT 'DEMINROLIT' PLANTS IN COMMERCIAL USE.

(Note - All figures in parts per 100,000.)

Plant	No. 1		No. 2		No. 3	
Water	Crude	Treated	Crude	Treated	Crude	Treated
Cations						
Calcium Ca	3.2	-	9.4	-	10.7	-
Magnesium Mg	0.8	-	0.36	-	1.09	-
Sodium Na	0.46	0.23	1.0	0.31	1.66	0.44
Total	4.46	0.23	10.76	0.31	13.45	0.44
Anions						
Carbonate CO ₃	4.2	0.24	12.4	0.29	10.5	0.57
Chloride Cl	1.8	0.06	2.5	0.12	2.84	0.30
Sulphate SO ₄	1.35	-	3.48	0.03	11.95	-
Nitrate NO ₃	-	-	-	-	1.15	-
Total	7.35	0.30	18.38	0.44	26.44	0.87
Total ions in solution	11.81	0.53	29.14	0.75	39.89	1.31
COST per 1000 gallons	5.22d		9.83d		16.5d	

The table shows the composition of some types of water before and after treatment by Permutit's "Deminrolit" Process. Water similar to a distillate is produced by this process at a fraction of the cost. Where distilled water was too expensive you can afford "Deminrolit" water. The process has been in practical use in Great Britain for over 7 years. Write for technical publication "Distilled Water without Distillation" to

PERMUTIT Company Limited

Dept. T.W., Gunnersbury Avenue, London, W.4.

Chiswick 6431

AGRO BAKELITE BLOCKS

THE ALTERNATIVE TO WOOD BLOCKS



AS SUPPLIED TO THE
AIR MINISTRY
PROMPT DELIVERY



- No. 5050 Round type for one 2" or 2½" 5-ampere switch.
- No. 7070 Round type for one 2" centre Ceiling Rose.
- No. 8080 Oblong type for two 2" or 2½" 5-ampere switches.

BROWN BAKELITE

Marketed by

T.M.C. HARWELL (SALES) LTD.

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Telephone: TFMble Bar 0055 (3 lines)

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QUICK RELIABLE REPAIRS
AND
REWINDS

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Sperryn
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T. A. LAMPHOLDER

Suitable for Gas-filled lamps.
Will operate at 10 amps continuously.
Stands up to the hottest lamps.

Manufactured by

SPERRYN & CO. MOORSOM ST. WORKS
BIRMINGHAM

Established over 50 years



Some achievements of British Industry
under the impetus of war.

(vide "Statistics relating to the war effort of the
United Kingdom." H.M.S.O. Nov. 1944.)

THE POWER BEHIND PRODUCTION

AT COUNTLESS WORKS AND FACTORIES

is carried by

**PIRELLI GENERAL
CABLES**

made at Pirelli-General Cable Works

The Cables that play a vital part both
in the production and the operation of
equipment for war



Get it from the S.E.C.

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.

OFFICIAL NOTICES, TENDERS, ETC.

CITY OF BIRMINGHAM ELECTRIC SUPPLY DEPARTMENT

Domestic Apparatus

THE Electric Supply Committee invites tenders for the supply and delivery during the period ending 30th September, 1946, of

Spec. No.	Item
S & D/A 24	Electric Kettles.
" 25	Saucepans.
" 26	Cookers.
" 27	Wash Boilers.
" 28	Circulator Water Heaters.
" 29	Cooker Control Units.
" 30	Circulator Control Units.

The General Conditions of Contract (which include the Corporation's usual Fair Wages and Conditions of Labour Clause), Specifications and Forms of Tender may be obtained on application to the undersigned, stating which Specifications are required.

Sealed Tenders, enclosed in the official envelope provided and endorsed for the purpose, must be delivered to the undersigned Not Later than 10 a.m. on Wednesday, 12th September, 1945, when they will be opened. Tenders not complying with the foregoing will be rejected.

The Committee does not bind itself to accept the lowest or any Tender.

F. W. LAWTON,
Chief Engineer and Manager.

14 Dale End,
Birmingham, 4.
4th August, 1945.

2567

BRIERFIELD URBAN DISTRICT COUNCIL

Electricity Department

2 250-kVA Transformers

TENDERS are invited for the supply, delivery and placing into position of 2 250-kVA Three-phase 6,600/400 volts Transformers.

Specifications, etc., from N. Ashton, A.M.I.E.E., Engineer and Manager, Electricity House, Colne Rd., Briarfield, on payment of a fee of one guinea, which amount will be refunded on receipt of a bona fide tender.

Tenders to be delivered by 10 a.m. on Thursday, 20th September, 1945.

H. L. SMITH,
Clerk to the Council.

Town Hall,
Brierfield, Lancs.
10th August, 1945.

2580

CITY AND COUNCIL OF BRISTOL

THE installation of a system of Automatic Control of Electric Street Lighting is being considered and any interested firm can have further particulars on application to the City Engineer.

7, College Fields,
Clifton, Bristol. 8

2554

BRIERFIELD URBAN DISTRICT COUNCIL

Electricity Department

Switchgear Equipment

TENDERS are invited for the supply, delivery and erection of 6,600 volts Metal-clad Switchgear.

Specification, etc., from N. Ashton, A.M.I.E.E., Engineer and Manager, Electricity House, Colne Rd., Briarfield, on payment of a fee of one guinea, which amount will be refunded on receipt of a bona fide tender.

Tenders to be delivered by 10 a.m. on Thursday, 20th September, 1945.

H. L. SMITH,
Clerk to the Council.

Town Hall,
Brierfield, Lancs.

10th August, 1945.

2579

SITUATIONS VACANT

None of the vacancies for women advertised in these columns relates to a woman between 18 and 40 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 WALTHAMSTOW ELECTRICITY DEPARTMENT

Mains Assistant

APPPLICATIONS are invited from qualified Electrical Engineers for the position of Mains Assistant. Salary in accordance with National Joint Board Schedule: Class G, Grade 8A (at present £413 p.a.).

Applicants must have had a sound technical training, together with a practical experience in the installation and operation of H.T. and L.T. underground mains on A.C. and D.C. systems.

Corporate or Graduate Membership of the Institution of Electrical Engineers or equivalent qualifications are essential.

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

Applications (on form to be obtained from the Electrical Engineer and Manager, Electric House, Church Hill, E.17), should be delivered to the undersigned not later than Friday, 7th September, 1945, and must be accompanied by copies of two testimonials.

Canvassing, either directly or indirectly, will be deemed a disqualification and candidates must disclose in writing whether to their knowledge they are related to any member of, or holder of any senior office under, the Council. A candidate who fails to do so will be disqualified, and, if appointed, will be liable to dismissal without notice.

The Ministry of Labour and National Service have given permission under the Control of Engagements Order, 1945, for the advertisement of this vacancy.

E. S. RILEY, M.I. Mech. E., M.I.E.E.
Borough Electrical Engineer and Manager.

2564

APPOINTMENT OF FOUR RESIDENT ENGINEERS AND FOUR ASSISTANT RESIDENT ENGINEERS FOR INDIA

A PPLICATIONS are invited for the above posts in the Electricity Supply Department of Messrs. Martin & Co., Calcutta, to fill vacancies in their Electricity Supply Undertakings in the United Provinces and Central Provinces of India.

Grade B. Applicants for the posts of **RESIDENT ENGINEER** should be fully qualified Electrical Engineers between the ages of 35 and 40 years, and should have had at least four years' executive and commercial experience in the control and management of an Electricity Supply Undertaking.

Grade A. Preference will be given to those with additional qualifications, e.g., Chartered Electrical Engineers, Chartered Mechanical Engineers and those with at least four years' experience in the efficient maintenance, operation and control of a modern thermal power station.

Grade B. Applicants for the posts of **ASSISTANT RESIDENT ENGINEER**, preferably unmarried, should be between the ages of 25 and 30 years, with sound technical training and practical experience in Electrical Engineering.

Grade A. Preference will be given to those with additional qualifications, e.g., Bachelors of Science, Student, Graduate or Corporate Members of the Institutions of Electrical Engineers, and those with at least four years' practical experience in the generation and/or distribution of electricity.

SALARY SCALE (1 rupee equals 1s. 6d. approx.). Grades according to qualifications.

RESIDENT ENGINEER: Grade A, Rs. 1,250/-, rising by annual increments of Rs. 100/- to Rs. 1,750/- per month. Grade B, Rs. 1,000/-, rising by annual increments of Rs. 50/- to Rs. 1,200/- per month.

ASSISTANT RESIDENT ENGINEER: Grade A, Rs. 750/-, rising by annual increments of Rs. 50/- to Rs. 950/- per month. Grade B, Rs. 625/-, rising by annual increments of Rs. 25/- to Rs. 725/- per month.

All posts carry a 5 years' agreement, with free passages, a liberal house and car allowance, free medical attention and liberal home leave on renewal of contract.

Successful applicants will be required to pass a medical examination and contribute to the Company's Provident (Superannuation) Fund.

Applications, stating post applied for, age, whether married, qualifications, particulars of education, training and experience, and accompanied by copies of not more than three testimonials or references, should be addressed to "F. D." c/o Charles Barker & Sons Ltd., 31, Budge Row, London, E.C.4. 2532

CITY OF PETERBOROUGH

Electricity Department

Appointment of Consumers' Engineer

A PPLICATIONS are invited for the above position from Engineers who have had a sound training and wide experience with a Supply Authority in the preparation of specifications and estimates in connection with water and space heating schemes, modernisation of industrial plant, and electrical development of domestic and commercial supplies; the servicing, reconditioning, installation, testing and maintenance of electrical equipment; and generally dealing with consumers' enquiries.

Preference will be given to candidates who are Corporate Members of the I.E.E.

Salary will be in accordance with Class G, Grade 7, of the N.J.B. Schedule of salaries, at present £445 per annum.

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

Applications, stating age, qualifications, training and experience, together with copies of not more than three recent testimonials, should be enclosed in an envelope endorsed "Consumers' Engineer," and must reach the undersigned not later than August 31st, 1945.

The Ministry of Labour and National Service, Technical and Scientific Register, have given permission under the Control of Engagement Order, 1945, for the advertisement of this vacancy.

ARTHUR J. REEVES.

Town Clerk.

Town Hall,
Peterborough.
3rd August, 1945.

2548

COUNTY BOROUGH OF STOCKPORT

Electricity Department

THE Ministry of Labour and National Service Technical and Scientific Register, have given permission under the Control of Engagement Order, 1945, for the advertisement of this vacancy.

Mains Engineer

Applications are invited for the position of Mains Engineer, from persons who are Corporate Members of the I.E.E. and have had experience in the operation and maintenance of distribution work covering 33 kv., 6.6 kv. and L.T. transmission systems.

Applicants will be required to take charge of layout and planning of distribution works, including E.H.I. Substations, and will be responsible to the Borough Electrical Engineer.

Full details of training and previous experience must be supplied together with copies of three recent testimonials. Salary in accordance with Class H, Grade 3, of the National Joint Board Schedule, plus car allowance, £70 per annum.

The appointment is subject to the Local Government Superannuation Act and satisfactory medical report.

Applications to be submitted to—

Chairman of the Electricity Committee,

Electricity Offices,

23, Tiviot Dale,

Stockport

and to be received not later than first post, Thursday, 30th August, 1945.

Town Hall,
Stockport

Town Clerk,
2566

CORPORATION OF BRISTOL

Electricity Department

Appointment of Three Boiler House Shift Engineers

A PPLICATIONS are invited for the above positions from Engineers who should be between the ages of 25 and 35 years, and preferably have Power Station experience.

Sound practical and theoretical engineering training is essential.

Salary (E.P.E.A. Schedule), Class "L," Grade 8a, at present £504/529 per annum.

Appointments will also be subject to the provisions of the local Government and Other Officers' Superannuation Act, 1937, and successful candidates must pass a medical examination by the Bristol Medical Officer of Health.

The Ministry of Labour and National Service (Technical and Scientific Register) have given permission under the Control of Engagement Order, 1945, for the advertisement of these vacancies.

Applications, stating age and full particulars of experience, must reach the undersigned by the morning of Friday, 7th September, 1945.

I. A. D. PEDLER,

Acting General Manager
and Chief Engineer.

Dorset House,
Clifton Down,
Bristol, 8.

2571

FIRST GARDEN CITY LIMITED

Electricity Undertaking

A PPLICATIONS are invited for the position of **SHIFT CHARGE ENGINEER** from men having received technical training in electrical and mechanical engineering and experienced in the operation of modern generating plant, including water tube boilers with automatic combustion control, steam turbines, centralised auxiliaries, remote controlled 11-kV switchgear, also A.C./D.C. rotary converting plant. Full salary in accordance with N.J.B. conditions, Grade 8, Class F, with early prospects of Class G.

Applications in writing, with copies of two recent testimonials, to the undersigned as early as possible.

This advertisement is published by permission of the Ministry of Labour and National Service under the Control of Engagement Order, 1945.

CHARLES GOULD, M.I.E.E.,

Engineer and Manager.

Works Road,
Letchworth, Hertfordshire.

2547

COUNTY BOROUGH OF NEWPORT

Electricity Department

H.T. and L.T. Overhead Linesman

THE Newport Corporation Electricity Department invite applications for the position of H.T. and L.T. Overhead Linesman.

Applicants should be not more than 40 years of age, and should have had experience in the construction, maintenance, and repair of overhead high-tension and low-tension transmission lines.

Wages and conditions of employment will be in accordance with the Schedule of the South Wales and Monmouthshire No. 4 District Joint Industrial Council (Electricity Supply Industry), the rate of wages at present being 2s. per hour, or £4 14s. per week of 47 hours.

The successful applicant will be required to pass a medical examination, and to contribute to the Newport Corporation's Superannuation Scheme.

Applications stating the applicant's age, training, and experience, and accompanied by copies of recent references, should be addressed to Mr. T. H. Wood, M.I. Mech. E., A.M.I.E.E., Borough Electrical Engineer and Manager, Electric House, 191-2, Dock Street, Newport, Mon.

This advertisement is published by permission of the Ministry of Labour and National Service under the Control of Engagement Order, 1945.

11th August, 1945.

2589

THE MERSEY POWER COMPANY LTD.

Applications are invited for the following positions:

TECHNICAL Assistant, to supervise Records Office and carry out technical investigations. Degree, or equivalent technical qualification. Previous works experience not essential. Salary Class J, Grade 10A (at present £300 per annum).

Assistant Switchboard Attendant: Technical qualifications and previous experience with power plant switchgear required. Salary, Class J, Grade 10A (at present £300 per annum).

Conditions of appointments in accordance with N.J.B. Agreement.

Applications, stating present position, age, details of training and experience, together with copies of testimonials, to be addressed as below, and received not later than Wednesday, August 29th, 1945.

Envelopes should be endorsed with the vacancy applied for.

Permission has been received from the Ministry of Labour and National Service to advertise these vacancies.

General Manager and Engineer,
The Mersey Power Co. Ltd.,
Roche House,
Runcorn,
Cheshire.

2509

CITY OF SALFORD

Electricity Department

Senior Assistant Mains Engineer

APPLICATIONS are invited for the post of Senior Assistant Mains Engineer at a salary in accordance with Grade 7, Class H, of the N.J.B. Schedule. The present value is £485 per annum, rising to £501 in four years.

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

Candidates should have had technical training to H.N.C. standard, and subsequent experience on D.C. and A.C. cable systems up to 33 kV.

Applications should be addressed to the City Electrical Engineer, Electricity Department, Frederick Road, Salford, 6, Lancs, and must be received by Monday, 10th September.

The Ministry of Labour and National Service (Technical and Scientific Register) have given permission under the Control of Engagement Order, 1945, for the advertisement of this vacancy.

H. H. TOMSON, Town Clerk.

2578

AN opportunity occurs for a Maintenance Electrician to assume full charge of the work of an industrial group. An adequate salary will be paid and the candidate will be expected to supervise and develop the industrial maintenance and domestic installation business as determined by the Directors. Only candidates suitably qualified and possessing enterprise, initiative and drive and preferably commercial experience will be considered. Applications only from those over 51 or from Class A ex-servicemen with references to—Box 2523, c/o The Electrical Review.

APPLICATIONS invited for appointments, after present restrictions are removed, for Transformer Sales Engineers for various areas in the British Isles. Immediate vacancies open to Class "A" ex-Servicemen.—Box 7416, c/o The Electrical Review.

ASSISTANT Manager for Winding Shops (mixed labour) repairs and rewinds, all types motors, fractional to 100 h.p. London area. Very good prospects for keen man who is good disciplinarian and able to train beginners and improvers. Salary £400, plus production bonus.—Applications only from those over 51 or Class A ex-Servicemen.—Box 2565, c/o The Electrical Review.

CAPABLE Manager to take charge of, and develop, electrical department of soundly established London retail business. State age and full details of experience.—Box 7463, c/o The Electrical Review.

CHIEF Draughtsman. Experienced and competent Draughtsman to take charge of Drawing Office of firm in S.E. London, specialising in light and mechanical equipment, including small electric machines. Write, stating qualifications, experience, salary required, and when available to—Box 2576, c/o The Electrical Review.

CERKERIAL Assistant, Class A. Ex-serviceman, for Stores Office. Must have thorough knowledge of all electrical material. Apply—London Electrical Company, 92, Blackfriars Road, S.E.1 2924

CONSULTING Engineers require immediately qualified Chief Electrical Assistant for Birmingham office. Must be thoroughly experienced in design and layout, lighting and power distribution schemes, A.C. and D.C., factories, hospitals and public buildings, the preparation of specifications, E.H.T. substation design, etc. Preference will be given to Corporate Members of the Institution of Electrical Engineers. Salary commensurate with qualifications and experience. Age 51 to 55. Applications, stating age, qualifications and detailed experience and salary required, and whether disengaged, to—Box 2545, c/o The Electrical Review.

CONTRACTS and Office Manager required for estimating and technical correspondence by firm of Electrical Instrument Manufacturers, London district. Apply—Box 2585, c/o The Electrical Review.

DETAILED applications are invited from experienced engineer for post as technical manager for big independent electric lamp factory in India. Write to "Electric," c/o Abbots, Eastcheap, London, E.C.3, 7472

DRAWING Office Staff required for X-Ray Apparatus Manufacturers. State experience and salary required. Applicants should be over 51 or Class A ex-servicemen.—General Radiological Limited, 15/18, Clipstone Street, London, W.1. 7441

ELECTRIC Motor manufacturer has vacancy for Assistant Designer immediately the present employment restriction is removed. Applications will now be considered. State age and experience.—Higgs Motors Limited, Witton, Birmingham. 2583

ELECTRICAL Engineers and Wiring Contractors (Midland District) require young energetic man as Assistant Manager to assist with supervising and estimating. Applications only from Class "A" ex-Servicemen. Give full particulars and wages required.—Box 2584, c/o The Electrical Review.

ELECTRICAL Installation Engineer, with knowledge of all branches of the trade; able to take charge of men, and experienced in costing and planning. Good prospects for right man. Applications only from those over 51, or Class "A" ex-Servicemen. Write, stating wages required, and all particulars.—Box 2588, c/o The Electrical Review.

ELECTRICIAN required immediately by Electrical Contractors, London, permanency to suitable man. Class A ex-Serviceman or man over 51. Apply, giving full particulars to—Box 2592, c/o The Electrical Review.

ELECTRICIANS required. Apply in writing, giving full details of experience, to Giles (Electrical Engineers) Ltd., 11 Victoria Colonnade, Southampton Row, W.C.1. Class A ex-servicemen only, or over 51. 2505

ELECTRICIANS wanted by Electrical Contractors in Warrington, Lancashire. Permanency to good men. Class "A" ex-Servicemen or over 51.—Box No. 2494, c/o The Electrical Review.

ELECTRICIAN-Wiremen wanted. Permanencies to suitable applicants, who should be Class A ex-service men or over 51, or otherwise exempt from Ministry of Labour control.—J. W. Russell Ltd., 18, Queens Road, Watford. 2550

ELECTRONIC Equipment for Industry. Required by well-known firm in S.E. London, Engineers with good basic knowledge and development initiative for designing, supervising construction and installation special Control Equipment. Applications only considered from Class "A" ex-Servicemen or men over 51. Write, stating qualifications, experience, salary required, and when available, to—Box 2575, c/o The Electrical Review.

ESTIMATING Engineer required by Central London Contractors. Applications from those over 51 or Class A ex-Servicemen only. Write, stating age, experience and salary required.—Box 7452, c/o The Electrical Review.

EXCELLENT opportunity for boy leaving school to begin work in Illuminating Engineering Department of well-known electric lamp manufacturers. Write, with brief details of education, to—Box H.M.6, c/o 5, New Bridge Street, London, E.C.4. 2543

EXPANDING London Company engaged in development of new electrical instruments requires immediately executive to co-ordinate research and development work and small-run production prior to sub-contracting for large-scale manufacture. The position is one of considerable scope, requiring knowledge of scheduling, time-planning, purchasing, and calls for ability to co-ordinate the activities of technical personnel, but does not necessitate technical qualifications. Write full details of qualifications, etc.—to—Box 2499, c/o The Electrical Review.

FRACTIONAL h.p. Motor Designers, Electrical and Mechanical Inspectors and Testers required by firm in S.E. London. Consideration only given to applications from Class "A" ex-Servicemen or men over 51. Write, stating qualifications, experience, salary required, and when available, to Box 2574, c/o The Electrical Review.

INVOICE Clerk (Female) required for electrical wholesalers, Hammersmith district, good at figures and preferably with knowledge of E.L.M.A. discounts, etc. Permanent and progressive position to suitable applicant. State full particulars of experience, age and wages required in confidence to—Box 2454, c/o The Electrical Review.

LIFT Engineers. Old-established firm requires experienced men as General Manager. Salary and participation in profits. Applications accompanied by details of experience will be considered in confidence.—Box 2456, c/o The Electrical Review.

LIGHTING Engineers required by leading electrical manufacturers, capable of planning industrial and commercial schemes. Responsible posts for first-class men with initiative and experience. Applications from men over 51 or Class A ex-service men only. Write—Box H.T.2, c/o 5, New Bridge Street, London, E.C.4. 2544

MANAGER required, with general experience in the manufacture of lead storage batteries. State experience and salary required.—Box 76, c/o The Electrical Review.

REPRESENTATIVES required for some areas to sell Non-Ring Flexibles and Cables to Contractors, Electricians, etc. Side-lines not objected to.—Box 7445, c/o The Electrical Review.

SALES Manager required by expanding firm of Electrical Engineers in London manufacturing electrical appliances, to take complete charge of sales. Applicants must have first-class connections both in England and abroad, as Export markets are especially contemplated. Sound progressive position. Write stating qualifications with details of previous experience, age and salary required to—Box 2560, c/o The Electrical Review.

SEALING Charge-hand, Experienced with Anstee Machines, required for Electric Lamp Factory in British Dominion. Single man preferred, state age, give full particulars of experience and results of breakage obtained, production and sizes of lamps manufactured. Good salary offered, and fare paid. Written applications only, in confidence to—Box 7451, c/o The Electrical Review.

THE Indian Iron & Steel Co. Ltd. require an Assistant Electrical Engineer, who must be well experienced in electrical maintenance in Iron and Steel Works. Modern power house experience an advantage. Technical knowledge essential, and preference to candidate with engineering degree or equivalent. Age about 30-35. Starting salary Rs.1,000/- per month (= £75 at 1/6d. exchange). Provident Fund, free unfurnished quarters, free medical attention, passage paid both ways, local leave allowed in India, and Home leave on renewal of Agreement—four years Agreement. Write with details of experience, stating age and whether married, and position applied for to—Z. W. c/o Charles Barker & Sons Ltd., 31, Budge Row, London, E.C.4. 2531

TRACER (Female) required in Drawing Office of electrical firm in S.E. London. Write, stating qualifications, experience, salary required, and when available, to Box No. 2577, c/o The Electrical Review.

WANTED by large firm of electrical engineers, Manager for Ships Installation Department; must have first-class marine experience, organising ability, and be accustomed to the control of men.—Box 2546, c/o The Electrical Review.

WIRKMAN wanted, London, over 51 or otherwise free to take position. Best conditions. Reply—Box 2344, c/o The Electrical Review.

WORKS Manager required by leading cable manufacturers, London area; sound managerial qualifications essential, together with experience of manufacture of rubber and thermoplastic insulated cables; experience of wire-drawing and other operations an advantage; age 35/45; first-class opportunity for the right man. Write in confidence, stating experience and salary required, to—Box 2458, c/o The Electrical Review.

WORKS Manager required for Dominion Lamp Works. Extensive production and technical experience of General Service Lamps essential. Must possess resourcefulness to develop and expand existing production on own initiative. Full details to Box 2521, c/o The Electrical Review.

WORKS Manager required for small Control Gear and Switchgear Works in the North-West of England. Applicants should have had experience in similar manufacture and must give full particulars of age, experience and salary required. Address to—Box 2462, c/o The Electrical Review.

YOUTH required in London S.W. district, as Stores Assistant, with experience. Permanent position. Write, stating age, experience and salary expected to—Wholesale Electric Co. Ltd., 37, Vauxhall Bridge Road, S.W.1. 2561

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.

GALLOWAY Water Power Co.—Shift Charge Engineer.

SITUATIONS WANTED

ABILITY and integrity and many years supervision and layout, installations of all descriptions should be any position of trust and responsibility.—Box 7461, c/o The Electrical Review.

ASST. Buyer (Maintenance), aged 35, seeks change with scope for advancement. Smart and adaptable. Present position over 10 years, wide knowledge of all record work appertaining to buying dept. routine, etc.—Box 7469, c/o The Electrical Review.

DIPLOMA Electrical Engineer, M.Sc., 16 years' experience, rotary electrical machinery, including A.C. commutator motors, electrical instruments and electronics, seeks suitable position.—Box 7476, c/o The Electrical Review.

ELECTRICAL and Mechanical Engineer, fully qualified seeks appointment where organising ability and keenness are essential. Experienced in the management and administration of an electrical undertaking with extensive practical experience construction, maintenance and operation work.—Box 7434, c/o The Electrical Review.

ELECTRICAL and Mechanical Engineer, A.M.I.E.E., A.I.Mech.E. (33), Ex. B.T.H. apprentice. Versatile Designer, Lecturer and Journalist specialising in Control Gear and Domestic Equipment, seeks responsible position requiring initiative, sound technical knowledge and high administrative ability. Full ancillary industrial experience.—Box 2549, c/o The Electrical Review.

ELECTRICAL and Mechanical Engineer Mem. Am.I.E.E. it.col. Polish Army Engineers 30 years' managerial experience in electrical trade and contracting business, seeks technical or administrative post knowledge of languages. Ready for eventual service on Continent or Overseas.—Box 7435, c/o The Electrical Review.

ELECTRICAL Engineer seeks executive position, B.Sc., 39. Fully conversant with H.T. Distribution, Power Station work and industrial layouts, power and lighting.—Please write, c/o 17, Frederica Rd., Winton, Bournemouth. 7455

ELECTRICAL Plant Engineer (55) (Managerial), Extensive Practical Experience, Installation, Maintenance, Large Industrial Factory, Birmingham or Midlands preferred.—Box 7454, c/o The Electrical Review.

ELECTRICAL Engineer, I.E.E., age 44, desires works maintenance.—H. H., Devonshire House, Woodstock, Oxon.

ELECTRICIAN (43), requires position as Assistant to Consultant Engineers, sound practical experience, able to supervise and execute large contracts. Box 7466, c/o The Electrical Review.

ENGINEER, 10 years' experience, control gear, estimating and technical work, A.M.I.E.E., 3 Sc (Hons.), 5 years' indentured apprenticeship, desires change. Offers with details of salary to—Box 7459, c/o The Electrical Review.

EXPORT. Electrical Engineer with sound mechanical, field, office, construction and maintenance experience in Great Britain, Switzerland, Chile, Brazil, British West Africa, British West Indies on Electric Traction, Public Utility, Open and Underground Mining, Oil Field and Refinery, War Office and Air Ministry, offers his services to manufacturers of repute who are desirous of opening up their export markets. Age 43, Public School, A.I.E.E., languages spoken, French, Spanish, Portuguese, with slight knowledge German. Italian.—Box 2481, c/o The Electrical Review.

EX-Sq./Ldr. R.A.F. recently released, age 48, residing West Sussex, seeks position in Electrical or Engineering Trade as part-time Travelling Representative in this area. Own car, good references, previous electrical experience. Box 7442, c/o The Electrical Review.

FOREMAN Ganger (36), 12 years' present post, ex-serviceman release obtainable.—Box 7449, c/o The Electrical Review.

FREEDOM from Government Control, is desired by Keen Young Engineer (27), anticipating release from present post of Electrical Engineer Officer, R.A.F., very shortly. Civilian experience of estimating, maintenance, contracting. War-time experience, technical supervision and organisation of Electrical and Instrument sections of R.A.F. stations, administration of both sexes. City & Guilds certifies in Electrical Engineering, Stud.I.E.E., A.M.Inst.E.E. Position required offering prospects for keenness, adaptability, and initiative. Location, home or abroad, immaterial.—Box 7464, c/o The Electrical Review.

GOOD worker (28), seeks progressive post. Southern England preferred. R.A.F. release group 24, Class A. Secondary school education. Oxford school certificate. 5 years with A.M.I.E.E. Electrical Engineer, 7 years R.A.F., Grade I electrician; sound practical and theoretical knowledge, including instruments and electronics. Experienced in supervisory and administrative duties.—Box 7467, c/o The Electrical Review.

GRAD. I.E.E., aged 38, Elect. Radio exp. desires position Manager, Electrical Showrooms or similar post.—Box 7466, c/o The Electrical Review.

KEEN young man (27), at present serving H.M. Forces, seeks progressive post. Qualifications include City and Guilds and Higher National certificates. Student M.I.E.E., 6 yrs.' experience general contracting plus 6 yrs. as electrician R.A.F. Release group number 25.—Box 7386, c/o The Electrical Review.

MAN, age 39, ex-H.M. Forces, desires position in Showroom or Office where thorough knowledge of Electrical Appliances and Accessories, Stock and Record-keeping is required. Full details to—A. H., 21 Westwood Hill, S.E.26. 7458

NAVAL Instructor (27), due for Class A release early October, seeks position with electrical firm, 8 years experience electrical installations, batteries, battery charging equipment, A.C. and D.C. machines, etc. Wide knowledge of general and technical French. Matriculation standard of education—Box 7444, c/o The Electrical Review.

PAPER Cables, General Foreman with over 20 years' experience desires change, willing to travel.—Box 7450, c/o The Electrical Review.

POST as Advertising Manager wanted with medium size concern. Salary offered secondary to the right prospects. Please write to Box E.K., c/o Street's, 110 Old Broad Street, E.C.2. 2559

PRODUCTION Engineer, fully conversant manufacturing high standards, electrical instruments and mechanisms, experimental, prototypes. Present position assistant chief engineer and responsible for development eminent electrical equipment manufacturers. Release granted one month's notice, age 41. Within 20 miles London only, residing S.W. area.—Box 7389, c/o The Electrical Review.

REPRESENTATIVE wants change, and by mutual arrangement can transfer his valuable connection to another who can. Own car, good petrol allowance. Free Nov. 1945. N.W. London, Middlesex and Herts, ground.—Box 7460, c/o The Electrical Review.

TECHNICAL Journalist, Electrical Engineer, R.A.F. officer, 35, Class A, release Sept., seeks position manufacturer, publisher, etc.—Box 7453, c/o The Electrical Review.

WELL-known Supervising Electrical Engineer, shortly at liberty, desires responsible position as General or Dept. Manager to established firm used to good turnover.—"Charles," 21, Bedford Road, Wood Green, London, N.22. 7475

FOR SALE

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

DIESEL GENERATING PLANT

300 b.h.p. RUSTON HORIZONTAL SIX-CYLINDER COLD STARTING DIESEL; new 1927, 300 r.p.m., direct coupled to 275-kVA, 440-volts, 3-phase, 50-cycles METRO-VICK, Alternator.

200-b.h.p. PETER VERTICAL 4-CYLINDER COLD STARTING "ATOMIC" DIESEL; new 1934, 300 r.p.m., direct coupled to 200-kW METRO-VICK, 400-volts, 3-phase, 50-cycles Alternator.

250-b.h.p. RUSTON HORNSBY VERTICAL FOUR-CYLINDER COLD STARTING DIESEL; new 1929, direct coupled to 130-kW L.D.C. 400-volts, 3-phase, 50-cycles Alternator.

168-b.h.p. PETER VERTICAL 3-CYLINDER COLD STARTING ATOMIC DIESEL; new 1932, 400 r.p.m., direct coupled to 100-kW, 220-volt D.C. Generator.

120-h.p. RUSTON VERTICAL TWIN-CYLINDER COLD STARTING DIESEL; new 1930, 333 r.p.m., direct coupled to 85-kW, 400-volts, 3-phase, 50-cycles Alternator.

60-h.p. RUSTON VERTICAL 3-CYLINDER COLD START DIESEL; new 1936, 500 r.p.m., direct coupled to 50-kW CROMPTON 250 volt D.C. Generator.

60-h.p. BLACKSTONE HORIZONTAL SINGLE-CYLINDER COLD START DIESEL; new 1934, 240 r.p.m., direct coupled to 35-kW E.C.C. 220/230-volt D.C. Generator.

60-h.p. FIELDING & PLATT HORIZONTAL SINGLE-CYLINDER COLD START DIESEL; new 1931, direct coupled to 35-kW E.C.C. 230-volt D.C. Generator.

49-h.p. CROSSLEY HORIZONTAL SINGLE-CYLINDER COLD START DIESEL; 240 r.p.m., new 1932, belt driving 25-kW, 400-volts, 3-phase, 50 cycles Alternator, 750 r.p.m.

37 1/2-h.p. CROSSLEY VERTICAL SINGLE-CYLINDER COLD START DIESEL; new 1935, 500 r.p.m., direct coupled to 20-kW, 400-volts, 3-phase, 50-cycles Alternator.

30-h.p. RUSTON VERTICAL 3-CYLINDER ELECTRIC START DIESEL; new 1939, 1,000 r.p.m., direct coupled to 20-kW BULL 430/215-volt D.C. Generator (2 available).

22-h.p. BLACKSTONE HORIZONTAL SINGLE-CYLINDER HAND STARTING DIESEL; new 1942, 600 r.p.m., belt driving 17.5-kW NEWTON 220-volt D.C. Generator, 540 r.p.m.

17-h.p. NATIONAL HORIZONTAL SINGLE-CYLINDER HAND STARTING DIESEL; new 1934, belt driving 10-kW CROMPTON 230-volt D.C. Generator.

9-h.p. LISTER VERTICAL SINGLE-CYLINDER HAND STARTING DIESEL; new 1937, 1,000 r.p.m., direct coupled to 4.5-kW, 110-volt D.C. Generator.

All the above offered in first-class condition complete with all accessories.

NEWMAN INDUSTRIES LIMITED, YATE, BRISTOL
2492

WATER TUBE BOILERS IN STOCK

Two	55,000 lbs.	evaporation,	270 lbs. W.P.
Two	25,000 lbs.	..	250 lbs. ..
Two	25,000 lbs.	..	175 lbs. ..
Three	20,000 lbs.	..	200 lbs. ..
One	12,000 lbs.	..	175 lbs. ..
One	12,000 lbs.	..	160 lbs. ..
One	9/10,000 lbs.	..	200 lbs. ..

We install complete, including brickwork. Economisers, Pumps, Piping Valves, Generating Sets and Motors in stock. Please send us your enquiries; we can give immediate delivery.

BURFORD, TAYLOR & CO. LTD.,
Boiler Specialists, Middlesbrough,
Telephone: Middlesbrough 2622.

GEORGE COHEN, SONS & CO. LTD.

for

GUARANTEED ELECTRICAL

PLANT,

MOTORS, GENERATORS,

SWITCHGEAR,

etc.

WOOD LANE, LONDON, W.12.

Telephone: Shepherds Bush 2070

and

STANNINGLEY, NEAR LEEDS.

Telephone: Pudsey 2241.

Established 1834.

REBUILT MOTORS AND GENERATORS

LONG deliveries can often be avoided by purchasing rebuilt secondhand plant. We can redesign or replace surplus plant of any size.

SEND US YOUR ENQUIRIES.

OVER 1,000 RATINGS ACTUALLY IN STOCK HERE.

DYNAMO & MOTOR REPAIRS LTD.,

Wembley Park, Middlesex.

Telephone: Wembley 3121 (4 lines).

Also at Phoenix Works, Belgrave Terrace, Soho Road, Handsworth, Birmingham.

Telephone: Northern 0898.

26

ELECTRIC MOTORS AND DYNAMOS

WE hold one of the largest stocks of New and Second-hand Motors. Secondhand machines are thoroughly overhauled. Inspection and tests can be made at our Works.

For Sale or Hire. Send your enquiries to:—

BRITANNIA MANUFACTURING CO. LTD.,

22-26, BRITANNIA WALK,

CITY ROAD, LONDON, N.1.

Telephone: 5512-3 Clerkenwell.

13

CITY AND ROYAL BOROUGH OF EDINBURGH

Electricity Department

FOR Sale—2 Lister Diesel engine 3-kW, 230 volts D.C. generating sets with switchboards, also 1 1.75-kW, 50/73 volts Lister Diesel battery charging set, complete with 1 27 cell battery, 50 A.H. capacity sealed-in type in glass boxes with double tier stand and switchboard.

Sets may be seen running by appointment, and full particulars obtained from the Engineer and Manager, Corporation Electricity Department, Dewar Place, Edinburgh, 3, to whom tenders must be delivered not later than Saturday, 25th August, 1945.

2573

A large stock of Searchlights (sale or hire), also Winches of our self-sustaining type. Hundreds of thousands supplied during the last 40 years to Government departments, corporations and innumerable traders. Mirrors, Lenses, A.I.D. Turnbuckles, etc., also surplus Carbon Rods, Ebonite and Fibre—London Electric Firm, Croydon. 42 quantity of nearly new Storage Cells by Young, 350-amp.-hour capacity at 10-hour rate, heavy duty, only a few weeks old, fully charged. Further quantity of new Cells, 100-amp.-hr. cap. Full details from—G.P.U. Ltd., Wembley.

2569

THE CORPORATION OF DUNDEE

Civil Defence Surplus Stores

THERE is available for purchase one Targen 2 kW portable petrol-driven, hand-starting Electric Generating Set, suitable for 200-volt D.C. supply, at present installed in the former Control Centre. The set can be seen at any time by arrangement with the undersigned, with whom offers should be lodged not later than Saturday, 25th August, 1945.

WILLIAM BORLAND,

City Chambers,

Town Clerk.

Dundee,
4th August, 1945.

2555

A number of portable Alternating Lighting Sets, fully guaranteed, for quick delivery, 3.5 kVA, 230/1750. The Electropiant Co., Wembley, Middlesex. 2568

A.C. and D.C. House Service Meters, all sizes, quarterly and preparation, reconditioned, guaranteed one year. Repairs and recalibrations.—The Victra Electrical Co., 47 Battersea High Street, S.W.11. Tel. Battersea 0780. 19

A.C. and D.C. Motors, all sizes, large stocks, fully guaranteed.—Milo Engineering Works, Milo Road, East Dulwich, S.E.22 (Forest Hill 4422). 6781

A.C. and D.C. Motors always in stock.—Dawson, Caledonia, Oakengates. 7417

A.C. Motors, 1/50th h.p. to 10 h.p., from stock. Also D.C.—The Johnson Engineering Co., 86, Great Portland Street, London, W.1. Tel.: Museum 6373. 57

AERIAL Cables, all sizes quoted for, good deliveries against Government contract numbers.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 7477

AVALIABLE, ex Stock. Good supplies Bakelite Electrical Accessories at competitive prices including pushbar lampholders, torpedo switches, batten holders, etc. Write—BOM/Elec., London, W.C.1. 7415

BELT Grinders or Sanders, 4" wide belt, £5 5s.; 6" wide belt, £10 10s.—John E. R. Steel, Clyde Mills, Bingley, Phone 1066. 52

BEST English Cables, 1/104 up to 127/103, deliveries against M.O.S. requirements.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 7478

CARBONS, large stocks assorted sizes, solid and cored.—Edwards Bros., 20, Blackfriars Road, London, S.E.1. 7479

CHLORIDE Keapalite Equipment, with or without battery, condition indistinguishable from new. Particulars from—E. Powell Ltd., 39, High Street, Tumbidge Wells. 7394

ELECTRIC Construction Co. Rectifier No. 1361. A.C. input 440 volt, 3 phase, 50 cycles; D.C. output 110 volt, 9.1 amps. In perfect order. Apply to—Mr. G. O. J. Robson, 15, Newton Place, Charing Cross, Glasgow, C.3. 2537

GENERATING Sets for sale, 18 kVA, 400/3/50 petrol, 2½ kW, 220 v. D.C. crude oil set.—Fyte, Wilson & Co., Ltd., Bishop's Stortford. 2586

HEAVY duty Arc Welding Plants, 200 amps. Price £31 10s. complete. Also Spot Welders, £36 15s.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 50

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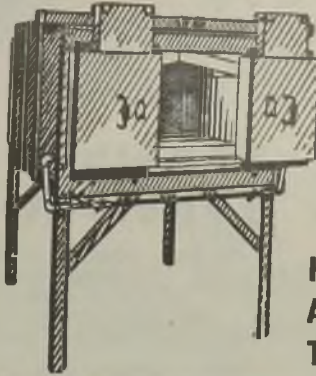
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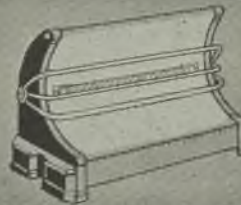
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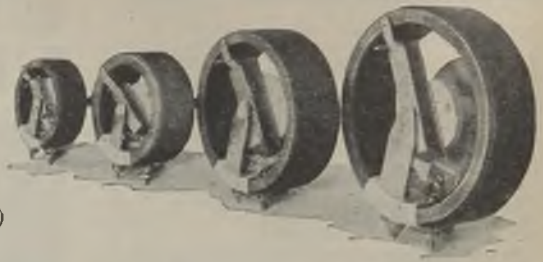
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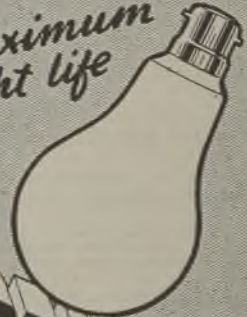
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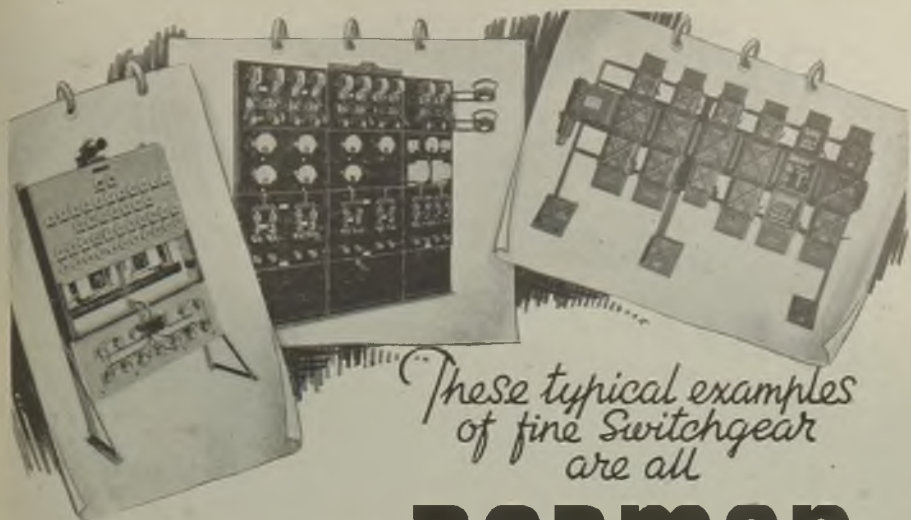
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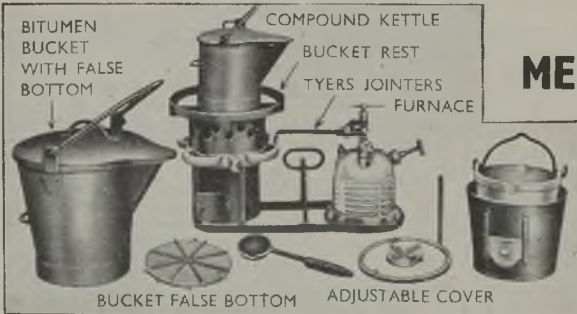


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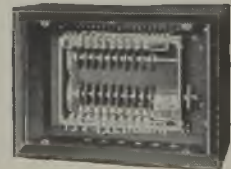


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