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Paxolin is the registered trade name for our laminated products of the phenolic class which are made in a wide variety of grades in Sheets, Rods, Tubes and Cylinders. Complete details, including technical data; information regarding the grade most suitable for any particular purpose and instructions for machining are obtainable from the manufacturers.

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Makers of MICANITE (Built-up Mica Insulation). Fabricated and Processed MICA, PAXOLIN (Synthetic-resin laminated sheets, rods, tubes and cylinders). High-voltage Bushings and Terminals for indoor and outdoor use. Empire Varnished Insulating Cloths and Tapes and all other forms of Electrical Insu-lation. Suppliers of Vulcanised Fibre, Leatheroid, Presspahn, etc. Distributors of Micoflex-Duratube Sleevings, Micoflex-Durasleeve (plastic covered flexible metal conduit) and Kenutuf Injection Mouldings (P.V.C.)



ELECTRICAL REVIEW

Monel

the value of menu ideas

Many years ago, a Mr. Dunlop conceived the idea of a pneumatic tyre to eliminate the many bumps of solid-tyred cycles.

1

To-day — all the world "rides on air" thanks to Mr. Dunlop's pioneer idea.

More recently, Heatrae decided—after lengthy experiment—that Monel was the ideal metal for Electric Water Heater Construction. Another example of a "Pioneer idea" which must ultimately influence Water Heater design and vastly simplify Maintenance.



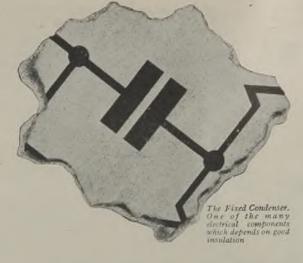
leaders in electric water heaters

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The Redifon sets have all the necessary safety devices, and they are fully enclosed and simple to operate. Manufacturers who wish for further particulars of the use of radio heating should get in touch with Rediffusion research engineers now.

REDIFFUSION Ltd.

Designers and Manufacturers of Radio Communication and Industrial Electronic Equipment A SUBSIDIARY OF BROADCAST RELAY SERVICE LTD. CARLTON HOUSE REGENT STREET, LONDON, S.W.I

SPEED-REDUCTION-UNIT

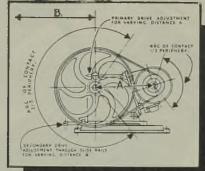
USES A means of transmitting power at reduced speed from a high speed, high efficiency induction motor. The following speed, can be obtained on the The following speeds can be obtained on the counter shaft, 350, 240, 170 or 140 r.p.m., depending on the motor speed, and, by using a suitable driving pulley, a final speed as low as 50 r.p.m. can be obtained.

PRINCIPLE

Belt contact on the driving pulley is approximately one-third the periphery, a vee pulley being used so that the belts can grip on both sides of the Vee.

The driven pulley (see Fig. A) has a belt contact of two-thirds of its periphery and gives a firm grip without grooves, resulting in lightness and economy.

Provision is made for adjusting primary and secondary drives independently. Initial stretch of the belts can be taken up without interfering with the secondary drive, the latter being adjusted through tightening screws on the slide rail.



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Specialists in the manufacture of Alternating Current Motors in Squirrel Cage and Slip Ring types from 1/3rd to 200 h.p. 20,000 h.p. speed types are listed for every industrial use, and thousands of these motors in all types have been supplied to the various countries of the world. We are the largest Alternating Current Motor Manufacturers in the world.

The Brook Motor factories, where 6,000 motors are made each month. EMPRESS PRINCESS . DUCHESS WORKS . HUDDERSFIELD

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4

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ELECTRICAL REVIEW

MORE POWER TO LOCHABER!



Despising all other weapons, the clansman trusted to his claymore and superb swordsmanship

THE old-time history of Lochaber is that of highland clans, highland feuds and the 'forty-five'. But today the power of this wild and picturesque district no longer lies in the claymore; it comes instead from one of the greatest industrial developments of recent times, which, promoted at a cost of millions of pounds, harnesses the waters of the countryside to generators that give an immense output of electrical power. A new page to highland history indeed !... and one in which it is recorded that an Alton battery has been installed in the hydro-electric station for emergency and other important duties.

ALTON BATTERIES OF MERIT THE ALTON BATTERY COMPANY LTD., ALTON, HANTS Sole Suppliers of Fuller Stationary Batteries Telephone : Alton 2267 and 2268 Telegrams : 'Battery, Alton '



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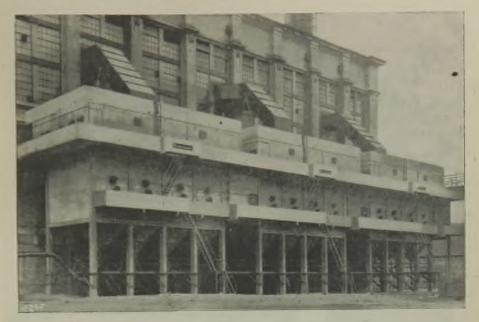
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... and here is the first MOFFAT ELECTRIC COOKER

Made over twenty-seven years ago, this highly ornamental Moffat "Electra" was considered the last word in electric cooking. It is a great tribute to Moffat craftsmanship ther there are still many of these cookers in service, giving quite satisfactory cooking performance.

Here is one of the latest models made by MDFFATS

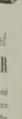
Embodying the improvements and features developed through more than half a century of manufacturing and selling, this Moffat model is the most modern interpretation of future trends in cooker design.

Note the balanced drop down door with hingeeasy mechanism in contrast to the old style swing door on the first Molfat electric cooker.









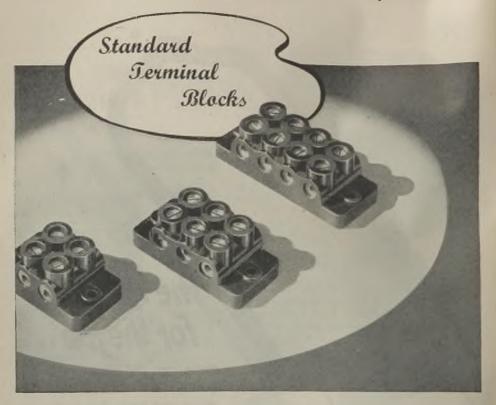
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Made to B.I. standards of quality, B.I. Cotton Covered Wires and Strips are justly renowned for their consistency of covering, and of space factor. Their uniformity counts with the discerning pro-

duction engineer. Made with standard white cotton coverings or with coloured tracer thread, as desired.



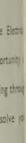
Telephone : PRESCOT 6571 BRITISH INSULATED CALLENDER'S CABLES LTD. Prescot - Lancashire



As Plastic Moulders with unrivalled experience in the Electrical and Wireless Trade, we look forward to the opportunity of employing the extensive knowledge gained from working through exacting war-time specifications in assisting you to solve your post-war Plastic problems.



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-has a high factor of safety, being tested at 40kV for one minute, before despatch.

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The above illustration shows a transportable multi-operator welding transformer equipment, comprising 3-phase welding transformer with primary and secondary protected type terminals, primary triple-pole "English Electric" fuse-switch and power factor improvement condenser, with two 300-amp. and one 600-amp. welding regulators.

" English Electric " Welding Equipments are manufactured in accordance with B.S.S. 1071/1943.

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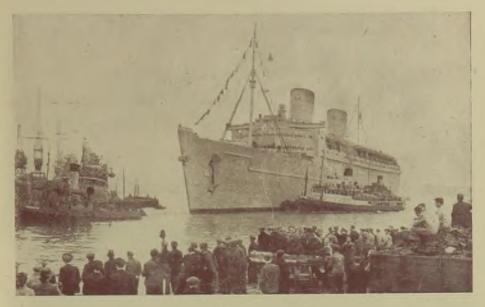


The construction of lighting fittings involves a number of considerations. Besides the need for suitable distribution of light which implies the provision of a range of reflectors, care must be taken that lamp caps and incoming cables are protected from excessive temperature due to the heat from the lamp, wiring must be easy, maintenance facilitated and provision made for cleaning. At the same time electrical and mechanical safety must be assured. Saaflux construction ensures all these features. They dissipate heat so that wiring and lamp cap temperatures are not too great, they are removable complete with lamp for cleaning or service. When wiring, only a 3-oz. terminal block has to be handled. An inner supplementary reflector adds to the light output and prevents danger from touching lamp caps. A range of reflectors is available covering all types of light distribution.

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> Over 600 miles of HENLEY C.M.A. 250-volt and 660-volt Rubber Insulated Cables of various types were used in the electrical installation of the "Queen Elizabeth".

> > HENLEY (ABLES

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at the service of the Empire

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During the war the vast G.E.C. technical and manufacturing resources have been devoted to one purpose providing equipment to help win the war quickly.

Electrical progress has been constant and important advances have been made by the Company in all applications of electricity, including electronics, which will be of inestimable value to all concerned with electrification schemes for the busy years of peace.

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G.E.C. Electrification Schemes have been applied to all industries, including: Aircraft Factories : Chemical Works; Collieries ; Food Factories; Gold Mines; Iron, Steel and Copper Works ; Locomotive and Railway Carriage and Wagon Works ; Motor Car Works : Ships and Shipyards; Textile Mills, etc., etc.

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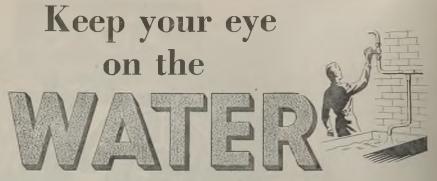
one of Britain's

Largest Cement Kilns.

The Crompton Parkinson Motor shown above has given many years reliable service in its testing job. In designing large motors to meet the requirements of the drive, Crompton Parkinson are able to apply experience dating from the very foundation of the electrical industry.

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Expert advice for water users

Pumping and conveying water to where you want it take a lot of power (and much fuel and money). Water is even more precious if it has been heated or purified in your works.

How to make the best use possible of your water supply is told in these handy booklets :

FUEL ECONOMY BY WATER SAVING (Bulletin No. 31)

This is a survey of the economies (many of them substantial) that are possible in water supply for boiler feed, drinking and washing, process and cooling. It tells you, too, how to clean water mains and plant, and how to keep them clean.

WATER TREATMENT (Bulletin No. 39)

The correct treatment of water, whether for boiler feed, cooling or process is a matter for the specialist. This Bulletin surveys the whole field and describes briefly the methods available for overcoming your difficulties.

BLOW-DOWN (Bulletin No. 35)

Too often the blowing down of boilers is merely a matter of routine, bearing no relation to need. Excessive or insufficient blow-down are both serious fuel

wasters. This Bulletin tells you why, when and how much to blow down.

THE UNORTHODOX USE OF ECONOMISERS (Bulletin No. 30)

This Bulletin shows how to obtain the maximum results from your feed-water economiser. Some of the suggestions may be new to you, e.g., the use of a condemned plant for process water heating or as an air heater.

A SOUND ANSWER to practically every problem of fuel economy is quickly found in these Fuel Efficiency Bulletins. Keep a list of their titles handy; then you can turn up at once the particular Bulletin you need. The Bulletins are free from your Regional Office of the Ministry of Fuel and Power.





20

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1941 S. ptember 14, 1945

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That DIFFERENCE is in DETAIL

TO the holiday-maker the snapshot camera will always be a magic box of tricks. Simply, cheaply, it preserves for him the *atmosphere* of happy days . . . and he asks for no more. But, to the professional photographer, the simple box camera is little more than an interesting plaything.

The professional's camera, indeed,

has much in common with a Crabtree switch. Designed with care, assembled within the closest tolerance limits and tested at every stage of production, both camera and switch embody a full This illustration of the Crabtree "Lincoln" switch is an apt example of a Switch that has been safely modified in the interests of economy. Cheaper, smaller, and more simple than the standard product, it yet conforms in every way to our established standards of performance.



complement of those working parts essential to unfailing service under *all* operating conditions.

We may take our parallel further. As in a camera—so in a switch: certain refinements and details can be left out in the interests of economy. But with a switch, the process of elimination must not be too sweeping. It cannot, for instance, be

> cheapened until it is little more than an "interesting plaything." However simple its mechanism a switch must always retain those features which stamp it as a product for onerous everyday service.



C.229137. Advt. of J. A Crabtree & Co. Ltd., Walsall, England



BRANCHES :-- London, Birmingham, Cardiff, Bath, Manchester, Leeds, Newcastle, Glasgow, Belfast, Dublin.

September 14, 1945

The old man is a craftsman...



"He's a what?"

asked the Young Apprentice.

"A Craftsman" repeated the Oldest Employee.

" Oh !'' said the Y.A. " I thought you said something else."

"It comes to the same thing. Nothink I do or you do or anyone does is good enough for his lordship. See ?"

"I can't say as I do" said the Young Apprentice.

"You will!" muttered the Oldest Employee darkly. "I bin watching you, me young cockalorum, and if you take my tip you'll go and get another job—where being 'am-'anded and 'alf-witted is an advantage. Go and be an 'eavyweight boxer. Get a job in one of these 'ere Ministries. You won't never do no good here."

"Why not?" asked the Young Apprentice.

"Because the Old Man's a Craftsman" said the Oldest Employee. "He ain't never satisfied with nothing and nobody. Not even mc. I believe he 'ates 'isself ! 'e'll certainly 'ate the very sight of you. 'E's a craftsman."

"He certainly sounds like it!" said the Young Apprentice.

DESOUTTER Specialists in Lightweight, Pneumatic & Electric Portable Tools DESOUTTER BROS. LTD., (Dept R), The Hyde, Hendon, London, N.W.9. Telephone: Colindole 6346-7-8-7



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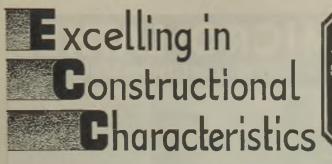
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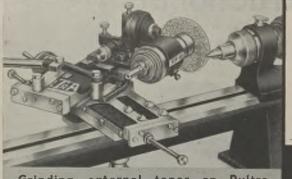
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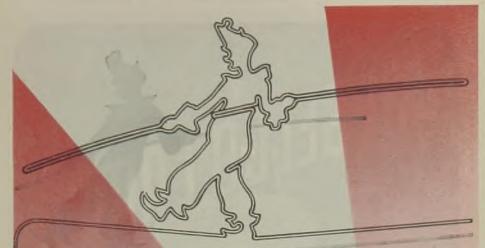
milling cutters and tools. When the steel on shrouded gears is being cut reduce the speed from about 140 feet per minute to about 50 feet per minute. Back unshrouded gear blanks with wood. A quantity of identical unshrouded gears can be cut in "Banks". Cut unshrouded blanks dry, use an oil lubricant when cutting steel shrouded gears.

PERRY BARR BIRMINGHAM 228

September 14, 1945 ELECTRICAL REVIEW

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PLAY SAFE-USE CROMPTON

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ELECTRICAL REVIEW

DIKIDSIKS

"Going to Russia" was billed on the sides of these lorries, so that our workers could see how they were aiding our valiant Ally in her great struggle.

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ALUMINIUM RESEARCH

Aluminium and its Alloys in the Electrical Industry

How our Technical Development Department can help you

The properties of aluminium and its alloys have developed remarkably during the war years. Very high strength to weight ratios and increased resistance to shock and corrosion make aluminium capable of wide application in the electrical industry from kettles and washing-machines to bus-bars and overhead lines. You are invited to write to our Technical Development Department for valuable data and for assistance with your production problems, and if aluminium is not suitable for your particular job we will say so.

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Motors-endshields, fans, housings, etc. Motor and field coil windings Panels and cases of control gear and instruments Brake magnet coils Transformer tanks Cooling tubes Traction motors Booms and collector gear for trams and trolley buses Mining equipment Radio-chassis, coil cans, panelling Electrolytic condensers Rotor bars Ancillary ncillary equipment ---conduit vice benches, portable drills, ladders equipment ~

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NORTHERN ALUMINIUM COMPANY LTD., Banbury. Oxon Makers of NORAL Products VENT-AXIA for better Air Conditions

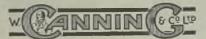
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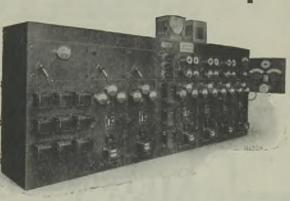
"Current" PROBLEM:

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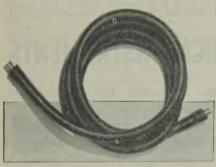


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Condenser Cooling

Tower Design and Performance

ALTHOUGH steam raising provides the primary reason for building power stations near water, the quantity required for this purpose is very small, having regard to the re-use of the condensate, in comparison with that used to condense the exhaust steam in order to create the high vacuum necessary to secure high thermal efficiency and to provide soft feed water. The amount of water circulated through the condensers, being about 5,000 times that required as feedwater make-up, is therefore the predominant factor.

Advantages of Riverside Sites

Industry also and hence populations tend to congregate near waterways, and railways are run to serve their needs. The desirability of river sites for generating electricity is thus reinforced by proximity to the market and by the ability they confer to choose either water- or railborne fuel and other materials. Where water resources are not enough for the needs of generation or no suitable site is obtainable nearby or where road space is insufficient for transport above ground or to accommodate the number of cables below the surface to deal with the station output, recourse has been had to cooling tower stations.

Until recent times the towers of wooden construction available provided a substitute but, for reasons mentioned in Mr. C. H. Fielding's article in this issue, of a very inferior kind which resulted in notably lower thermal efficiencies. The position was materially changed for the better by the introduction of concrete hyperbolic towers, which permitted of designs that ensured lower recooled temperatures. Requiring considerably less ground space, and of more pleasing appearance, they appreciably mitigated nuisance from moisture emissions. Moreover, they enabled efficiencies to be reached that were within about 5 per cent. of those that would have been achieved with direct pumping from a river in similar circumstances. This adverse margin may, however, be more than offset by ability to build on cheaper land or by savings in the construction of culverts and in expenditure on transmission. A recent example of the high thermal performance possible with concrete towers is provided by the Hams Hall "B" station (Electrical Review, July 20th.)

Compensation Water

While the amount of new water required by concrete cooling towers to compensate for evaporation and windage is generally less than 2 per cent. of that entailed with direct pumping from a river, it is nevertheless considerable, being nearly as much as would be required to provide steam if condensate were not used—for driving the associated turbine at full load. Even to provide this quantity for a 100,000-kW station at 60 per cent. plant load factor would call for nearly 1[§] million gallons a day—an amount that may not be readily available—and at several stations sewage effluent has been utilised with good results.

Methods of acquiring data regarding the operation of condensing arrangements have not yet generally reached the advanced stage attained in the boiler house and turbine room, and on the switchboard. In some instances there is no means of ascertaining accurately the amounts of make-up water or of differentiating between the performance of individual towers or of recording temperatures and atmospheric humidity. Having regard to the implications inherent in the use of cooling towers, a development to be expected is a control panel with all instruments required for checking their performance.

Inspecting German Industry ONE of the consequences of Germany's defeat is the obligation put upon her to allow industrialists from Allied countries to inspect

her works and so far as is possible gain useful information regarding plant, design, construction and processes. In our last issue we made reference to tours of German factories by gauge and instrument makers and we are now informed that arrangements for similar tours of electrical manufacturing works by representatives of British manufacturers are well in hand. Recent reports that some of the electrical factories in the British zone had been stripped of a good deal of their plant before we took over suggest that full value will not be derived from such inspections but no doubt sufficient is still available to give the visitors some useful ideas.

> I.E.E. Appeal

An appeal for funds for a worthy object is more likely to succeed if the subscribers know that their

donations will result in something which they may see with their own eyes and will make them feel proud that they had a part in its achievement. Such is the appeal just launched by the I.E.E. for a sum of at least £50,000 to enable it to provide a residential estate for members who through misfortune or illness have had to be helped by the Institution's Benevolent Fund. We feel sure that after reading the proposals which have been circulated to them members will be convinced that the scheme is a most desirable one and will hasten to help. They should particularly consider the benefits of using the covenant form of subscription. The plan has been considerably helped by the generosity of two members; the offer of one of them provides a firm basis for an early start.

Canadian Steam Plant

As an indication of the fortunate position of Canada in regard to waterpower resources, the reference in *Power*

(August) to a 24,000-kW steam station as the largest in the country is significant. This is operated in conjunction with the Polymer synthetic-rubber plant in Ontario, which requires large quantities of steam at various pressures, and the six 275,000 lb. per hr. boilers installed have also the greatest individual capacities in Canada. In addition two 100,000 lb. per hr. separately fixed superheaters are reported to raise the steam temperature for the butadiene process to 1,400 deg. F. Before the war steam stations were responsible for less than 2 per cent. of the public supply but with the addition of industrial plants the steam proportion probably approaches 10 per cent.

Gas-Turbine ALTHOUGH the gas turbine does not at present c o m p e t e thermodynamically with the steam

turbine for the generation of electricity, it should, with a five-to-one pressure ratio and 1,200 deg. F., give appreciably better results on a locomotive with electric drive than would non-condensing steam turbines, which require moreover, 100 per cent. make-up feed water. The ultimate aim is the direct combustion of pulverised fuel from which fly-ash has been removed. The closed-cycle (Escher-Wyss) system requires too-cumbrous heat exchangers, but according to *Power* investigations are in hand regarding the gasification of coal under pressure and the burning of the resulting gas after cleaning in the combustion chamber.

As a salutary reminder Little Fuel to the public of the need Saved for fuel economy, the reduction in street lighting after midnight will doubtless serve a purpose. Its effect on the stocks of domestic fuel will, however, be nil, as Mr. N. Boydell, borough electrical engineer of Eastbourne, has pointed out, since the type of coal used for generating electricity has no value for household purposes. Even if it had, a complete reversion to the black-out state would add under 15 lb. per head to the domestic supplies over the country as a whole.

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Recent Developments and Future Possibilities

DETAILS of the cablelaying plough given in the article by Mr. P. K. Davis of the Northmet Power Co. in the

Electrical Review of July 23rd, 1943, described

the various types of cable plough then in

use and some of the jobs which had been

completed by those machines. That article

also referred to a machine which was at that

time being built for laying 33-kV cables, the

By P. F. Clark, A.M.Inst.C.E. A.M.I.E.E. coulter had always exerted the major influence.

After some experience with this machine it was found that, while it was a great improvement on anything previously built, there were still a number of difficulties to be overcome, particularly when working in soft ground. Owing to the weight and size of the machine its manœuvrability was poor; the mounting of the drum took too long; and the weight of the various parts made it difficult to handle them with the number of men available. It was, therefore, decided to re-design and build a further machine.

From experience gained while laying approximately 150 miles of cable it was felt

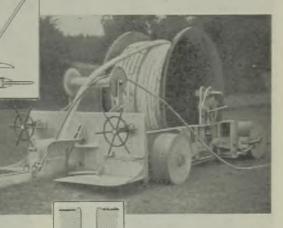


Fig. 1. — Cable - laying plough, Model 3, with (upper inset) coulter details and (lower inset) cable at bottom of soil cut

further development which has since been carried out by my company, Clough, Smith & Co., Ltd.

This was the first

machine made to carry the drum of cable on the plough chassis, thereby obviating the former tedious operation of laying out the cable in front of the plough and then pulling it back through the coulter of the machine as the latter moved forward. The drum is mounted by rolling it from the front of the machine between the two chassis members and then raising it on the hydraulic jacks (one of which can be seen in fig. 1), the cable being next fed into the plough coulter along the very gradual curve necessary when laying such large cables. The combined weights of the chassis and cable to be laid will thus control the coulter (fig. 2) whereas in previous types of cable-laying plough the



that in order to be really reliable the cable should be given some satisfactory protection, not only from possible damage after it had been laid, but also to ensure that the cable was always bedded in some known safe substance. Ex-

periments had already been made to effect a means of surrounding the cable as it was laid with a concrete grout, and in designing the new equipment this process has been perfected. Results already obtained show that the concrete surround affords a very good protection, ensuring no movement

of the soil near the cable, and filling the slot made by the plough, thus keeping the cable three parts :- the trolley portion of the in complete contact with the surrounding

Fig. 2.-Soil slot in soft ground (left) and in hard ground (right) under grout C2.

earth. By this means hot spots caused by local poor thermal conductivity are avoided and also. owing to the colloidal nature of the grout, it is impossible for any sharp stones or flints hauling (far distance in fig. 4) is made up of plough; the chassis supporting the blade,

or coulter; and the grout car. The two parts of the plough are joined together and appear as a single When a pin unit. (seen to the right of the front track, fig. 1) is removed the two parts are divided by a simple racking device and the front portion can then be used as a trolley for moving the drums into position.

Drums are mounted quickly on to the trolley by winching them up the ramp (fig. 5). the two

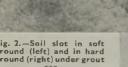
to remain in contact with the cable at any point.

The new plough train set up ready for pulling (fig. 3) with the windlass used for

Fig. 3.—Plough train ready, for pulling and (left) Fig. 4.-Grout pipe and funnel

"goalposts" helping to maintain control of the drum. The photograph actually shows an empty drum being lowered by a small hand winch mounted on the plough. To raise the drums a motor-driven winch fixed to the tractor, which forms an essential part of the equipment, is used. It will be noted that all parts of the equipment are mounted on tracks thus making them easily movable

over all types of ground. Screw jacks (two of which can be seen fixed to the front of the two ramps in fig. 3) are fitted to steady the trolley and grout car while they are





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being loaded. The steering of the train is effected by moving the tracks of the trolley in either direction; the control is by a simple reduction gear and the hand wheel which operates this mechanism can be turned as easily as the steering wheel of a car.

The rear, or chassis, of the plough carries the plough blade. The present equipment is designed to take different sizes of blade at varying depths; by this means cables

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Fig. 6.—Plough blade raising winch centre, where water is available,

Fig. 5.-Ramp winch for drum

up to 4 in. in diameter can be laid up to a maximum depth of 3 ft. A hand winch is used for raising and lowering the plough blade (fig. 6) and it can also be used for lowering an empty drum and for moving the rear portion of the plough when it is being connected to the front portion.

The grout is mixed at some convenient



by the well-known "Colcrete" process. It is pumped from the mixer direct into the grout car (fig. 7) which is then hauled by a tractor and coupled to the plough by a simple tow bar. Inside the grout car tank a catherine wheel rotates in bearings, one of which can be seen about half way up the tank.



(Left) Fig. 7.—Grout-pouring car and (above) Fig. 8.—Concrete surround, removed from cable at centre

On the spokes of the catherine wheel buckets are fixed. The whole wheel is then driven, through gearing, by the small rubber wheels which are pressed on to the tracks on either side of the car.

The buckets pick up the grout in the bottom of the tank and deposit it in a small container fixed at the top of the tank, whence the grout flows by gravity through a large

pipe (fig. 4) into a funnel which is fixed to the cheek plates of the plough coulter. The amount of grout deposited in the container will naturally depend on the speed of the catherine wheel and so is controlled by the speed of the tracks. The flow of grout will thus vary directly with the speed of ploughing and the concrete surround (fig. 8) will be approximately constant. It should be noted that just before the plough moves off, the valve at the end of the pipe feeding the coulter is always closed. The container in the grout car tank is then filled by rotating the catherine wheel by hand so that there is a reserve of grout in the feed pipe. Immediately the plough starts to move the valve is opened to allow the reserve grout to pour on to the cable. The container is

then fed automatically as already described. A light tractor or "Fordson" is an essential part of the equipment, for hauling the cable drums into position when mounted on the trolley portion of the plough, for moving the grout car to the plough from the dump where the grout is mixed and for generally moving all heavy parts of the equipment. The winch fitted on the back of the tractor is also of great use for overcoming general difficulties as well as for the mounting of drums.

Hauling Arrangements

A mobile winch of heavy design is still used as the plough-hauling unit. It has now been fitted with tracks, thus enabling it to move easily over all types of soil and also reducing considerably the time taken to anchor when setting up for a pull. The best speed for ploughing has been found to be at the rate of 12 yd. a minute. A very steady pull is obtained at this speed and the cable can be handled with the greatest possible care.

For moving from job to job the equipment is mounted on a special trailer which can be towed behind any large lorry or for short distances by a "Fordson" tractor. The winch can move by its own power; for long distances, a low-loader would be necessary.

The whole equipment has been designed primarily for laying cables across country by the most direct route. Six men can operate it. Everybody is well aware of the acute labour shortage there has been during the war period; it appears to be almost certain that it will continue for some time and there is, therefore, no doubt that some form of mechanical means will have to be used for laying all types of electrical distribution mains, whether underground or overhead. For cross-country work the cable plough will compete with any excavator and, provided cable costs are kept down, should compete with overhead lines up to 11 kV, particularly if all the costs of overhead lines, such as maintenance and total useful life, are considered. In the future it is also felt that economy of labour will be nearly as important as small savings in capital cost, and in this respect the cable plough will have a considerable advantage when deciding between cables or overhead lines.

Municipal Reports

Aberdeen

Although the income of the electricity undertaking for the year ended May 31st, increased from £398,691 to £419,584, the gross profit was £16,254 lower at £95,984, while the net deficit rose from £10,642 to £17,040. Mr. Alex Gardner, the city electrical engineer, says that the financial result is disappointing, but is almost entirely due to the action of the Ministry of Fuel and Power in increasing the price of coal without giving permission to make a corresponding increase in electricity charges. A contributory cause is the loss of output due to the restrictions on industrial output in March. The total sales of electricity increased from 90,770,547 kWh to 92,598,253 kWh, which was more than accounted for by an advance from 28,798,588 kWh to 31,843,704 kWh in consumption under the domestic tariff, probably due to the convenience of switching on electric fires compared with the difficulties of obtaining solid fuel. Power sales declined from 30,517,963 kWh to 29,795,503 kWh and heating and cooking from 10,976,275 kWh to 10,672,967 kWh.

Nuneaton

Sales of electricity by the Nuneaton undertaking (engineer, Mr. J. Lightbown) totalled 28 0 million kWh in 1944-45 as compared with 26 1 million in the previous year. Income amounted to £139,020 (against £130,761) and working expenses were £108,715 (£104,088). After meeting interest, etc., charges there was a net profit of £8.322 (£3.876), of which £2.664 was applied to special expenditure, £2.249 contributed to the rates and £3,409 transferred to reserve.

Heywood

Revenue of the Electricity Department (engineer and manager : Mr. H. C. Day) for the year ended March 31st was £80,498, which was $\pounds 7,117$ more than in the previous year. The gross profit was $\pounds 15,868$ ($\pounds 15,980$) and the net profit was $\pounds 2,623$ ($\pounds 2,055$). In the past five years the sales of electricity have advanced from 7,503,687 kWh to 16,198,602 kWh.

Cooling Towers

Comparison of Performance need By C. H. Fielding, 15 of

B.Sc., A.M.I.Mech.E.

THE chief facts which need to be known about a cooling tower are:—Weight of

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water to be cooled in a given time; drop in temperature of the water in passing through the tower; temperature of water leaving the tower (recooled water temperature); atmospheric humidity conditions, *i.e.*, wetand dry-bulb temperatures; height of tower and pond area (the surface of the tower pond on which the cooled droplets fall).

A cooling tower is 100 per cent. thermally efficient, since it must give up to the atmosphere all the heat put into the cooling water by the exhaust steam. It follows that the temperature drop of the water in its passage through the tower must be the same as the temperature rise in passing through the condenser.

The chief criterion in judging the performance of a cooling tower is the recooled water temperature in relation to a given wet-bulb temperature. Cooling takes place by convection and evaporation simultaneously, evaporation being the most potent factor. Evaporation occurs because the atmosphere is not saturated. The relative humidity of the atmosphere is usually found from observation of the wet- and dry-bulb thermometers. When the atmosphere is saturated the wet- and dry-bulb temperatures coincide, but when it is not saturated and therefore capable of absorbing more vapour the wet-bulb temperature is depressed below that of the dry bulb.

Figure of Merit

The lowest temperature to which water can be cooled by evaporation is the wetbulb temperature. From this a figure of merit can be computed for comparing the performances of cooling towers. If a tower were a perfect cooling agent it would cool the water down to the wet-bulb temperature, but this is not practicable, since an infinite amount of air would be necessary to achieve this.

This figure of merit is expressed by the ratio of the actual temperature drop of the water to the difference between inlet and wetbulb temperatures. As an example, suppose two towers to be capable of cooling one million gallons of water per hr. through 15 deg. F., with a wet-bulb temperature of 52 deg. F. Tower

A has a recooled temperature of 75 deg., and tower B 80 deg. Tower A will obviously be the more effective cooler since it is able to deliver the colder water. The water temperature at inlet to tower for A would be 75 + 15 = 90 deg. F. and for B 80 + 15 = 95 deg. F. Consequently the figures of merit would be, for A, $\frac{15 \times 100}{90 - 52} = 39.5$ per cent. and for B

 $\frac{15 \times 100}{95 - 52} = 34.9$ per cent.

The value of the recooled water temperature obtained, and hence of the merit figure, depends upon the design of the water distribution system and the stack, water concentration (*i.e.* gal. of water falling on each sq. ft. of pond surface per hr.), height of the water distribution system above pond level and height of the tower chimney.

Air Penetration

The cooling problem is really one of getting a sufficient quantity of cooling air to all parts of the water as it falls to the pond. The older wooden-chimney tower was limited in its performance by its inability to give correct air penetration to the centre of the stack if the width exceeded about 35 ft. The result was that the towers were rectangular in plan, the long sides presenting very large surfaces to the wind and consequently having a large overturning moment. For that reason the height of the chimney rarely exceeded 90 ft., whilst the amount of internal cross bracing necessary interfered with the flow of air and vapour leaving the tower.

Single towers of this type were therefore not built in sizes above a capacity of half a million gal. per hr. with a very moderate concentration of about 90 gal. per sq. ft. per hr. In addition, where banks of towers were necessary to deal with the considerable weight of water to be cooled in a large station, space had to be left between individual units to allow the ingress of air to the inner units, with the result that the total area covered was large. The number of towers required greatly complicated the pipework layout.

The modern ferro-concrete tower, which

can be built in single units of up to six million gal. per hr. can be designed to give a much better water and air distribution and, owing to the much greater heights to which it can be built without internal bracing, can secure a greater flow of air. This means that either a greater concentration can be used for a given recooled water temperature or with the moderate concentration of the wooden tower a much lower recooled temperature can be obtained. As an illustration, a station has four wooden towers, each

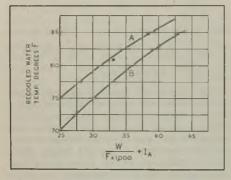


Fig. 1.—Performance of cooling towers with constant heat load and varying wet-bulb temperature

cooling 250,000 gal. per hr., 80 ft. long by 36 ft. wide with a chimney 80 ft. high. The water concentration is therefore $\frac{250,000}{60 \times 36} =$ 87 gal. per sq. ft. per hr. Allowing for the spacing between towers, the total ground area covered by the four towers with a total capacity of a million gal. per hr. is 87 × 160 = 13,900 sq. ft.

Adjacent to the wooden towers are two ferro-concrete units each capable of cooling 950,000 gal. per hr. with similar temperatures, having diameters at pond level of 96 ft. giving a base area of 7,200 sq. ft. The concentration for the ferro-concrete towers is $\frac{950,000}{7,200} = 132$ gal. per sq. ft. per hr. This is roughly 50 per cent. greater than for the wooden towers, but the ground area covered by the concrete towers is roughly half that of the wooden towers for an almost similar weight of water cooled. (7,200 sq. ft. as against 13,900.)

Recooled water temperature varies with the factor $\frac{W}{F} + I_A$, where W = the heat loading of the tower, that is, the weight of water cooled in lb. per hr, times the temperature drop in BThU, F = the surface area of the tower pond in sq. ft., and $I_A =$ the heat content per lb. of air entering the tower in BThU.*

Since the pond area is constant the recooled temperature will vary either with the tower heat load or with a change in wet-bulb temperature. With a well-designed tower the recooled temperature will be maintained steady over a large range of heat loadings. For example, a tower with a constant weight of water flowing through it might have a recooled temperature of 75 deg. F. with a cooling range of 10 deg. If the heat load were doubled by increasing the cooling range to 20 deg. the recooled temperature would not rise above 76.5 deg. a rise of only 1.5 deg. Since the recooled temperature is practically constant for a wide range of W, a curve relating recooled temperature with W/F + I_A, with I_A as the variable will give the tower characteristic.

Comparison of Different Designs

In Fig. 1, the performance of a ferroconcrete tower (A) at Darlington (Bottomley) is compared with that of another tower (B), of which the writer has knowledge. The two towers are of different design, but each is capable of cooling a similar weight of water through the same range, that is, with a similar heat load. The second tower puts up a slightly inferior performance, although it is higher by 45 ft. Where a bank of towers is worked in common, as is usually

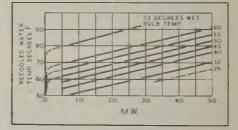


Fig. 2.—Relationship between recooled water temperature and wet-bulb temperature with different station loads

the practice, the weight of water circulated will be very variable as will also the heat loading which will depend upon the number of circulating pumps on load and on the turbine loading.

Fig. 2 gives the characteristic for the bank of four wooden and two ferro-concrete

^{*} Condensing Plant and Cooling Water Systems, W. T. Bottomley, Engineering, May 23rd and June 6th, 1941

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towers previously mentioned, the recooled water temperature being plotted against the station load in MW for various values of wet-bulb temperature, based on observations made over a considerable period. The linear relation between the recooled temperature and the load will be noticed.

When the temperature of air is raised it takes up heat by convection and evaporation simultaneously. The convective component is

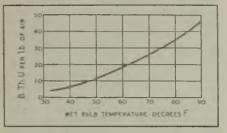


Fig. 3.—Variation of heat content of moisturefree air and the wet-bulb temperature

simply the product of the specific heat and the rise in temperature of one pound of air. The heat absorbed by evaporation in passing through the tower is equal to the difference in density of the water vapour due to its rise in temperature multiplied by the latent heat of vaporisation. The vapour content of the air varies considerably, the degree of saturation being denoted by the relative humidity and determined usually by means

THE Electricity Commissioners have drawn the attention of electricity supply undertakings to the provisions of the Town and Country Planning Act, 1944, with regard to (a) the designation of areas of extensive war damage and of land reserved for the re-location of population and industries in such areas, and (b) the powers conferred by that Act with regard to the compulsory acquisition of land, including in certain circumstances, the land of statutory undertakers.

In this connection special attention is drawn to the Particulars and Form of Orders and Notices Regulations, 1945 (S.R. & O. 1945 No. 1036, Stationery Office, 6d.) made on August 18th by the Minister of Town and Country Planning under section 63 of the 1944 Act and having effect from that date.

The forms of orders and notices contained in the schedule to the Regulations are those to be used by authorities in connection with declaratory and compulsory purchase orders to be made or authorised under the Act, and by bodies desiring to make representations in regard of a wet- and dry-bulb thermometer. The air is very rarely in a saturated condition but will approach this on a damp still day with a low temperature, whilst on a hot clear day in summer the humidity may be low, say 50 per cent. In the latter condition a considerable amount of isothermal cooling takes place.

A curve can be drawn of the heat absorbed by air with temperature rise from some base, usually 32 deg. F. The heat value so plotted is that of air originally "moisture free" *i.e.* the evaporative component is that of the heat absorbed by air when saturated from zero relative humidity.

The starting point of the curve at 32 deg. will be the heat required to saturate moisturefree air at that temperature, and is computed as follows. The volume of 1 lb. of dry air at 32 deg. F. is 12.4 cu. ft. and the vapour density 0.000304 lb. per cu. ft., the latent heat 1,070 BThU per lb. To saturate 1 lb. of moisture-free air would require $12.4 \times$ 0.000304 lb. of water vapour, and since the evaporation of 1 lb. of water at this temperature would require 1,070 heat units, the heat which the air could absorb by the evaporation process would be $1,070 \times 12.4$ \times 0.000304 = 4.03 BThU per lb. This is the starting point of the curve in Fig. 3 which shows the relationship between the heat content of moisture-free air and the wet-bulb temperature from which the value of I_A is obtained.

Supply Authorities and Planning

thereto. Form 4 is for representations by a statutory undertaker under section 13(5) of the Act with reference to a declaratory order; and Form 11 is for representations by a statutory undertaker under section 13(3) with reference to a compulsory purchase order.

Design in Industry

THE London Region of the Design and Industries Association is arranging a series of evening lectures to be held monthly in the Lecture Hall of the London School of Hygiene, W.C.1, during the coming tter. These lectures will deal Gower Street, autumn and winter. with design in the home, industry and commerce, with particular reference to new materials. They are being arranged primarily for the junior draughtsmen, benefit of students, designers, architects' assistants, etc. The first is on October 10th, 1945, at 7.0 p.m. The speakers will be Mr. J. E. Sisson, B.Sc., Ph.D., of the Plastics Division of the I.C.I., and Mr. Paul dshaw, B.Com. Lord Sempill, president the Association, will be in the chair. Bradshaw, B.Com. of Admission is free.

Views on the News

Reflections on Current Topics

BRITISH genius for compromise is again manifested in the proposal of the B.S.I. to produce a Standard Specification for a 3-kW (at 230 V) domestic plug and socket. It is intended to retain the dimensions stipulated in B.S. 546 and to put the fuse in the socket. But it is also proposed to allow for the use of fused plugs for the protection of smallcurrent appliances. This matter has been discussed for so long that settlement (if settlement it can be called) will be barely in time to catch the tide of new building which should soon be setting in. I await with some misgivings the views of the parties concerned.

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I cannot say that I am favourably impressed by the sign produced for members of N.E.C.T.A. by the E.C.A. Retail Trading Committee. It shows a pair of cupped hands apparently about to trap a thunderbolt although it looks as though this may escape. Above and below this strange device are the words:—" In Safe Hands: Electricity: N.E.C.T.A." Probably not more than six people outside the electrical industry know what the initials mean; I cannot agree with the *Electrical Contractor* that the public would not worry much about this—I think that it would want to know. As for the motto, or slogan, would not "Sweetness and Light" be more appropriate to the initials?

*

There are several references in this month's Electrical Contractor to the use by water supply authorities of asbestos cement pipes. Generally a warning is issued to those responsible for electrical installations but it is possible that this may sometimes be overlooked or may not come to the attention of an electrical contractor. In view of the trouble which is likely to arise in an installation which is "earthed" on an asbestos cement pipe system, those concerned should satisfy themselves that this is not being done. I see that it was stated in Dublin that some supply authorities provide earthing means in cases where effective earths are difficult to secure, but some of them would consider this to be the contractors' job.

Now that press censorship is ended it is meet and proper that a tribute should be paid to the Trade and Technical Section for the way in which it has discharged a far from easy task. When it began some people visualised a battle of wits between the papers and the censors, a false idea which was soon exploded. In fact cases actually arose in which the censors thought that the papers might have said more than they actually did and the Section often helped to overcome the Service Departments' innate tendency to excessive secrecy. But for all their kindness I think that no editor will actually shed tears over this parting.

A few months ago I referred to a query raised by a correspondent in The Times as to whether our factories should not "go to ground " even now that security considerations no longer operate. The development of the atomic bomb gives further point to his arguments and it might well be asked now whether we should not "go the whole hog" and put all our buildings underground in the future. Whether they (and we) should be then safe I very much doubt but, looking on the brighter side, we should at least prevent further encroachment on the countryside. With the more extensive use of electricity there should be no reason why living underground should not be every bit as healthy and comfortable as living on the surface. But let us hope that sanity will prevail and that we shall not have to revert to this troglodyte existence.

I see that in Cape Town the whole of the net profits of the electricity undertaking during the three years covered by the latest report have been taken for the relief of the city rates. The total sum exceeds half a million pounds and is equivalent to 16 per cent. of the revenue from the sale of electricity. Although the undertaking has a fine record of development this shortsighted policy must inevitably impose a considerable strain on its resources and the engineer rightly complains of this use of the undertaking as a taxing machine. In this country the propensities of local authorities in this direction are curbed to a certain extent.

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From the last annual report of the Electric Vehicle Association I gained an impression that the immediate outlook was not too bright, particularly as regarded the production of the standard vehicle. But the end of the war will make a great deal of difference and there is already an indication of improve-ment. Mr. V. W. Dale, the Association's secretary, says he has had a letter from the Ministry of Supply in which it is said that a number of individual manufacturers have applied for authority to produce electric road vehicles in 1946 and programmes have been agreed which total many times this year's estimated output and more than four times the number which the last-recorded pre-war figures indicate were manufactured in the previous year. -REFLECTOR

Dielectric Heating

High-frequency Welders for Cable Repairs and Joining Seams in Plastic Materials

THE novelty stage of dielectric heating by hysteresis induced with high-frequency AC is receding. Several equipments have been in use during the past two years for repairing p.v.c. cables and another model is employed in making seam welds between sheets and strips of insulating substances. By J. C. Quayle,

In both cases the production of radio-frequency power is accomplished by thermionic valve generators. They are

preferably designed for specific needs, otherwise the many adjustments required to match the generator to different kinds of load will involve a multiplicity of controls, which is best avoided in industrial service.

Material to be heated is contained between

electrodes and the capacitor so formed is included in a highfrequency resonant circuit and it may or may not form the total effective capacitance necessary for tuning the circuit to resonance. The power which is absorbed in the dielectric, and thus heats it, is given by the expression P = $\frac{0.2244}{10^{12}} \omega \left(\frac{E}{d}\right)^2 V (k$

 $\cos\phi$) watts where ω = frequency in circular measure $(2\eta f)$

d

= RMS poten-

tial gradient per inch through the material. V =volume of material in cubic inches. (k

 $\cos \phi$ = product of dielectric constant and power factor (termed loss factor).

Heating is proportional to frequency (for a given loss factor) and the range of frequencies that can at present be generated for dielectric heating extends up to about

missible applied voltage is a factor which limits the application of dielectric heating, particularly to those substances having very low loss factors. It is fortunate, however, that most thermo-setting and many thermoplastic materials possess a sufficiently high

Fig. I .- High-frequency heater for repairing p.v.c. cables

 2×10^8 cycles, or 200 Mc/s. There is at present, however, a restriction of the frequency at which large powers can be continuously generated due to the scarcity of valves of the type suitable for continuous operation at frequencies exceeding about 40-50 Mc/s.

The loss factor (k cos ϕ) is not independent of frequency and will vary over the range in a manner determined by the nature of the material. The

product $\omega(k \cos \phi)$ will nevertheless tend to increase with rising frequency for any material to which dielectric heating may be industrially applied. This consideration makes it advantageous to operate the equipment at the highest frequency at which the type of valve em-

> ployed can generate its full power.

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Heating is also proportional to the square of the voltage gradient $\frac{E}{d}$ through the material and this

is, of course, limited by the breakdown of the voltage material. Even when the material to be heated is of sufficient thickness to permit very high applied voltage, there will be losses due to discharge corona and this becomes troublesome above about 15 kV. Since it is not possible at the present stage of development to effect a great increase of frequency, the per-

M.Eng., A.M.I.E.E., M.I.R.E., and P. Jones

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loss factor for dielectric heating to be applied on an industrial scale.

The necessity for an efficient machine to repair p.v.c. cables arises from the fact that during extrusion the p.v.c. will sometimes suffer local damage. The location of



Fig. 2.-Seam welder for plastic strip and sheet

the damage is shown on breakdown test, and the faulty material must be removed and replaced. Former methods of making such a repair have a common failing in that the heating of the repair is accomplished by conduction methods. The steep temperature gradient through the repair which this form of heating entails will often result in imperfect bonding, particularly when a quick repair is being attempted.

Before the advent of p.v.c. such repair work was mainly confined to rubber cables and an essential difference between them lies in the fact that the former is truly thermoplastic during the cable manufacturing processes and remains so in the finished product. In contrast, rubber itself is thermoplastic during the initial stages of manufacture and is later converted into a non-thermoplastic material by the action of a vulcanising agent. The conversion is due to a chemical reaction which takes appreciable time and involves the liberation of heat within the material. These features, which assist in bonding a vulcanised joint, are absent in the case of p.v.c. No chemical reaction occurs when this material is used and great difficulty has in consequence been experienced when making repairs to p.v.c. cables by the methods previously employed. It follows that the merits of high-frequency heating for repairs to p.v.c. cables have been readily accepted by the cable industry, particularly as this method of heating may also be applied with benefit to repairs of v.i.r. cables.

Repairs of most kinds of p.v.c. cables are facilitated by the use of plastic filling compound, which is of putty-like consistency, and may be moulded into the repair under finger pressure. This compound is a mixture of gelled p.v.c. solution in excess of plasticiser. with sufficient powdered p.v.c. to give the desired ratio. When making repairs to cores or sheaths, filling compound may be used alone, or in conjunction with a split sleeve of dielectric cut from a similar cable. The repair may be held in a mould, or it may have a spiral lapping of varnished cambric, or similar tape, tightly applied and kept under tension to ensure that the repair is consolidated.

A foil applicator is lapped over the repair so that during the heating cycle it acts as the high potential electrode of the capacitor of which the repair material forms the dielectric; the conductor or metal braiding of the cable is the low potential or earthy electrode. When moulds are used (as is customary in making butt welds) the high potential electrode may be embedded in the mould material, or may lie flush with the active surface of the mould.

Cable Repair Set

In the machine shown with a length of metal braided cable in position (Fig. 1) the repair is located centrally over a sheet of material of low loss factor mounted flush with the panel. The energy is applied to the metal foil surrounding the cable by means of a loop mounted on insulating pillars. The loop forms the primary of a high-frequency transformer, the secondary of which contains a diode rectifier and milliammeter, which is mounted to the right of the rectifier box, for indicating the magnitude of the current flowing through the repair.

The braid of the cable has a relatively high capacitance to the earthed trough in which it is located, and the path for the highfrequency energy between the high potential

electrode and earth may be regarded as being through two capacitors in series. One is between the high potential electrode and the braiding with the repair forming the dielectric, and the other between the braiding and the earthed trough with the sheath of the cable forming the dielectric. The electrode area of the braiding-to-earth capacitor is very large compared with that of the capacitor of which the repair forms the dielectric; since the same current flows through each, there is negligible heating of the cable sheath owing to the lower current density induced in it.

The large control knob on the left (Fig. 1) varies the power generated, hence the current flowing through the repair, while the smaller control knob mounted next to it adjusts a time switch which is calibrated over the range 4 to 30 seconds. The time switch is of an electronic type and shuts off power after a predetermined interval. It consists of a resistance-capacitance network in which the voltage across the capacitor operates a gas-discharge device which controls the current in a contactor relay circuit. Many precautions have been observed to ensure the consistent operation of the time switch with variations in ambient temperature and humidity. It has incidentally been found possible for this type of switch to be used when time intervals of several minutes are required.

Safety Precautions

No high-frequency power can be generated until the hinged screening cage is brought down over the repair and radiation from the equipment is thus minimised while, at the same time, the job is rendered inaccessible. In use, the requisite current and time settings for given types of repair are found experimentally; but, after a little practice, these can be estimated for a new type of repair with fair accuracy. The machine is capable of accommodating cables up to one-inch diameter and its operation presents no difficulties to unskilled personnel.

The heating time required for a repair on p.v.c. cables ranges from 5 to 15 seconds, but will be somewhat longer when v.i.r. cables are being treated. As mentioned earlier, the conditions required for vulcanising rubber are somewhat different from those needed for effecting a joint in p.v.c. and there is, in the case of rubber, a greater danger of spoiling the repair through overheating. By h.f. methods the heating is not directly proportional to time, because the values of dielectric constant and power factor of the dielectric are inclined to increase with temperature. This causes some dielectrics to heat much faster at higher temperatures and, to obviate the risk of overheating on v.i.r. repairs, it is usual to operate with smaller currents than are used in making repairs to p.v.c. cables of similar dimensions.

Plastic Seam Welding Equipment

Seam welds between p.v.c. sheets can be quickly and effectively made by highfrequency heating, for the heat is generated



Fig. 3.—Smaller cable repair outfit

within the material and good bonding naturally results. It is worthy of mention that if a seam which has been welded by high-frequency power has the appearance of being sound it is invariably found to be so in practice; whereas a weld made between heated platens can look satisfactory but subsequent use may prove it to be faulty.

The view of the controls of the strip welding equipment (Fig. 2) shows the high potential electrode flush-mounted on the top panel with strips of the p.v.c. to be welded secured under spring clamps with their ends slightly overlapping. The pivoted central arm carrying the earthy electrode is fitted with a handle by which pressure is applied to the joint. When this is done a switch energising the generator is automatically operated and so ensures that high-frequency power is not

produced until the earthy electrode is pressed down over the high potential electrode, which is then screened and rendered inaccessible. P.v.c. in strips of thickness up to 0 025 in. and up to 6 in. wide can be accommodated on this equipment and a good weld made in one to five seconds, according to the type of job.

There is no necessity for a time switch on this equipment, as the operator applying pressure to the electrode handle can easily feel when the weld has been made. The thickness of the weld is the same as that of the material itself for the electrode becomes supported on the cold material at either side of the weld at the end of the operation. It is also possible to dispense with a meter for indicating the passage of current through the work and the complete equipment is of a very rugged and simple nature.

The power capability of the seam welder illustrated is much less than that of the cable repair set; as the need has been felt for a cable repair set to accommodate smaller repairs, a number of seam welders have been converted (Fig. 3) for this purpose and fitted with an electronic time switch.

Acknowledgments are made to British Insulated Cables, Ltd., for permission to publish this article and for development facilities made available in the company's condenser department research laboratories.

Domestic Plugs and Sockets

Proposed Standard Specification

A N announcement has been made by the British Standards Association of its intention to prepare a new Standard Specification for domestic plugs and sockets. In a summary of the events leading up to this the B.S.I. says that experience prior to the war had shown that the existing B.S. 546, which provided three standard ratings of 2, 5 and 15 A, was not wholly satisfactory from the standpoint of the convenience of the consumer; there was a growing need for a rating intermediate between 5 and 15 A which could be used for all domestic purposes.

The large programme of house-building envisaged for the post-war period made it urgent to consider this question so as best to meet post-war conditions; the cessation of house-building during the war gave an ideal opportunity for such consideration. With the encouragement of the then Ministers of Reconstruction, Works, and Fuel and Power (Lord Woolton, Lord Portal and Major Lloyd George) the question has been intensively studied during the past two or three years with the assistance of all those concerned with manufacture, installation and use. In all these discussions, there has been universal agreement that there should be a single all-purpose domestic plug and socket-outlet, but there has been a difference of opinion as to whether this could best be achieved by the adaptation of one of the existing standards or by an entirely new design, non-interchangeable with any existing standard.

A final decision has now been reached by the Electrical Industry Committee of the B.S.I., which, feeling that on balance the complicated needs of the situation will thus be best met, has decided to standardise an all-purpose domestic plug and socket-outlet of the same dimensions (as regards interchangeability) as the 5-A size in B.S. 546 but rated at 3 kW (13 A at 230 V). This decision also embraces the decision that a local fuse shall form part of the fixed part of the installation but that an additional fuse rated at not more than 3 A may be fitted in the plug when required for the protection of small-current appliances. Plugs suitable for the accommodation of 3-A fuses are already available, and are included in B.S. 546.

Except that the rating of the new plug and socket-outlet is to be 13 A instead of 10 A this decision conforms with the majority recommendation made in paragraph 92 of the main report of the Electrical Installations (Study) Committee (Post-War Building Studies No. 11) whose other detailed design requirements will be adopted. The decision reverses a previous decision of the Electrical Industry Committee which endorsed the recommendations made by the Electrical Installations (Study) Committee in its supplementary report which is contained in the Appendix to Post-War Building Study No. 11.

A new British Standard Specification embodying modifications to the present B.S. 546 will be prepared at an early date. The modifications relate to matters of comparatively small detail and will leave existing 5-A plugs interchangeable with the new plug.

Electrical Industries Victory Ball

A N attractive programme has been arranged for Friday, November 9th, at Grosvenor House, Park Lane, when the Electrical Industries Victory Ball is being held on behalf of the Electrical Industries Benevolent Association Jack Payne and his band will provide the music, and a cabaret of well-known radio stars will include Jack Train (of "Itma"), Michael Howard and Margaret Eaves. Owing to the war there has been a six years' gap since the last Electrical Industries Annual Ball, which was a notable event of pre-war winters. I H

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CORRESPONDENCE

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

Chief Engineers' Salaries

PROTEST is surely overdue against the space and publicity devoted in your journal and others to the question of the remuneration of the heads of undertakings.

Doubtless the question as to whether someone is entitled to a salary of say $\pounds 1,800$ instead of $\pounds 1,500$ is of intense moment to himself and to the relatively few in this salary class, but becomes tedious (to put it mildly) to the less fortunate majority of readers.

One might have thought, that at any rate during the war, the continued prominence given to such questions would have been regarded as of secondary importance, even to those directly concerned. I did not, however, detect any abatement, and wish to make a plea for "first things first."

M.I.E.E.

(Master Mariner).

Concerning Trams

YOUR correspondent Mr. Grierson states that "responsible bodies have decided upon one of the alternatives to the tram", implying that all the leading operators of urban transport have decided upon the replacement of tramways by motor or trolley-buses. Yet of the eight largest cities in Great Britain, only two, London and Manchester, have announced such a policy; one other, Birmingham, has abandoned several routes, but has not definitely decided to replace the remainder.

The remaining five, Glasgow, Leeds, Liverpool, Sheffield and Edinburgh, have modernised their tramway systems, and have mostly stated their intention of continuing this policy in the future. At Glasgow both the transport manager and the city engineer have drawn up plans, covering the next fifty years, during which the trams will be further modernised and transferred to reserved tracks and subways. Similar schemes are envisaged at Leeds, where a new route is at present being laid and new cars built, and at Liverpool, which has opened miles of new extensions, replacing bus services, during the war.

With "Reflector's" remarks, concerning the suitability of trolley-buses to replace trams where the latter, due to narrow streets, insufficient traffic, or other special reasons, have to be abandoned, I agree, but I fail to see how Mr. Grierson interprets this to mean that all trams should be replaced by trolley-buses.

As for noise, it is true that even the modern trams in this country are not as silent as trolley-buses, but they are quieter than Diesel buses and certainly do not cause any suffering to the workers who use them, who would tolerate a little noise for the sake of cheap fares, freedom from smell and ability to read their paper in comfort as they ride to work. However, even this noise is unnecessary, as trams are already running in America which are absolutely silent, and the managers, of two British systems are considering the possibility of introducing similar cars here.

Although a Graduate of the I.E.E., I am not connected in any way with the traction side of the industry. ELECTRANSPORT.

WHY your correspondent Mr. Grierson should import into this discussion the name of the Light Railway Transport League, which neither initiated nor took part in it, is a mystery, and is also a little discourteous to the organisation in question, which might have missed the reference. It is still more mysterious why he should apparently imagine (I can think of no other interpretation of his words) that this in some way automatically discounts everything that has been said.

I personally do happen to be a member of the League, though naturally I cannot answer for any other correspondents; but I wrote purely as an individual, expressing my own personal views of long standing, as I was in the habit of doing on such occasions long before the League admitted me- to membership and indeed long before it had even been formed. I would add that never, in the course of a long association with this organisation, have I ever heard it referred to as " The Tram Club "-it has a perfectly good and adequately descriptive title of its ownand I would also suggest that if any particular correspondent, expressing certain personal views, has in fact also taken the trouble to take concrete action in the same direction by giving his support by membership to an organisation professing similar aims, this is,

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if anything, an additional proof of his sincerity and conviction.

Your correspondent, in admitting that he has never heard of any measures being taken to reduce noise on tramways, thereby reveals that he is unaware of the existence, let alone the technical features, of the American P.C.C. car—undoubtedly the greatest single advance in the transit field in recent years—and this alone is sufficient to preclude serious consideration of his conclusions far more effectually than any irrelevant and academic question as to whether he happens to be a member of some hypothetical "Bus Club."

If your periodical were seriously intending, in its correspondence columns, to cover exhaustively the whole highly complex and controversial question of the respective places to be assigned to different methods of street transport, I fully agree—while remarking that any reference to a "natural change" begs

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the whole question-that it would be necessary to canvass the opinions of, inter alia, successful trolley-bus operators, as well as of the thirteen British undertakings which have totally abandoned this vehicle. This is to say nothing of those with successful experience with motor omnibuses or modern tramways, and perhaps of such bodies as the Melbourne and Metropolitan Tramways Board, whose current programme of busscrapping and tramway extension along some of the main streets of that capital city is certainly not without bearing on the matter. But if I remember rightly, the present discussion arose out of a more limited issue: to be precise, an assertion that trams must be dangerous because they have lifeguards; and to that, the original point under discussion, more than adequate replies have already been given.

Neasden, N.W.10.

W. H. BETT.



Control in Retail Industry. By K. C. Johnson-Davies, M.A.(Cantab), Barrister-at-Law. (118 pp.) The Trader Publishing Co., Ltd., Dorset House, Stamford Street, S.E.1. Price 6s.

Although this handy work refers more particularly to the motor-car industry the general principles operating in that industry can find application in many others. Its purpose is to outline the legal rights of a trade association in securing the observance of rules of trade and conduct designed for the common good of those in an industry. Among other things it sets out the case for the maintenance of fair prices and the prevention of undercutting. Judicial decisions upon many aspects of trade-association operations form a large part of the book, which has a foreword by Sir Miles Thomas, vice-chairman of the Nuffield Organisation.--J.H.C.

Hydraulics. By E. H. Lewitt. Seventh Edition. Pp. 601; figs. 268. Sir Isaac Pitman & Sons, Parker Street, London, W.C.2. Price 15s.

The seventh edition of this well-established textbook (first published in 1923), which aims primarily at covering the syllabuses of the B.Sc. (Eng.), Inst.C.E. and I.Mech.E. examinations in hydraulics and the mechanics of fluids, has been enlarged and brought up to date by the addition of material on recent developments and by a selection of recent examination questions. Some of the earlier portions of the book have been revised. New matter includes sections on wave formation, boundary layer control, effect of supersonic velocity and measurement of air flow. The scope of the book is confined to theory and its applications based on first principles, and does not include problems of design.—C.O.B.

Basic Physics. By D. R. W. Archer, B.Sc. Pp. 41; figs. 17. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, London, W.C.2. Price 1s. 6d.

Though intended primarily for the use of aircraft mechanics, this little book provides a useful introduction to physics for the general reader which should whet his appetite for further study.

Book Received

Luminous Tube Lighting. By H. A. Miller, A.M.I.E.E. (152 pp. 78 figs.) George Newnes, Ltd., Tower House, Southampton Street, W.C.2. Price 10s. 6d.

Brazil Railway Electrification

WING to congestion at the port of Santos the project of linking Sao Paulo and Santos by the Sorocabana Railway has again come to the forefront. The idea which was first conceived several years ago has been neglected but in view of present day difficulties Minister Mondonca Lima, during his recent stay at Santos, resumed negotiations with the appropriate authorities. The entire extension of the railway will be about 100 km and Diesel-electric locomotives of 1,300 HP for trains of 700 tons have already been ordered.

The director of the Sao Paulo Railway who recently returned from Rio de Janeiro states that preparations for the electrification of the line between Sao Paulo and Jundiahy have been completed.—Reuter's Trade Service. 45

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PERSONAL and SOCIAL

News of Men and Women of the Industry

BELFAST Transport Committee has recommended the appointment of Major H. G. Crawford, M.C., B.Sc., A.M.Inst.C.E., as deputy to the general manager and engineer of the Corporation's transport undertaking (Lt.-Col. R. M'Creary). Major Crawford, who is permanent way engineer and building superintendent in the Department, was in the Territorial Army before the war and won the Military Cross in Tunisia.

Mr. A. D. Noble has been appointed manager of a new branch which Berry's Electric, Ltd.,



Mr. A. D. Noble

has opened in Scotland with temporary offices at 45, Hanover Street, Edinburgh, 2. Mr. Noble was educated at St. James' School, Edinburgh, and has been connected with the electrical trade in Scotland since 1919. He was for many years on the sales staff of the Edison Swan Electric Co., Ltd., and was subsequently with Wood & Cairns, Ltd., Edinburgh.

Blackburn Corporation Electricity Department proposes to set up a new sales and development section with Mr. J. Ashworth, consumers' engineer (who was recently offered but has declined an appointment at Preston) as the new technical engineer in charge, at a salary of £745 a year. Responsibility for publicity, canvassing and completion of sales agreements, formerly under the commercial assistant and chief clerk, will be transferred to Mr. Ashworth, leaving the chief clerk to concentrate on accountancy.

Mr. Stanley J. Harley, Technical Controller, Machine Tool Control, headed the delegation of sixteen representatives of Government Departments and industrial concerns which left for Ottawa last Sunday to take part in the conference on unification of engineering standards which opens on September 24th. The conference, which is under the auspices of the Combined Production and Resources Board, is representative of Great Britain, Canada and the United States, and will discuss screw threads. The British Standards Institution is represented by Sir William Stanier, Mr. Percy Good and Mr. J. E. Baty.

We are informed that Mr. G. B. Page, having concluded his arrangement with the Associated Industrial Development Co., Ltd., Calcutta, has ceased to be a director of that company and is no longer connected with it or any of the other companies under its managing agency, namely, the National Insulated Cable Co. of India, Ltd., National Rolling Mills, Ltd., National Pipes & Tubes Co., Ltd., and Hindustan Wire & Metal Products, Ltd.

Mr. G. H. Clipstone has been appointed manager of the Control Gear Sales Department of the British Thomson-Houston Co., Ltd., in succession to the late Mr. F. G. B. Hill. He joined the company in 1912 as an engineering apprentice and after serving at the Admiralty during the 1914-18 war he returned to the company in 1919, when he was attached to the Control Gear Engineering Department, being transferred to the Sales Department in 1924.

Mr. O. A. Pallett has been appointed supervisor of purchases for the B.T.H. Co., this post having became vacant by the death of Mr. J. E. Betts. Mr. Pallett joined the company at Coventry in 1912 and saw service in the Army in Egypt, Palestine and France from 1915 to 1918. He was appointed chief of the B.T.H. order department, Coventry, in 1930, and chief of order and stores in 1931. Now, as supervisor of purchases, his address is Rugby.

In announcing that their "Thermovent" heating branch is resuming activities after a

break of five years, E. K. Cole, Ltd., state that Mr. C. B. Cleland, technical formerly manager of Unity Heating, Ltd., has been appointed technical sales manager. He will operate from 5, Vigo Street, London, W.1 Regent (telephone : 2602). The "Thermovent" branch is under the general management of Mr. M. I. Lipman, M.B.E.



Mr. C. B. Cleland

Two retiring employees of the English Electric Co., Ltd., Stafford Works, were last week presented by the board and management with long-service testimonials. They were **Mr. J. F. Powell**, who retired after 47 years' service, and **Mr. F. Ryell**, who retired after 42 years' service. The presentation was made by Mr. Milligan, manager of the Stafford Works.

Mr. A. E. Bostel, for fifteen years consumers' and sales engineer of the Sheffield Corporation Electricity Department, is retiring. For some years he has been hon. secretary of the Sheffield 'Sub-Centre of the Institution of Electrical Engineers. Mr. Reynolds-Davies, B.Sc., M.I.Chem.E., has been appointed deputy secretary of the Institute of Fuel, and will take up his duties in a few weeks' time. Mr. Reynolds-Davies received his technical education at University College, Cardiff, and the South Wales School of Mines. He has had a wide experience as a chemical engineer and fuel technologist for several years.

Mr. Camille Espir has returned from service with the R.A.F. which he joined after being demobilised from the French Air Force. He served for about a year in Africa and was then on service in this country. He was recently awarded the British Empire Medal for helping to rescue an airman from a burning aeroplane in June last year. His address is 38, Dennington Park Road, West End Lane, West Hampstead, N.W.6.

Mr. W. R. Herod, formerly executive vicepresident of the International General Electric Co., has been elected president and director. He succeeds Mr. Clark H. Minor, who is retiring after twenty years as president. Mr. Minor will continue as a director of both the General Electric and International General Electric Companies and as chairman of the executive committee of the latter.—Reuter.

Mr. G. A. Vandervoort, who recently retired from the position of chief engineer to the New Brunswick Electric Power Commission, had been with the Commission for twenty-three years and was superintendent of operations until 1941. He was formerly with the Hydro-Electric Power Commission of Ontario. Mr. Vandervoort is succeeded by the present superintendent of operations, Mr. W. D. McDonald, and Mr. J. Stephens has been appointed to a new post-engineer in charge of steam power development.

Appointments Vacant .--- Among the positions advertised in this issue are the following:---Chief assistant engineer for the Southampton Electricity Department (£826 per annum); electrical engineer for Penmaenmawr U.D.C. (£300-£360, plus war bonus, at present £60); distribution superintendent for the Swinton and Pendlebury Electricity Department (£523); assistant mains engineer for the Greenock Electricity Department (£445); engineering assistant for the Mid-Lincolnshire Electric Supply Co. (£306 plus bonus, at present £62); charge engineer (£397) and relief charge engineer (£371) for the West Midlands J.E.A.; assistant section engineers for the C.E.B ; and assistant secretary for the Association of Supervising Electrical Engineers (£500-£600).

Obituary

Mr. Edward Carlton Coote, lamp sales manager of the British Thomson-Houston Co., Ltd., whose death on August 27th after a short illness at the age of eighty-one was briefly recorded in our last issue, began his association Mr. Coote's service with A.E.I.—practically all of it in connection with the sale of electric lamps—extended over a total period of nearly sixty years. During this time he saw, and to some extent influenced, the many changes which transformed the early carbon filament lamp into the fluorescent lamp of to-day.

The funeral took place at the Mortlake Crematorium on August 31st many representatives of the electrical industry being among those present.

Mr. M. Falk.—We regret to report the death of Mr. Max Falk on September 9th at the age of seventy-eight. Mr. Falk was chairman of Falk, Stadelmann & Co., Ltd., until his retirement in May last year and was still a director of the company at the time of his death. Mr. Falk entered the business very shortly after its foundation in 1882 by his brother, Mr. Solomon Falk, and upon completing fifty years' connection with the company in 1932 was presented with a gold cigarette case from his co-directors as a memento of the occasion.

Mr. P. Wilson.—The death has occurred at Windlestone, Ferryhill, Co. Durham, of Mr. Percy Wilson, who held the position of chief electrical and mechanical engineer for many years at the north-east group of collieries of Pease & Partners, Ltd.

Will.—Mr. E. Bolton, director of Mather & Platt, Ltd., left £51,458, with net personalty £49,873.

B.T.H. Contribution to Radar

OME idea of the important contribution made by the British Thomson-Houston Co., Ltd., in the development and manufacture of radar equipment (particularly the design of G.L.3 type) for A.A. fire control and searchlight control was afforded by a demonstration last week with aircraft in flight, and visits to the company's factories at Rugby and Leicester. The company received its first contract for this kind of equipment in 1940 and in November of that year started a programme of research leading to the design and construction of the centimetric type of gear. The first six models were delivered in December, 1941, and during 1942 large-scale production commenced at the Blackbird Road factory, Leicester, which became the company's principal radar factory with an area of 125,000 sq. ft. delivering its first equipment in October, 1942.

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Public Lighting Conference

Address and Papers at Glasgow

This week the Association of Public Lighting Engineers has been holding its first post-war annual conference in Glasgow. Mr. E. J. Stewart, M.A., B.Sc., the President delivered his address on Tuesday afternoon and subsequently four papers were read and discussed. An illustrated report of the proceedings and some notes on the exhibition of street-lighting equipment arranged in connection with the conference will appear in our next issue. The presidential address and papers are summarised below.

Presidential Address

N his address the President MR. E. J. STEWART (Inspector of Lighting, Glasgow), first draws attention to some aspects of present local lighting which, for reasons of economy, has not yet fully reached post-war levels. In its present modified form it has meant an increased expenditure in Glasgow over the previous year of £24,393 on gas and electricity alone. The total increase of the city's estimated 1945-46 net expenditure

over that of last year is £56,749. Restoration of the full pre-war standard would have necessitated the expenditure of £50,000 more on gas and electricity, the equivalent of an additional penny rate.

These considerations lead the president to question whether upper limits, financial or technical, are desirable. He does not suggest restriction of street lighting when compelling causes no longer operate, being



Mr. E. J. Stewart, President, A.P.L.E.

content simply to emphasise the value of high mounting. He also points out that low mounting tends to create glare and patchy illumination.

Turning to the future, the president remarks that the forms of towns of 50 years hence, of their roads and, consequently, their illumination are already developing. Concerted planning for town and country is going to exert much more influence on form and lay-out than in the past. Glasgow

suffered very little war damage and so there is no easy way to the radical alterations of road systems which the volume and speed of modern traffic demands.

The most recent, most official and, perhaps, most sweeping of plans is that put forward by Mr. Robert Bruce (city engineer) which implies much activity on the part of the city's Lighting Department. A glance at the principles involved shows classification of roads into arterial, sub-arterial and local whereas the proposed new specification (based on Ministry of Transport recommendations) provides for two classes only.

The president suggests that the dual distinction is insufficiently comprehensive either for present or future needs; also that, if the proposed "Group A" standard of illumination is the better, then its application ought not to be harshly restricted. If there is to be segregation of functions among roads, then some divergence in form of lighting should be provided for.

Junctions and Intersections

Rural stretches have special problems of supply and maintenance; solutions might include a return to series electric lighting. It is assumed that there will be no more single carriage-ways of 50-60 ft. width, which are difficult to light properly from the sides without the use of central islands. The proposed reduction of the number of junctions should simplify lighting lay-outs, although intersections are likely to be more complicated than at present while future "roundabouts" and multi-storey street junctions will introduce a number of fresh lighting problems.

These plans partly answer the question whether lighting should be provided merely for public safety, or sought as a gracious amenity to be admired for its own sake. It will be worth while thus to embellish the attractiveness of cities.

Such long-term plans raise the question whether immediately necessary improvements should be quick or gradual. Glasgow's way is to carry out only that which can be paid for from the revenue of the current year; this method takes longer but avoids payment of interest and obviates the risk of a scheme becoming out-of-date before it has been paid for.

Glasgow's System

TREET illumination in the convention City, which claims to have become one of the best lighted of the larger towns since the relaxation of restrictions a year ago, is described in a paper by MR. J. M. WARD (assistant inspector of lighting, Glasgow). There are 685 miles of lighted streets and 25,000 common stairs providing access to flats and tenement dwellings; so statutory requirements involve the lighting, extinguishing and maintenance of 126,500 lights ranging (pre-war) from 1,000 W electric to 0.7 cu. ft. of gas. During the "black-out" 300 miles of streets were illuminated to the permitted 0.2 ft.-candle (B.S. 37 " starlight ") standard, but labour and energy, costs have prevented restoration of prewar wattages. The present "economy" lighting is provided by 60-W bulbs in place of 150- and 200-W lamps, or 100- and 300-W instead of 300- and 1.500-W lanterns.

The Ministry of Transport's recommended mounting height of 25 ft. with 40 yd. spacing in main streets has been the practice in Glasgow since 1908. In addition to tall steel poles, Transport Department poles with extension pieces are also used for lighting and there are many examples of span mounting. "Glasgow"-type lanterns are generally employed although "St. Mungo" reflector fittings without glassware (stocks of which are very low) have helped considerably to minimise costs of cleaning and maintenance by tower wagons, raising and lowering gear being rarely used.

Seven Control Areas

Being so largely committed to the use of overhead cables, Glasgow cannot usefully employ the lower mounting heights, which are generally agreed to be unsatisfactory; nevertheless, heights of 20 and 22 ft. are in use while on many large housing estates completed between 1920-30 swan-neck 9 ft. iron pillars are used.

In a city of 39,725 acres with 675 miles of lighted streets and a switchable load of over 4,000 kW any idea of a master switch is out of the question. Instead, the city is divided into seven control areas and in each of the existing five "stations" there are switchboards for controlling large numbers of street and stair lamps through a system of relays.

The switching cables are rings, returning to indicator lamps on the switchboards; all the cables are overhead and under the Lighting Department's care and maintenance, are nearly 1,000 relays serving street lamps and traffic signs. The author's preference is for impulse relays (triple-pole mercury) which he considers could be improved in respect of housing, mounting, lubrication and toggle design.

Stair lighting is a peculiarly Scottish problem. In Glasgow 17,000 closes are gas lighted in addition to 30,300 electric lights in 8,000 closes and stairs with 6,000 relays for stair lights, many of them being group controlled.

The paper concludes with some remarks on finance in explanation of the \pounds 529,714 estimate for 1945-46, of which salaries and wages account for \pounds 282,000 and electricity for \pounds 71,585.

Bends, Junctions and Roundabouts

IGHTING of street bends, junctions and roundabouts is considered in a short paper with a number of diagrams by MR. F. F. MIDDLETON.

Carriageway illumination produces substantially brighter regions on the road surface by semi-specular reflection between the observer and lamps than on other parts of the road which are equally illuminated. Such bright regions are narrowed and elongated towards approaching traffic. In the author's opinion there is a tendency to attach too much importance to the formation of those bright patches and to the merging of reflections from successive sources. He contends that too little regard is paid to those other parts of the backgrounds which should be as uniform as possible in brightness with the carriageway.

Types of Road Surface

Compensation for this disparity necessitates graduating the light intensity which is reflected from different surfaces, thus involving the use of lanterns appropriately designed to distribute light in relation to the types of surfaces which are normally to be illuminated.

In an endeavour to prove the necessity for extensive and uniform backgrounds the paper includes comparative iso-candle diagrams and pedestrian silhouettes that are intended to indicate the very small part which road brightness (as compared with pavement brightness) plays in exposing objects to motorists on straight roads; it is much less effective at curves, the amounts 345

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available as background being considerably reduced by perspective.

The author maintains that without adequate background brightness, particularly at bends and junctions, objects cannot be made visible.

Street-Lantern Design

WGINEERING principles in the design of street lanterns are discussed by MESSRS. J. G. CHRISTOPHER and J. S. SMYTH (G.E.C.) whose paper was written for presentation to the abandoned 1939 conference. They set out to analyse fundamental mechanical requirements, assuming the incorporation of an efficient optical system, with the object of indicating how far the equipment then available satisfied them.

No startling changes from the conclusions reached six years ago need be expected. The economic limitations to the power available for street lighting still apply and there will not be any departures in the near future from pre-war methods of " applying " the light to road surfaces. For some time to come pre-war types of lamps will continue to be employed, since special types devised for military service (which have absorbed so much of lamp designers' time) do not usefully lend themselves to street lighting. It is thus only in respect of materials that real developments need be considered at the moment. A short section on plastics has accordingly been added to the paper and recent designs of lanterns are illustrated.

Guarding Against Corrosion

The greatest addition to relevant knowledge is in respect of the protection of equipment against corrosion, and the original discussion of this subject has been rewritten. It is not possible to lay down definite rules, but in the authors' opinion zinc-aluminium alloys are not satisfactory for the worst coastal conditions, while specialised proprietary aluminium alloys are too expensive for general use in lighting equipment. In addition, materials used for making screws and other small attachments must be carefully selected to avoid serious interaction between body casting and its components. Brass and copper alloys are often unsatisfactory, their behaviour depending upon the exact nature of the body casting with which they are in association.

Advice is given on the avoidance of shaking and vibration of lanterns in service and minimising ill-effects of high temperature on lamp performance and glassware. In the authors' opinion the best way of ensuring easy maintenance is to place a simple optical within a totally enclosed lantern having a smooth exterior that can be brushed clean. Reduction of light output due to absorption in the additional glassware and glazing bars necessitated by total enclosure is from 5 to 10 per cent., which loss is usually outweighed by reduced depreciation.

The principle of total enclosure has recently been extended to lanterns not previously available in this form; for example, the "cut off" type for horizontal discharge lamps. The glassware is blown as a complete globe, the upper part being silvered to form a reflector while a diffusing finish is moulded on to the lower portion to break up striations.

The cost of lanterns is perhaps not more than 15 per cent. of the total cost of a street lighting installation. Since the optical component is the main portion, the metalwork should be unobtrusive. Some optical parts operate at temperatures of the order of 100 deg. C., which is above the softening temperature of plastics of a suitable nature now available; there does not appear to be any easily moulded plastic material that combines in itself the strength, toughness and machineability of metal at an economic price.

Gas Company's Experience

THE public lighting service which the Gas Light & Coke Co. is able to offer is indicated in a paper by MR. E. S. HARRIS, who summarises the accumulated experience of that company. Administrative aspects are dealt with first, passing on to the planning of new installations and, finally, indicating what to look for in a street lighting installation.

Installations in Temporary Houses

EDINBURGH Corporation Housing Committee has called for a report on the adequacy of the provision of internal plumbing and electrical installations in temporary houses. Some assurance is wanted that the installations are adequate in respect that repairs will not be a recurring necessity. One member thought the matter should be taken up with the Secretary of State, because someone would have to bear the responsibility if there were an accident. Replying to a question as to financial liability in connection with the temporary houses, the Town Clerk said the position was that while the Government erected the houses the Corporation arranged for occupation and maintenance. If a house was not fit for occupation, then the question might arise whether the Corporation

The Ownership Question

Electricity and National Planning

CERTAIN aspects of the development and structure of the electricity supply industry are surveyed in a book by F. Hamlyn Dennis just published* with a view to bringing the problems of reorganisation before consumers as well as electrical engineers. Data have been industriously collated from many well documented sources, leading particulars being conveniently presented in eleven charts and thirteen tables. Recent reports of various bodies are summarised and such matters as the trends of wages and salaries are discussed.

This information is likely to be of use to those wishing to acquire an insight into the statistics of the industry and of imperfections that call for remedy, even though there may not be agreement with the author's general conclusions. These favour the transfer of all generating stations to the Central Electricity Board and the setting up of a central distribution board, answerable to Parliament through an appropriate Minister, and area boards so constituted as to enable consumers to influence the control of a nationally-owned system.

The primary object of reorganisation is stated to be the chcapening of electricity, but Mr. S. E. Britton in a preface emphasises the availability aspect, which is quite as important. The difference in overall price (excluding bulk) charged in 1937-38 by public authorities and companies is shown to be 6 per cent. in favour of the former (1 03d. as against 1 08d.). Corresponding figures of total revenue from working are, however, 1 09d. and 1.07d. Supply conditions differ so materially that no useful comparisons can be drawn from this, but it would be only fair to state that but for private enterprise no public supply would be available in most of the geographical area of Great Britain.

Power Station Siting

The substantial reductions expected in charges do not appear to be a logical outcome of the author's argument that the future of electricity cannot be planned without a plan for the social economy of the country as a whole. This viewpoint ignores a supreme merit of electrification-the enormous flexibility of the connection between generation and utilisation, which increases as transmission voltages get higher. The chief recognition given to this flexibility here is the curious one that the operating economies due to the grid are the result of greater use of stations nearer cheaper fuel supplies. Even if this were so, this advantage would not obtain in the future should stations be built, as he advocates, where

there is a concentrated heat consumption with back-pressure turbines to supply district heating as well as the base load of the national network; for the latter duty climatic variations alone would make them inherently unsuitable. Moreover the claim that district heating would mean substantially lower charges for both heating and electricity seems unjustifiable.

Without a planned social economy, the author considers, power stations, even within the period of their construction, may prove to have been wrongly located owing to alterations in local demand. Actually, during the war, loads of any magnitude at any point of the country were met from existing stations. The practice of constructing power stations mainly in relation to water and transport facilities runs counter to the opinion of the author that " the location of generating stations will clearly depend upon the future location of industry and population." The Severn Barrage would compete with steam stations if the price of coal in the area rose to 49s. 1d. per ton-not 37s. 3d. as stated; the latter figure allows nothing for transmission.

Is There "Wasteful" Competition ?

National ownership of the fuel and power industries is held to be necessary in order that the right kind of fuel may be allocated to each purpose and to avoid "wasteful" competition in the sale of electricity and gas to consumers. The electricity supply industry does not purchase coal of the type used for the gas, domestic, railway or other important markets. The £1 million per annum alleged to be used in propaganda by electricity and gas for fighting each other is in fact used to prove to consumers how they can best be served. Showrooms, for instance, are established in rural areas where no gas is available. It is to be hoped that, whatever the ultimate ownership, far more will be spent in publicity of this kind.

The admission is made, in the light of the higher charges where both public services are municipally owned, that under present conditions an electricity-gas monopoly would not be in the consumer's interest. It is overstating the case for voltage standardisation to imply that consumers who move to a non-standard supply area must have all their apparatus altered, since considerable voltage tolerances are allowed by manufacturers.

The above criticisms relate to only a few of the contentious points raised in this publication as in others recently written. They illustrate how much room there is for debate and how many pitfalls there are to be avoided when engineering matters are subordinated to political considerations.—Omicron.

^{*} Electricity—Public or Private Monopoly? By F. Hamlyn Dennis. 143 pp. Victor Gollancz, Ltd., 14, Henrietta Street, W.C. 7s. 6d.

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COMMERCE and INDUSTRY

Statement on Man-Power. New Battersea Collier.

Interrupted Apprenticeships

N consultation with the Ministry of Labour and National Service, the employers' organisations and trade unions in the principal industries have prepared schemes for dealing with those young men whose apprenticeships have been interrupted by war service. In accordance with the Government's scheme the unexpired period of the original apprenticeship is to be reduced by a " time allowance" In the engineering, building and electricity supply industries the time allowance will be one-third of the unexpired period or one-third of the period of war service, whichever is the less.

Apprentices will be remunerated during their remaining period at the rates (including bonuses) which they would now be getting if their apprenticeship had not been interrupted and thereafter (except in the electricity supply industry) at the full journeyman's rate. Apprentices who return to resume their training after the date on which their apprenticeship would have ended will receive the full journeyman's rate immediately. In the case of the electricity supply industry apprentices will receive, after the date of the ending of the original apprenticeship, ten-twelfths of the fully-qualified workman's rate for the trade during the first half of the period of renewed apprenticeship and eleventwelfths during the second half. Full particulars of the scheme are given in a leaflet (P.L. 174) obtainable from local offices of the Ministry of Labour.

Release from the Forces

A statement on man-power was made last week by the Minister of Labour and National Service (Mr. G. Isaacs) following a broadcast talk by the Prime Minister in which he said that about 5 million workers were needed to restore employment in industry and services to the 1939 level. Mr. Isaacs explained the group method of releasing men and women from the Forces and the difficulties attending upon this process. At the present rate of release, by the end of this year about 950,000 men and 145,000 women would be returned to civilian life, but the military requirements were being studied with a view to increasing the pace. It was hoped to make a further statement about the end of the month.

As regarded munition workers, at mtd-1944 about 5 million men and women were engaged in the production of munitions and other war stores; by mid-1945 the number had been reduced to nearly 4 million and by the end of October it would be further lowered to 3 million.

Important Radio Contract

Marconi's Wireless Telegraph Co. has received from the Portuguese Ministry of Colonies a contract for the establishment of a complete system of radio communications in Mozambique, at a cost of approximately £120,000 Twelve short-wave telegraph-telephone stations will be constructed at the company's Chelmsford works and subsequently erected under the supervision of British engineers

throughout the Colony, which has an area of 260,000 sq. miles and is over 1,300 miles from north to south.

Three main stations equipped with highspeed transmitting and recording apparatus for the telegraph services are to be erected at Lourenço Marques, Beira and Nampula, while the first two stations will also have telephone terminal equipment linked with the Colony's internal telephone system. All stations will be in communication with Lourenço Marques and Beira, and three of them— Lourenço Marques, Beira and Mossuril—will be equipped for communication with ships at sea.

All-electric Kitchen at Andover

During the past week an all-electric kitchen designed by the Wessex Electricity Company has been on exhibition at Andover. The principle of unit cabinet and cupboard construction has been adopted throughout so that the assembly will retain its unified appearance whether used for new houses or wholly or in part for modernising existing property.

The cooker is a Jackson prototype model of the horizontal type with thermostatic control. Above the cooker is a Vent-Axia "Silent 9" extractor to remove steam and odours, and ventilation can be augmented by another extractor in the window over the sink. The Hotpoint sink unit comprises a storage water heater, clothes washer and power-driven wringer, and to the right there is an electrically heated drying cupboard. The "people's" refrigerator, placed at convenient working level, is fitted with automatic temperature control and has a capacity of over 4 cu. ft. All cupboard doors have magnetic catches and access to the cutlery drawers and china cupboard is available both from the kitchen and dining room.

from the kitchen and dining room. Lighting is by three 80-W fluorescent lamps and the kitchen is warmed by means of recessed thermostatically controlled low temperature panel heaters. A number of smaller electrical appliances are on show, for which the kitchen is liberally equipped with plug points. A corner cupboard is provided for storing the appliances and an electric clock is mounted on the door.

Wages and Working Hours

The half-yearly review of average earnings and working hours in industry is published in the August Ministry of Labour Gazette. It is based on an inquiry made among about 54,000 establishments employing over 5½ million people. It is seen from the figures that while there was little difference in the hourly rates in January last as compared with July, 1944, average earnings were lower (over 4 per cent. in the case of men and 2 per cent. for women) which is attributable to reduced working hours.

In the electrical engineering industry the average hours worked in one week in January were 47.2 for all workers (men 50.1, women 43.9); average weekly earnings were 92s. 10d. (men 128s. 3d., women 66s. 5d.); and average hourly earnings 23.6d. (men 30.7d., women

18.2d.). The average percentage increase in hourly earnings since 1938 is given as 84 (men 70, women 109) and in weekly earnings as 83 (men 72, women 105).

In the group "Electric cables, apparatus, lamps, etc., manufacture," average working hours in January are shown at 46.4 (men 51.2, women 43.3); average weekly earnings at 86s. (men 127s. 5d., women 66s. 2d.); and average hourly earnings at 22.2d. (men 29.9d., women 18.3d.). The average percentage increase in hourly earnings is given as 77 (men 71, women 94) and in weekly earnings as 72 (men 75, women 86).

Corresponding statistics for the electricity supply industry are :—Average working hours 50.4 (men 51.3, women 40.9); average weekly earnings 104s. 8d. (men 112s. 4d., women 69s. 7d.); average hourly rate 24.9d. (men 26.3d., women 20.4d.); average percentage increase in hourly earnings, as compared with 1938, 48 (men 49, women not stated); percentage increase in weekly earnings 52 (men 55).

Paint Manufacturers

The Society of British Paint Manufacturers, Ltd., has been registered as a company limited by guarantee without share capital. Its objects are to become a corporate non-profit-making authority representing the interests of technically qualified manufacturers in the United Kingdom of paint, varnish, lacquer and similar protective and decorative substances, etc. The original number of members is 100.

Electrical Housecraft Examinations

The E.A.W. Certificate examination in electrical housecraft for teachers was held on June 23rd when 104 candidates qualified for the certificate. The examination for demonstrators and saleswomen was held on June 14th when 51 candidates qualified. The total number of certificate holders is now 964.

Kirk Electrical Industries

Referring to the note regarding the registration of Kirk Electrical Industries, Ltd., in our issue of August 31st, Mr. J. P. Ryan, the managing director, states that the company is organised for the wholesale distribution of electrical materials; it is only connected with the retail trade insofar as it supplies retailers. The name of one of the directors was incorrectly given in our note; it is not K. A. Kennedy, but A. K. Kirk.

Building Standards

When Handbook No. 3 dealing with standardised building materials and components was issued in December, 1944, many relevant BS.8. were still in course of preparation. More details that have since become available have now been published in a-198-page supplement, which summarises the requirements of 82 specifications; 18 of them are revisions, accordingly superseding those mentioned in the No. 3 handbook.

The scope of subjects dealt with is very wide; both gas and solid fuel domestic appliances are included, but only the space required for electrical appliances (B.S. 1183) is mentioned. There are also recommended space dimensions for kitchen fitments and equipment (B.S. 1195) and provision for electro-plated coatings of nickel and chromium (B.S. 1224) on steel and brass. A subject index covering both volumes clearly indicates which specifications are to be found in the supplement and which in the original handbook. Copies of the supplement (price 7s. 6d.) and of the original book

(price 12s. 6d.) are obtainable from the British Standards Institution, 28, Victoria Street, London, S.W.1. The two volumes together contain details of 228 B.S.S.

Trolley-Buses for Johannesburg

In October, 1939, the Johannesburg City Council, awarded the Associated Equipment Co., Ltd., a contract for the supply of thirty A.E.C. English Electric six-wheel, double-deck trolleybus chassis, but owing to wartime manufacturing and transport difficulties this contract was never fulfilled. It has now been renewed and doubled, making a total of sixty. It is anticipated that these chassis will be shipped overseas in the third quarter of 1946. It was announced in the *Electrical Review* of August 31st that Sunbeam Commercial Vehicles, Ltd. had a large contract in hand for trolley-buses for Johannesburg.

War Bonus Awards

Southport Town Council has been asked by its Finance Committee to suggest to the Association of Municipal Corporations that instead of the varying war bonus awards of the Whitley and other Councils there should be one award covering all Corporation employees.

Large Motor for Canadian Ship

C. A. Parsons & Co., Ltd., Heaton, Newcastleon-Tyne have completed a 110-ton main propulsion motor for the C.P.R. turbo-electric liner, *Beaverdell*, under construction at Greenock. The motor is more than 15 ft. high, 19 ft. long and 16 ft. wide, and special precautions had to be taken while it was being carried by road to Newcastle quayside where it was shipped aboard the steamer *Yewcroft* for Greenock.

New Collier for Battersea Power Station

The 2,450 tons deadweight "up-river" type steamer Sir Joseph Swan, launched from the shipyard of Hall, Russell & Co., Ltd., Aberdeen, on September 6th, has been built to the order of the London Power Company under the direction of Stephenson, Clarke, Ltd. The purpose of this specialist type ship is to transport coal from Northern England and South Wales ports to the Battersea power station.

The ship, which has a speed of 10½ knots, has been built to designs prepared by the Burntisland Shipbuilding Co., Ltd., the design and construction being under the direction of Mr. N. W. Dawson, chief consulting engineer of Stephenson, Clarke, Ltd. Besides the special construction for the voyage up and down the River Thames, with its irregular line of lowlevel bridges and awkward corners, a feature of the vessel is the type of cargo hold. Wing ballast tanks are arranged on the Burntisland collier principle such that the cargo is enabled to flow by gravity to the discharging grabs thus providing expeditious handling of cargo. The accommodation throughour s of a highclass character, particular attention having been

ELECTRICAL REVIEW

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Goaline amenity. The propelling machinery consists of on stat triple expansion superheated steam engines. both Steam is supplied by a large cylindrical boiler ions are fitted with Howden forced draught, modern air which heating arrangements for coal burning, and of the smoke tube type superheaters designed to raise ongui the steam to a temperature of 610 deg. F. from the !

The naming ceremony was performed by victoria 1 Lady Ayre. Amongst those present were Mr. J. W. Rodgerson, director of Stephenson, volumes j. Clarke, Ltd.

Trade Publications

Harland Engineering Co., Ltd., Alloa, Scot-land.—Illustrated leaflet with data sheets specifying small AC motors up to 50 HP. Also illustrated brochure entitled "Steel," which is

when the cable was broken the fuses were taken out so as to render it harmless, but someone must have restored them.

Metal Industries Electrical Group

The registration in Edinburgh of Metal Industries (Electrical Group), Ltd., is recorded in the "New Companies" section of this issue. We are informed that the new company has been formed for the purposes of organisation of the electrical interests of Metal Industries, Ltd., and is not in the meantime a manufacturing concern.

Technical Officers Retained

It was announced from Field-Marshal Montgomery's headquarters on Monday that it had been found necessary to retain a large number



Representatives of Thorn Electrical Industries attending the company's recent post-war sales conference (see Electrical Review September 7th, page 340)

descriptive of the Harland hydraulic and electrical machinery installed in the Ebbw Vale Patrick. steel mills of Richard Thomas & Co., Ltd.

PR Dorland Electric Co., Ltd., 38 Brompton Road, London, S.W.3.—Leaflet illustrating electronic "bridge" tester and a commutator testing outfit.

Falk, Stadelmann & Co., Ltd., 91 Farringdon Road, London, E.C.1.—Illustrated list (No. 2128) describing the "Efesca" range of refractor lanterns for street lighting.

Applicants for copies of these publications should write on firms' business notepaper.

Fatalities

Portable Lamp in Bathroom. — While apparently reading in her bath Mrs. May Kathleen James, aged thirty-one, of Hildersham, Cambs, received a fatal shock from a portable lamp, which was found crushed between her lamp, which was found crushed between her chin and chest. Mr. C. E. Miller, an electrician employed by the B.C. & H. Electricity Co., said that the porcelain part of the lampholder had been broken and one of the cores of the twin flex was in contact with the brass part. duing = The pedestal, which was wooden, was connected eside as an extension from the ceiling pendant by an in add adaptor and twin flex. Mr. A. D. Church, dar lint electrical engineer, B.C. & H. Co., emphasised mers the danger of installing portable apparatus in a bathroom.

the bars Broken Cable. — While playing near a water trough and wearing clogs Philip Procter (10), stepped on a broken electric cable and received ing of a fatal shock. At the inquest at Newton-in-is of a Furness on August 28th a witness stated that of technical officers in the British Army of the Rhine. Normally many of these would have been due for release in the period starting towards the end of this month. It was hoped, however, that none of them would be retained longer than three months. The officers affected are largely in the Royal Engineers and R.A.O.C.

Trade Announcements

Associated Technical Manufacturers, Ltd., inform us that, in consequence of the steadily increasing volume of their sales in the London area and of the extension of their manufacturing area and of the extension of their manufacturing range to include cables, they have recently established a London office at Abbey House, Victoria Street, Westminster, S.W.I (telephone, Abbey 4014; telegraphic address, Permanoid Sowest, London). Mr. S. W. Heath, formerly of A. C. Cossor & Co., Ltd., and Mr. T. E. Hardacre, formerly of Johnson & Phillips, Ltd., have hear appointed to represent this company have been appointed to represent this company for sales and technical service.

The Craigpark Electric Cable Co., Ltd., has opened new branches at Liverpool (3, Leigh St., Whitechapel) and Dundee (7, Dock St.)

Change of Address

Hogan & Wardrop are moving on September 17th to City House, 158, City Road, E.C.1 (telephone: Clerkenwell 8656; telegrams: Tribord, Phone, London).

Change of Name

E. Harriott & Co., Ltd., have changed their name to Box-Carton, Ltd. The company specialises in the manufacture of packaging for the electrical industry.

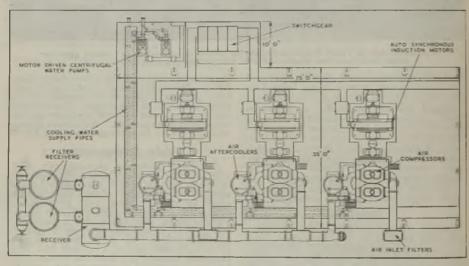
Air-Compressor Stations

Details of the Dartford Tunnel Plant

WO air-compressor stations, generally alike, were utilised in the construction of the Dartford tunnel, a main artery for road traffic under the River Thames from the south-east to the north. Both Kent and Essex stations were used when driving the tunnel from opposite banks simultaneously. The machinery is housed in a steel frame building covered with corrugated sheeting and provided with a $7\frac{1}{2}$ -ton overhead handoperated crane. Due to the close proximity to the river the machinery foundations are of the rafted type entirely isolated from the buildings.

Three "Sentinel" compressors draw air through "Visco" oil film ferrule type filters mounted on the outside. They are of the accessible strainers supplies oil at 35 lb. to all bearings.

The trunk guides carrying the crosshead slides are fitted with white metal scraper plates which remove oil from the piston rods passing out of the crankcase. On top of the trunk guides are the top and bottom air cylinder covers, carrying the air valves and the cylinders themselves. An independent mechanical lubricator of the four-feed type serves the air cylinders and the piston rod metallic packings, being capable of very fine adjustment and fine oil feed, an important point since the air was used for human breathing in the tunnel. The air pistons are of special construction, fitted with three Ramsbottom rings per line while the top and



Layout of the plant in one of the compressor stations erected in connection with the construction of the Dartford Thames tunnel

two crank single stage double acting crosshead type, each delivering 5,000 cu. ft. of free air per minute at 45 lb. per sq. in. gauge pressure; they are directly coupled to Crompton Parkinson auto-synchronous motors. The balanced crankshafts have forked marine type connecting rods and solid forged piston rods with renewable castiron slippers, white-metal lined. A geared pump driven directly off the crankshaft and drawing from the crankcase through bottom air covers carry a total of 32 ($8\frac{1}{4}$ -indiameter) air valve assemblies of the automatic multiple ported plate type. The pressure of air in the main is controlled by means of a copper bus pipe led back from the air receivers to a spring loaded air governor set for a variation of 42–45 lb., this governor passing air to an oil dashpot controlled inlet throttle valve. The oil dashpot control can be adjusted to ensure a smooth on and off action of the throttle valve for gentle

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mechanical take-up of load to prevent surging in the electrical circuit. For starting against pressure with minimum current

having a bearing outside the flywheel and the crankshaft being extended through this to take Wellman Bibby couplings, which success-

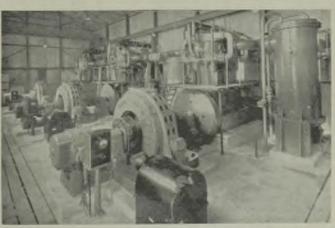


General view from air-intake side showing compressors, autosynchronous motors and starting gear

consumption, automatic unloading valves are fitted on each cylinder.

The air is delivered to a multi-tube contraflow aftercooler fitted with brass tubes, brass tubeplates and ferrules, restricting the exit compressed air temperature to 80 deg. F.

Cooling water is supplied by indepenmotor - driven dent centrifugal pumps, two in each station, each capable of delivering 30,000 gallons per hour against a total head of 70 ft. through cast iron from rising trenches in the floor. The waste cooling water is returned to the top of a natural draught cooling tower outside, collecting in a concrete tank for reuse. All water systems are fitted with "Sentinel" special visible flow indicators and the pump motors are



View from air-delivery side showing compressors, after-coolers, autosynchronous motors and starting gear

electrically interlocked with the main motors to ensure cooling water circulation before the compressors start up.

Motors and compressors are separately mounted on concrete plinths, the compressors ring induction motor, by closing a main oil circuit-breaker to energise the stator and operating a rotor starter, which is electrically interlocked with the main breaker. The three motor-controlling oil circuit-breakers,

fully reduce critical vibration stresses to $\pm \frac{1}{2}$ ton per sq. in. as proved by Geiger tests on site.

Each compressor is by a Crompton driven Parkinson 750 HP (continuous rating) autosynchronous motor energised from a 3,300-V 50-cycle three-phase supply and operating at unity power factor. This type of motor combines starting facility with high power factor and, moreover, when a synchronous motor is used to drive against a cyclic variation in torque (therefore, incorporating a flywheel) its efficiency may be reduced due to a

tendency towards phase swinging (hunting) causing increased parasitic losses. In the present case this is prevented by the highly effective damping effect of the autosynchronous motor.

Starting is effected exactly as with a slip-

each of 300 A normal rating, are installed in a substation, together with a 600-A oil circuit-breaker controlling the incoming supply; all have a guaranteed breaking capacity of 40 MVA at 3,300 V three-phase.

The four switchgear units are of the Crompton Parkinson type "MCB1," metalclad and compound filled with mechanical interlocking. Facilities for contact inspection and tank removal are provided by means of the integral isolating mechanism. The rotor liquid starters are of the Allen West type "DL4" two-phase three-wire dipper pattern with slow-motion operating gear, having a long-interval starting capacity of 1,000 HP-minutes. They are equipped with a 500-A air-break short-circuiting switch, together with one air-break interlocking switch. The liquid starters are mounted adjacent to their respective motors, together with a pedestal which carries the exciter regulator and ammeter. Connections between the main switchgear and the motors are made with 3-core p.i.l.c., s.w.a. cable laid

in trenches. Between the liquid starters and motors high-voltage v.i.r. cables are used.

In addition to the main motors there are in each station two 17-HP Crompton Parkinson screen-protected "SCR" motors for driving the cooling water circulating pumps by direct couplings. They are interlocked with the main switchboard to ensure that none of the motor breakers can be closed to start a compressor unless cooling water is being circulated by at least one pump. Conversely, if the cooling water circulation should stop the motor breakers would be tripped automatically. An emergency "stop" button is fitted on each compressor.

The whole of the equipment was designed, manufactured and erected by Alley & MacLellan, Ltd., Glasgow, as main contractors, the main sub-contractors for the electrical equipment being Crompton Parkinson, Ltd., all to the requirements of the consulting engineers, Mott Hay & Anderson, MM.I.C.E., and the civil engineering contractors, Charles Brand, Ltd.

I.E.E. Residential Estate

Appeal for £50,000 Fund

UST over a year ago the Institution of Electrical Engineers announced the opening of a fund for the provision of a residential estate where some of the beneficiaries of the Benevolent Fund might live. Now that victory has been achieved the LE.E. Council has decided that an appeal to members to contribute to this fund is opportune; contributions amounting to about £1,200 have already been received and two further magnanimous offers have been made. One member has given the Benevolent Fund a deferred option of using his house and garden with its furniture and equipment as a home for aged, infirm or convalescent members. Another has offered his house and estate for use in immediate fulfilment of the objects of the new fund. The Council has expressed its gratitude to these two members. The first offer must necessarily await the day when the option matures; the second so nearly approaches the ideals of the Committee of Management that it is on the point of being accepted. The gift comprises a house with outbuildings and about 8 acres of land on which a suitable number of buildings could be erected. To carry out this development and achieve the objects of the Committee a capital sum of at least £50,000 is required.

In a circular sent to members some details of the plan for the proposed residential estate are given. Reference is made to the excellent scheme of this kind carried out by the Institution of Civil Engineers and it is stated that the Institution's plan provides for a slightly larger number of houses, capable of accommodating at least thirty adults, and the treatment of the land in an attractive way. The estate is within easy reach of London.

To the circular is attached a sheet of three different kinds of subscription forms.

American Manufacturers and Britain

SPEAKING at a gathering in London last week, Mr. Wallace B. Phillips, president, American Chamber of Commerce in London, said that many American manufacturers had visited this country during the last few months to study the possibility of opening branch works here. They found, however, that the difficulties in the way of securing premises and the prospect of a continued labour shortage made their plans Nevertheless, one important impracticable. American concern had reached an agreement with the Board of Trade as a result of which it was intended to erect a large new factory in this country. Mr. Wallace expressed the view that Great Britain was handicapped by a number of things in its endeavour to increase export trade; the outstanding one was the price of coal which, he said, was two-and-a-half times the American price. It was also necessary to increase the output per worker if production costs were to be lowered. All American trade associations and the U.S. Congress agreed that a return to world prosperity would only be achieved by a lowering of tariff barriers and the removal of restrictive controls.

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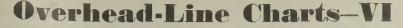
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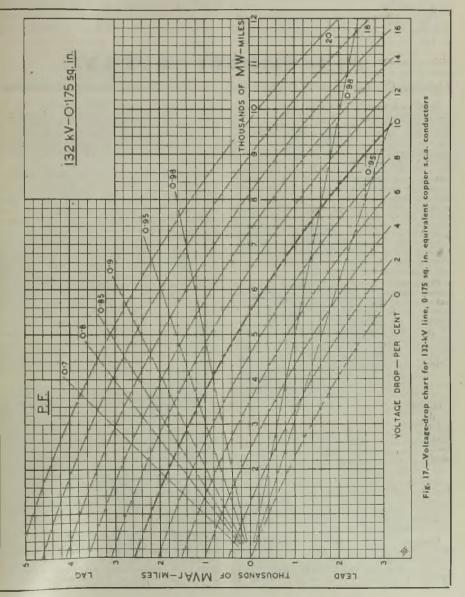
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By J. S. Forrest, M.A., B.Sc., F.Inst.P.

VOLTAGE-DROP charts and examples 66 kV (400,V; 3.3 and 6.6; 11 and 22; and 33

have so far been given for solving typical and 66 kV). The present chart deals with problems in respect of overhead lines up to 132-kV lines, and Part VII, the concluding



article in this series, will cover long lines (100 to 300 miles) up to 264 kV.

Example 9

(a) A 132-kV line with 0.175 sa. in. conductors is 50 miles long, and supplies a load of 80 MW at 132 kV and 0.9 lagging power factor. It is required to determine the voltagedrop in the line.

The load transmitted is 4,000 MW-miles, and the chart for a 132-kV line with 0.175 sq. in. conductors (Fig. 17) shows that the corresponding voltage-drop is 14 per cent. at 0.9 lagging power factor.

(b) How much leading MVA must be supplied by synchronous plant at the receiving end in order to reduce the voltage-drop to 4 per cent?

Further reference to Fig. 17 shows that 2,800 MVAR-miles, or 56 MVA of leading wattless power are required. The equivalent power factor of the load is now 0.98 leading.

BLECTRICITY SUPPLY

Lighting Change-over at Brentwood. Salford Power Station Extension.

Brentwood (Essex).-ELECTRIC STREET LIGHT-ING.—Subject to a contract for a period of ten years, the Urban District Council has accepted the tender of the Brentwood District Electric Co. for public street lighting. The annual cost amounts to £3,988, as against the £6,391 tender of the Gas Light & Coke Co. Despite an outlay on the erection of new standards and connecting existing standards (\pounds 1,737 and \pounds 1,263 respectively) the acceptance of the tender for electric lighting throughout the district saves the ratepayers £2,403 per annum, and £24,000 over the period of ten years. As the change-over to electricity is estimated to take six months to complete the Council have arranged for certain lamps to be lighted as a temporary measure. Eventually it is expected that certain parts of the district which have not been previously lighted will be incorporated in the scheme.

Chesterfield. — SUPPLY TO ESTATE. — At a recent meeting of the Electricity Committee the electrical engineer reported on the existing scheme for the supply of electricity to Swaddale estate by the Staveley Coal & Iron Co., Ltd. He suggested that now certain restrictions had been revoked it was desirable that this area should be absorbed in the Corporation's supply system. The Committee authorised the engineer to open negotiations for this purpose.

COLLECTION OF FIXED CHARGE.—The Elec-tricity Committee has asked the Housing Committee to collect from the tenants of the temporary houses the standing charge of 7d. per week per house.

Fleetwood.—ELECTRICITY FOR MUNICIPAL HOUSES.—The Urban District Council on September 6th rejected a proposal that tenants of the new municipal houses should have the option of choosing gas or electricity. Electricity only will be available.

Grimsby .--- ELECTRICITY FOR HOUSING SITE .--The Electricity Committee has approved an expenditure of £14,260 on the provision of electricity services to the temporary housing site at Laceby Road. It is proposed to use the site later for permanent houses.

Liverpool.—EMPLOYMENT OF PRISONERS OF WAR.—Discussion took place at the City Council meeting last week on a proposal of the Electric Power and Lighting Committee to employ prisoners of war in the laying of electric cables. The recommendation was

adopted, after it had been explained that no German war prisoners would be employed if local labour was available. The town clerk had been instructed to press the Ministry of Labour for the return as quickly as possible of all men connected with the electricity supply industry.

Norwich.—DEVELOPMENT IN OUTER AREA.— Presenting the report of the Electricity Com-Presenting the report of the Electricity Com-mittee for 1944-45 the chairman (Councillor S. A. Bailey) said that the number of kWh sold was 115.5 million compared with 90.3 million in the last pre-war year. The serious wartime decline in consumption in the city had been more than offset by the sturdy development in the fringe and county areas, where even apart from the aerodromes, sales of electricity had nearly doubled during the war. The rate of growth would increase when the large county development scheme, approved by the Council, was commenced. The total income of the undertaking for the past year was £757,059 and there was a net profit of £26,298.

St. Austell.-EXTENSION OF TIME.-The Electricity Commissioners have made an Order extending for another two years the period in which the three local authorities concerned may purchase the parts of the St. Austell & District Electric Lighting & Power Co.'s system within their areas.

Salford.—AGECROFT EXTENSION.—Application is being made by the Council for sanction to borrow £2,262,276 in connection with the extension of the Agecroft generating station. In the report of the Light, Heat and Power Emergency Sub-Committee presented to the Council last January the estimated cost of the extension was given as £3,500,000, but the Committee is now advised that, based on broad estimates and now advised that, based off oroad estimates and on price levels ruling in July last, the total cost is likely to be £4,017,026. This is made up as follows: Land, £7,500; building and civil engineering works, £1,109,500; turbo-alternators, con-densing plant, boilers and ancillary plant, £2,650,026; and cooling towers, £250,000.

Scotland.—LOCH DUNTELCHAIG SCHEME.— The North of Scotland Hydro-Electric Board has asked Inverness Town Council to abandon its scheme to obtain a domestic water supply from Loch Duntelchaig. The Council is invited to join the Board in a combined scheme for water supply and water power developments. 45

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The Board, it is stated, has in mind a scheme for the diversion of the upper waters of the River Findhorn and the upper tributaries of the River Ness into Loch Duntelchaig by means of a dam below Tomatin and a tunnel.

OPPOSITION TO TUMMEL-GARRY PROJECT.— Pitlochry (Perthshire) Protest Committee has passed a resolution stating that the report of the tribunal on the Tummel-Garry hydroelectric scheme is contrary to the wishes of the inhabitants of Pitlochry and against their best interests, and those of the Highlands, and that all necessary steps should be taken to have confirmation of the scheme annulled.

Worcester.—REVISION OF CHARGES.—Presenting the past year's accounts of the Electricity Department, which showed a deficit of £5,566, Alderman Roberts stated that the Electricity Commissioners had agreed to consider an application for the revision of tariffs.

Overseas

Canada.—MONTREAL COMPENSATION. — The Premier of Quebec (M. Duplessis) announced last week that an Arbitration Board would be set up for the purpose of establishing the amount to be paid to shareholders of the Montreal Light, Heat & Power Consolidated and its two associated companies, the Montreal Island Power Co. and Beauharnois Light, Heat & Power Corporation. The Premier said that the Board's decision would be final, definite and without appeal. By expropriation, the companies' properties were taken over by the Quebec Hydro-Electric Commission as from April 15th, 1944.

Egypt.—Assuan DAM PROJECT.—A Reuter message states that, following a decision reached by the Council of Ministers, a national loan is to be floated to finance a hydro-electric scheme at the Assuan Dam. The Council has also approved the transfer of a credit of $\pounds E.25$ millions from the reserve fund to implement a five-year plan. Under this plan $\pounds E.1,000,000$ is to be provided for the purchase of British and American workshops in Egypt, $\pounds E.4,000,000$ for the purchase of rolling stock and $\pounds E.5,000,000$ to improve the country's irrigation and drainage systems.

Street Lighting Control

CARRIER-CURRENT system of remote control of street lighting, claimed to be the largest of its kind, has been in use in Memphis, Tenn., for about five years. From particulars given in *Electronic Industries* (August) it appears that two-thirds of lamps are thus controlled in two multiple groups, one for all-night and the other for half-night standards.

The equipment includes six low-frequency 6-kVA transmitters installed in widely separated substations and 1,300 receivers. The transmitters can be operated individually or simultaneously from a central load dispatcher's office. Each of them incorporates a threephase 60-cycle motor which is mechanically coupled to three 2-kW single-phase 3,000-cycle inductor generators supplying 125 V at 120 deg, out of phase to 4-kV power busbars. On the receivers, the control voltage at the input terminal of the filter "triggers" the gaseous tube thereby energising a relay, which closes a contact to operate timer and load motors. The receiver can be made to operate on a signal of only 0 1 V, but in order to counteract possible interference 0.5 V is regarded as an operating minimum with an average signal level of at least 1.5 V.

Supervising Engineers

Branch Merit Competition

THE examining board of the Association of Supervising Electrical Engineers has awarded the silver cup, presented to the Branch achieving the best all-round record for 1944-45, to the Leeds Branch. The runners-up in the competition were Birmingham and Manchester, and special mention is also made of the Sheffield and Liverpool Branches.

London Lectures

The London lecture programme of the Association opens on October 16th with the presidential address by Mr. E. R. Wilkinson, M.I.E.E., commercial manager of the C.E.B. It will end with the reading of the three winning papers in the Branch Papers Competition in May. The November 17th event is as usual a joint meeting with the Institution of Engineersin-Charge, but this year will take place at Connaught Rooms, Kingsway, W.C.2, where Mr. R. O. Ackerley, M.I.E.E., F.I.E.S., will speak on " Illuminating Engineering, or Putting Things in a Good Light." This meeting will follow a Victory luncheon at which the two organisations will be the guests of the General Electric Co., Ltd. With this exception the meetings will be held as usual at the Lighting Service Bureau, Savoy Hill, W.C.2, on the third Tuesday in the month at 6.15 p.m.

Export Inquiries

WE have received the undermentioned inquiries from firms and individuals overseas who wish to secure agencies for British electrical equipment and appliances or to import them into their territories. We shall be glad to pass on to them replies received from readers which should be addressed to the Editors, quoting the number given in parentheses. We cannot vouch for the standing of inquirers and manufacturers replying to them will no doubt require the usual references :--

Belgium.—Agency required for electrical goods by firm buying on own account. (X.111.)

Cyprus.—Inquirer wishes to make contact with makers of small electrical goods, including motors, domestic refrigerators, domestic appliances, lamps and wiring materials. (X.112.)

India.—Agency for bakelite electrical accessories and domestic appliances. (X.113.) Supplies of electric motors, switchgear, measuring instruments and testing apparatus, centrifugal blowers and exhaust fans, pumping sets, welding accessories, portable tools and belting. (X.114.)

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FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Veritys, Ltd., have issued their accounts for the years 1943 and 1944, completion of which was delayed by negotiations with the Admiralty on price fixing. The trading profits for the two years, after charging all expenses, interest and depreciation, and providing for estimated price revisions and taxation, are given as $\pm 36,648$ and $\pm 21,658$, respectively. After deducting war risks insurance and war damage contribution the balances are $\pm 31,792$ and $\pm 18,385$, to which are added the amounts brought forward, $\pm 6,941$ and $\pm 13,876$, respectively. From the 1943 balance sums totalling $\pm 18,107$ are applied to writing off replacement expenditure, A.R.P. expenditure, special depreciation and transfer to war contingencies reserve, the corresponding figure for 1944 being $\pm 10,712$. Interim dividends of $7\frac{1}{2}$ per cent. have been paid in respect of each year and no further distribution is recommended.

The report states that the negotiations in regard to price fixing have not yet been finally determined, but it is considered that the accounts include full provision for any liabilities under this heading and for taxation. Plans for the reorganisation and improvement of the works have been considered and an expenditure of approximately £50,000 on new plant and equipment has been authorised.

In a statement by the chairman (Mr. B. C. Evans) circulated with the accounts information is given regarding the company's war work, which was dealt with in the *Electrical Review* of July 13th. Despite the fact that the administrative offices and main stores were destroyed by enemy action in 1940, and other damage was suffered in the three following years, the output in 1943 created a record.

British Insulated Callender's Cables, Ltd. — The statutory report shows receipts to August 18th as follows: U.K. bank and cash balances transferred from vendors £685,976, trading receipts £1,884,895, loans £90,699, realisation of investments £792, realisation of tax reserve certificates £200,000, total £2,862,362. Trading payments, including discharge of liabilities under agreements of June 29th amount to £2,295,052, preliminary expenses £49, compensation for loss of office £160,515, loans £45,500, investments £447, war damage contribution £4,240 and purchases of plant £5,076. A sum of £351,483 is held in cash and bank balances.

Thorn Electrical Industries, Ltd.—Speaking at the annual meeting last Friday, Mr. Jules Thorn (chairman and managing director) referred to the company's wartime activities. Among the equipment produced for the Services were special lamps for air and sea equipment and for ground installations, including landing lights. One large army communications receiver was responsible for contact between advanced units and headquarters at El Alamein and throughout the whole of the African and later campaigns. They had continued their research and development in the fluorescent lighting field and hoped to obtain an important share of this business. During the past year they had marketed a limited number of civilian wartime radio receivers made by the Ferguson Radio Corporation, Ltd.

They had striven hard to maintain their goodwill at home and overseas and their export department was ready to take an active part in helping to build up the nation's export trade. After paying a tribute to the staff and reviewing the accounts (see our last issue), Mr. Thorn said that the question of increasing the dividend had been considered but the directors thought that in present circumstances it was in the shareholders' best interests to maintain it at 20 per cent.

The British Vacuum Cleaner & Engineering Co., Ltd.—After deducting the allocations to the staff pension fund and depreciation the profit for the year ended September 30th, 1944, was £83,954 (against £81,140), to which is added £12,202 (£11,687) brought in. A sum of £57,000 (£54,000) is transferred to income tax and N.D.C. reserve. The distribution on the ordinary shares is maintained at 30 per cent. by a final payment of $17\frac{1}{2}$ per cent. and £12,531 is carried forward.

Glenfield & Kennedy, Ltd.—The directors announce provisional agreements for a fusion of interests with J. Blakeborough & Sons, Ltd., and Alley & MacLellan, Ltd. A circular has been issued to shareholders giving preliminary information as to the proposals, which provide for the issue of new ordinary shares of Glenfield & Kennedy, Ltd., in exchange for ordinary shares of the other two companies. All three companies will continue to trade in their own names under present managements.

The East African Power & Lighting Co., Ltd.— Operating and other receipts for 1944 amounted to £179,227 (against £162,100) and there was a net profit of £101,667 (£87,407). As already reported, the ordinary dividend is maintained at 7 per cent. by a final payment of 4 per cent. To meet expenditure on a comprehensive scheme of development an issue of 357,083 ordinary shares at 29s. has been made to shareholders.

The Nigerian Electricity Supply Corporation, Ltd., has declared a final dividend of 5 per cent. plus a bonus of 2 per cent. less tax at 5s. 2d. in the \pounds . With the interim dividend this again makes 10 per cent. for the year.

Barcelona Traction, Light & Power Co., Ltd.— The directors have put a plan before the holders of the company's sterling debt involving the repayment of the $6\frac{1}{2}$ per cent. prior lien bonds in full and of the $5\frac{1}{2}$ per cent. first mortgage bonds at the rate of £48 for each £100 of stock. Arrears of interest are to be settled by the allotment of no-par-value ordinary shares.

Anglo-Argentine Tramways Co., Ltd.—The chairman (Sir Bernard Docker) stated at the annual meeting last week that as no response had been received to date from the Argentine Government to the company's administrative claim of last November the company intended to appeal to the Argentine Courts.

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The County of London Electric Supply Co., Ltd., is maintaining its interim dividend at 3 per cent.

The Bournemouth & Poole Electricity Supply Co., Ltd., announces an interim dividend of 5 per cent. (same).

New Companies

W. E. S. (Wolverhampton), Ltd.—Private company. Registered August 28th. Capital, £1,000. Objects: To carry on the business of wholesale electrical and mechanical engineers, dealers in batteries, insulators and electrical supplies, etc. Directors: A. C. Bate and Patience M. Bate, both of 175, Birmingham Road, Wolverhampton, T. Thompson, Aysgarth, Penn House Avenue, Wolverhampton and R. P. Chambers, 9, Woodfield Avenue, Wolverhampton. Registered office: 12, Bell Street, Wolverhampton.

A. Murison (Electricals), Ltd.—Private company. Registered August 31st. Capital, £1,000. Objects: To carry on the business of electrical, motor, aircraft and mechanical engineers, etc. Directors: S. Levine, Westoe Lodge, Mitchell Avenue, Jesmond, Newcastleon-Tyne, R. A. Murison, Falmouth Road, Heaton, Newcastle-on-Tyne and R. H. Robson, 22, Myrtle Grove, Low Fell, Gateshead. Registered office: 1, St. Nicholas Buildings, Newcastle-on-Tyne.

Metal Industries (Electrical Group), Ltd.— Private company. Registered in Edinburgh August 30th. Capital, £1,000. Objects: To carry on the business of electrical engineers and electricians, mechanical engineers, etc. Subscribers: W. B. Hardic, 113, St. Vincent Street and J. S. Hutchison, 145, St. Vincent Street, Glasgow.

Nash Electrical Co., Ltd.—Private company. Registered August 29th. Capital, £1,000. Objects: To carry on the business of electrical, radio and general engineers, etc. Directors: H. H. Nash and Linda L. Nash, both of 722, Walsall Road, Great Barr, Birmingham, 22. Registered office: 82, Snow Hill, Birmingham, 4.

M. & H. Lewis (Electrical Appliances), Ltd.— Private company. Registered August 29th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, electrical and wireless goods, etc. Directors: H. Lewis and Marie Lewis, both of 67, Catton Crescent, Luton. Secretary: M. Gordon. Registered office: 113, High Holborn, W.C.1.

Electric Kitchens, Ltd.—Private company. Registered August 31st. Capital, £100. Objects: To carry on the business of manufacturers of, and dealers in, stoves, ranges, temperature control plant, etc. Directors: M. Victor and H. Victor, both of 59, Brook Road, N.W.2. Registered office: 62, Oxford Street, W.1.

Abbott Bros. (Western), Ltd.—Private company. Registered August 25th. Capital, £5,000. Objects: To carry on the business of refrigeration, cold storage and electrical engineers manufacturing, research, wholesale and retail chemists, etc. The directors are: F. A. S. Abbott 5, Burlington Crescent, Headington, Oxford; and S. J. B. Abbott, 205, London Road, Twickenham. Registered office: 4-6, Cattdown Road, Plymouth. Ernest Medhurst, Ltd.—Private company. Registered August 29th. Capital, £2,500. Objects: To carry on the business of electrical contractors, manufacturers of, and dealers in, electrical goods, refrigerators, vacuum cleaners, wircless goods, etc. E. Medhurst, Iona, Granville Road, Wigston Fields, Leicester, is the first director. Secretary: C. Goodyer.

Company Struck Off Register

Cheshire Cables, Ltd., was struck off the Register on September 7th and is thereby dissolved.

Companies' Returns Statements of Capital

F. D. Newcombe & Co., Ltd.—Capital, £30,000 in £1 shares. Return dated December 31st (filed March 23rd). 27,975 shares taken up. £22,975 paid. £5,000 considered as paid. Mortgages and charges: £4,000.

Gilbey Electrical Co., Ltd.—Capital, £2,000 in £1 shares. Return dated December 31st (filed March 12th). All shares taken up. £2 paid. £1,998 considered as paid. Mortgages and charges: Nil.

Increases of Capital

Bristol's Instrument Co., Ltd.—The nominal capital has been increased by the addition of £15,000 in £1 ordinary shares beyond the registered capital of £25,000.

•Ibbett Bros., Ltd.—The nominal capital has been increased by the addition of £500 in £1 ordinary shares beyond the registered capital of £500.

Mortgages and Charges

Phœnix Telephone & Electric Works, Ltd.— Satisfaction in full on (1) February 23rd, 1945, of charge dated June 29th, 1942, and registered July 17th, 1942, securing £30,000, and (2) July 1st, 1945, of charge dated August 29th, 1933, and registered September 6th, 1933, securing £1,200.

Bankruptcies

G. W. Bale, 13, Commercial Street, Brighouse, Yorks, trading in partnership as "Wyness & Bale," electrical engineer.—Discharge suspended for one week; date of discharge, August 9th.

H. C. Bridgman, lately carrying on business at 7, Abbey Road, Westbury-on-Trym, Bristol, electrical engineer.—Last day for receiving proofs for dividend September 19th. Trustee, Mr. H. Wheeler, 26, Baldwin Street, Bristol, 1, Official Receiver.

N. E. Butcher, carrying on business as the Herts Electrochemical Co., at 2, Woodfield Road, Welwyn Garden City, battery manufacturer.—Trustee, Mr. S. P. Child, College Hill Chambers, Cloak Lane, E.C.4, released August 21st.

STOCKS AND SHARES

TUESDAY EVENING.

THE City, and the country at large, are making large-scale preparations for the Thanksgiving Savings Campaign, and the effects have become manifest in the Stock Exchange prices of gilt-edged securities. After a period of improvement following upon the General Election result, Consols, which were leading the van of these securities, fell back from $89\frac{3}{4}$ to $87\frac{1}{2}$. This influenced the list as a whole. Business is quieter in the industrial market. Prices of the front-rank companies' shares, however, firmly hold their ground.

Some people talk as though they consider that the advent of the Labour Government to power should re-adjust investment ideas, and that, instead of a 4 per cent. yield, the minimum aimed at nowadays should be at least 5 per cent. Study of the yields that are to be obtained from such sound investments as the ordinary shares of Home electricity supply companies, to take this group as an example, will show that the average return is little more than $4\frac{1}{4}$ per cent.

"War" Stocks

Liberation of Singapore and victory over Japan brought in further buyers of Oriental Telephone shares. The price improved to 61s. 6d. Tokyo Electric "sixes" put on several points before profit-taking reduced the price from 62 to $57\frac{1}{2}$. Dollar stocks came to the front, with Brazilian Tractions leading. The price at $30\frac{1}{2}$ is the best reached by the shares for some years past. Montreal Light & Power shares at 26 are 2 dollars up. The choice of the British prospective buyer of dollar stocks is severely limited. A seller can get on without difficulty, but there are very few issues of which the Treasury permits a purchase on this side.

Market Movements

General Electric ordinary at 96s. 6d. have gained 6d.; Ever Ready are similarly better at 41s. 6d. Rises of 1s. lifted Revo to 45s. 6d., and Telegraph Constructions, old and new, to 56s. Siemens at 39s. are 1s. 6d. up. Tube Investments, now ex dividend, are better at $5\frac{4}{10}$ and Walsall Conduits at 56s. 3d. have recovered the dividend deduction. British Insulated & Callender's strengthened to 45s. 6d. Brush Electricals hardened to 9s. 9d.

Calcutta Trams, on a little buying pressure, are better at 84s., ex 1s. 6d. dividend. Other Indian shares hold their previous gains, without being quotably affected. Cable & Wireless stocks are quiet. At 37s., Marconi Marine are 1s. higher. Anglo-Portuguese Telephones at 29s. 6d., are equally better on the week.

Transport Stocks

The Home Railway market shows no evidence of throwing off its recent heaviness. Prices continue on the down grade and investment declines to be tempted by the substantial yields which, for the time being, are available from the junior stocks. The market was unfavourably affected, too, by the plan of the T.U.C. to bring all forms of transport under one group. This proposal includes the London Passenger Transport Board, as well as the other railways. Southern Railway 5 per cent. preferred is down $1\frac{1}{2}$, at $67\frac{1}{2}$ and the 5 per cent. preferred has lost 2, at 108 $\frac{1}{2}$, the latter having fallen 15 in less than a month. Thomas Tilling shares are unchanged at 51s. 6d. British Electric Traction deferred remains at 1025, which is 185 lower than on August 17th last.

Vactric

Vactric, Ltd., holds its annual meeting to-day, Tuesday, and the chairman has already announced that the company sold its principal London factory at a very substantial capital profit. Negotiations are well advanced for the sale of other redundant properties. These transactions will, in all probability, make unnecessary the capital issue which the last general meeting approved, to the extent of the creation of 600,000 ordinary 5s. shares. The company is at present producing its vacuum cleaners, etc., in a factory situated in a formerly depressed area in Scotland, and a larger factory is to be built shortly, to begin work early next year. The company's net profit, as already published, of £37,774 is about £5,600 down as compared with a year ago, but the dividend is maintained at 22¹ per cent. Dividends on the ordinary shares were resumed, it may be repeated, after four years, during which time the ordinary went without a dividend. The price of the shares, down to 1s. 7¹/₂d. in 1941, is now 20s. 6d.

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Nigerian Electric

By paying a final dividend of 5 per cent., plus a bonus of 2 per cent., making 10 per cent. for the year, the Nigerian Electricity Supply Corporation repeats the performance of a year ago. The dividend and bonus are paid less tax at 5s. 2d. which makes, of course, a substantial difference to the yield on the shares. The Corporation's lease, acquired from the Government, expires in 1972, but is extendable for another 20 years, at the Corporation's option, covers 4,400 acres of land. Some years ago, the Corporation acquired a fully-equipped hydroelectric power station at Kwall Falls. The Corporation's profits have undergone fairly wide fluctuations. For the year ended February 28th, 1944, the net profit after tax was £43,617, an increase of £12,600 over the previous year, which in its turn went against £37,400 for 1941-42.

East African Power

Another African company which holds its meeting this month is the East African Power & Lighting Co. As the meeting is to take place at Nairobi, the attendance of English sharcholders will probably be limited. The company's



ELECTRICAL REVIEW

September 14, 1945

FREE FROM THE SHADOWS OF ERROR



We can control the speed of an engine within 0.3%

Iso-Speedic

The Iso-Speedic Company Ltd., Coventry. Telephone : Coventry 3147 Telegrams : Isospeedic, Coventry

report and accounts disclose a net profit of £101,667, being £14,200 up on the year. The dividend already announced is 4 per cent., making 7 per cent. for the year, and the price of the shares at 37s. 6d. gives a yield of £3 17s. 6d. per cent. The new issue of 357,000 ordinary shares at 29s., recently made to shareholders in order to provide money for extension and transmission lines, will make its effects felt in the next accounts. The price of the new shares is about 36s.

Then and Now

The Stock Exchange re-opened on September 7th, 1939, after being closed for a week in consequence of the war conditions. When the markets started again, it may be recalled, prices were more or less nominal for a time.

Markets took a little while to get into a more normal stride, nor did business show any sign of real activity for several months. It is of interest to note some of the prices which prevailed at that time, and to compare them with to-day's quotations. A few examples in the radio group are :---

Company	Sept. 7th 1939	Now	Rise
E.M.I. Phileo Cossor Mar. Marine Cole, E. K.	s. d. 9 3 0 9 3 0 27 6 4 0	s. d. 33 3 14 0 40 3 37 0 35 0	s. d. 24 0 13 3 37 3 9 6 31 0

Pye deferred, now standing at 31s. 3d., varied between 11s. 6d. and 7s. in 1939.

NEW PATERNES

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 KT.-GES. Brown, Boverie & Cie.—" High-voltage cable connection." 14729/43. October 15th, 1942. (571481.) Ariel Motors, Ltd., and V. Page.— " Com-

bined electric current generators and ignition magnetos." 21855. December 30th, 1943. $(57\bar{1}385.)$

Babcock & Wilcox Co.—" Metallic structures for high-temperature service." 12930/43. July

Ioth, 1942. (571349.) E. Bode.—" Welding man January 14th, 1944. (571392.) manipulators." 719.

British Thomson-Houston Co., Ltd.—"Radio receiver circuits." 1314/44. January 30th, 1943 (571404.) "Electric transformers." 2215/ 44. February 10th, 1943. (571417.)

British Thomson-Houston Co., Ltd., and J. H. Pollard.—"Magneto ignition or other electrical machines." 9794. June 17th, 1943. (571342.)

British Thomson-Houston Co., Ltd., and W. J. Pool.—" Control systems for hoist motions of electric cranes and the like." 17414. October

2nd, 1943. (571447.) British Thomson-Houston Co., Ltd., and T. H. Woodfield.—"Circular saws." 17878. October 29th, 1943. (571449.) Bruno Patents, Inc.—"Coupling means for

the tubular conductors of electric cables or other tubular elements." Cognate applications 10161/ 43 and 10162/43. June 23rd, 1942. (571343.) Chance Bros., Ltd., and L. B. H. Hallett.— "Electric switches." 2721. February 14th,

1944. (571395.)

Electric Resistance Furnace Co., Ltd., and R. F. C. Robinson.—"Furnaces for the heat treatment of metals." 2765. February 15th, 1944. (571423.)

English Electric Co., Ltd., H. G. Nelson and H. Instone.—" Electro Co., Ltd., H. G. Nelson and H. Instone.—" Electrode arrangement suitable for resistance heating or welding." 1029. January 19th, 1944. (571401.)

Geophysical Prospecting Co., Ltd., and A. F. Fekete.—" Dynamo-electric machines of the homopolar type." 2495. February 15th, 1943. (571443.)

(5/1443.)
Greyhound Racing Association, Ltd., and T. J. Dawes.—" Device for timing the duration or interruption of an electric current." 14803.
September 9th, 1943. (571482.)
J. E. Hurst, Bradley & Foster, Ltd., Birming-ham Electric Furnaces, Ltd., and P. F. Hancock. —" Manufacture of iron powder." Cognate applications 18123/42 and 1434/43. December 21et 1942. (571442.)

India Rubber, Gutta Perch & Telegraph Works Co., Ltd., and H. L. Harding.—" Boxes or like containers." 2758. March 2nd, 1942. (571435.)

H. W. K. Jennings (Sun-Kraft, Inc.)-"Highrequency supply circuits for electrical discharge devices." 12038. July 23rd, 1943. (571345.) A. P. Lundberg & Sons, Ltd., and G. Pegg.— "Electric connectors." 11560. July 15th, 1943.

(571472.)

Morgan Crucible Co., Ltd., and L. W. Miller.—"Variable electrical resistance." 3306.

 Miner.— Variable electrical resistance. - 3500.
 February 22nd, 1944. (571458.)
 M-O Valve Co., Ltd., and C. W. Cosgrove.—
 "Manufacture of electron discharge tubes." 10002. August 6th, 1941. (571431.)

Pirelli-General Cable Works, Ltd., and J. L. Bishop.—"Insulated electric cables or con-ductors." 19930. November 29th, 1943. (571453.)

Plessey Co., Ltd. (P. R. Mallory & Co.)-"Electro-magnetic vibrator and method of 21759. December 28th, 1943. making same."

(571382.) O. I. O. I. Price.—" Electromagnetic devices." 1578. January 27th, 1944. (571407.)

F. Watson (Aktiebolaget Elektrolux) .-"Shells for refrigerator cabinets." 16639. November 24th, 1942. (Convention date not granted.) (571465.)

Western Electric Co., Inc.—" System for registering a train of positive and negative half-cycles of an alternating current." 14875/43. August 6th, 1942. (571483.)

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Manufacturers' War Work-XII

Important Admiralty Contracts

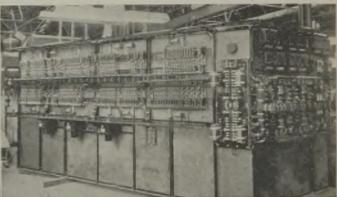
Engineering & Lighting Equipment Co., Ltd. OR the Engineering & Lighting Equipment Co., Ltd., the war has brought no very marked change in its normal pro-

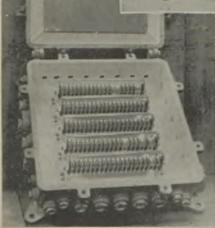
duction, since as far back as 1924 it has been very largely engaged in the manufacture of special electrical equipment for the Admiralty and it is claimed that there is scarcely a naval vessel constructed which does not contain some of the company's gear.

Consequently production steadily rose from some time before the outbreak of war until a peak was reached in 1944.

In spite of Admiralty demands the company has also supplied large numbers of lighting fittings for the lighting of essential works, and to various Government D e p a r t m e n t s for apparatus often meant that each item had to be "tailor-made" to suit its particular job, militating against mass production.

Amongst the types of equipment noticed at the time of a recent visit, which were being produced in large quantities, were junction, section and distribution boxes, and a wide range of switches, with cases of bronze, aluminium alloy or fabricated steel. Fire control apparatus made includes indicators,





special requirements, although, of course, the demand for street lighting fittings practically ceased.

As the war proceeded the company's efforts were directed towards making more of fewer items, but the special nature of the

Back of main controlling switchboard for one of the latest aircraft carriers, and (left) a typical watertight junction box made by the Engineering & Lighting Equipment Go. for the Navy

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balancing resistances and multi-position switches, which may contain up to 150 contacts. To achieve accurate firing, very rigid tests of millivolt drop are applied to these supplies and other comparable gear. Equipment for submarines, all of which is water-tested to a pressure of 225 to 300 lb. per sq. in., is also produced. The company's gear was fitted in the ill-fated *Thetis* and when the vessel was raised, it was found that no water had got into the junction boxes, etc.

Dimmer switches for navigation lights, etc., are among a large range of switch and resistance gear, which also includes limit switches, and shore connection boxes. Bakelite mouldings are now being used to an increasing extent in many types of equipment.

Special types of fuse-gear have been developed employing cartridge fuses. Other items have included searchlight resistances,

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fuse distribution panels, alarm gongs, rattlers, hummers and various bells. A high proportion of this apparatus has to be watertight.

Among the larger products manufactured are the main controlling switchboards for battleships, aircraft carriers, cruisers and depot ships. The whole of the large number of parts of these are made in the works, except the meters. A switchboard comprises two panels, one for the generators and the ring main, and the other the distribution through groups to particular apparatus. Remote control switches are employed with indicating lights on the switchboard.

The lighting equipment produced has included aircraft landing lights (including special types for use on aircraft carriers), submarine lighting fittings and special signalling lanterns, including the "Hether" lantern which is a specially small signalling lamp, fitted to binoculars.

At present there is considerable activity in regard to street lighting fittings and equipment for the rehabilitation of public lighting installations. Several prototypes of new street lighting fittings have been developed as well as new designs of raising and lowering gear and winches. Ultra-violet carbon-arc equipment which has been installed at over 400 hospitals and clinics for ultra-violet light therapy, is at present being supplied for various War Department hospitals.

London Electric Firm

Having been making searchlights for the past forty years (including, it is claimed, the largest and smallest in the world), the London Electric Firm during the war produced an entirely novel pattern for a special Service requirement. The firm's well-known high intensity lamp was fitted to this equipment, which also included the necessary generating plant, automatic control gear and cabling.

Other war contracts comprised cablewinding drums with enclosed slip-rings and brushes, including large units dealing with heavy cables for sinking pumps for clearing water from mine shafts, etc. A considerable number of hand winches were supplied for raising and lowering aerials in the field, for portable tools in aerodromes, and for other special uses.

Distance control was further developed to provide turning gears for aerials, and accessory apparatus of the precision order for radio work. The manufacture of raising and lowering gear for lighting fittings was continued, chiefly for war factories and for obstruction lights on chimneys and masts sometimes as much as 240 ft. high.

British Thomson-Houston Co., Ltd.

At present it is possible only to make a brief survey of the outstanding war achievements of the B.T.H. Co. Many of the company's peacetime products were indirectly required to meet war requirements. A very large amount of direct armament production was carried out, however, much of which, by utilising B.T.H. research and engineering facilities was either designed by the company itself, or in close collaboration with various Government Departments.

The company played an important part in the development of radar, being responsible for all kinds of sets for use at sea, in the air, and on land. Radar equipment, to which the B.T.H. made major contributions, was an important factor in the sinking of the German battleships *Scharnhorst* and *Bismarck*, and in the Cape Matapan victory. Earlier in the war and before radar came into such wide use, several thousand predictors were made by the company.

Another noteworthy event was the use of jet propulsion for aircraft. The jet engine was first developed by the company in conjunction with Air Commodore Whittle, and after exhaustive experiments, beginning in 1936, an engine, built by the company, was successfully flown for the first time in May, 1941, in a plane built by the Gloster Aircraft Co. In September, 1941, a similar engine, manufactured at Rugby, was sent by the B.T.H. Co., to its associated American company, the General Electric Co. (of New York) for them to study and copy. Following this development, work has been done on the gas turbine for which there are considerable future possibilities, particularly in the field of ship propulsion.

The danger of the acoustic mine was defeated with the help of the B.T.H. Co., and for this purpose the company designed and developed over 800 oscillators. The work on these was put in hand immediately following the introduction by the Germans in December, 1940, of the acoustic mine, and deliveries were commenced in March, 1941. The first oscillator, the Fessenden type, met with success, but suffered from certain inherent disadvantages in design. The company therefore proposed the use of the inductor type oscillator, and the device was put into successful service against the acoustic mine, towards the end of 1941.

The electric torpedo was another outstanding product. No manufacturing technique for the device existed in this country when the company was asked to undertake the work. It had to be made suitable for over-water discharge (the German torpedo was not), and lighter in weight to enable a heavier war-head containing more explosive to be adopted. Many difficulties had to be overcome before production was commenced on a large number of the torpedoes, in a building specially erected and equipped for the purpose. The B.T.H. Co. also gave valuable assistance in the development of the atomic bomb.

Thousands of Wellington bomber parts, aircraft magnetos, auto-timing devices, switches, motors, generators, compressors, servo-motors for auto-pilot control, amplidynes for servo-position control, aircraft cameras, tank components, mines and shells, were manufactured by the company.

United States Exports

Effect of Lend-Lease Supplies

PURSUING their policy of issuing statistics of foreign trade which were withheld during the war, the authorities at Washington have now published the returns of the exports In a recent statement, Mr. Milo Perkins, who was director of the Board of Economic Warfare, said that while the American market could absorb more than 90 per cent. of the country's

Class	1943 \$(thous.)	Inc. or dec. on 1942 \$(thous.)	Class	1943 \$(thous.)	Inc. or dec. on 1942 \$(thous.)
Self-contained lighting sets To Canada , Mexico , U.S.S.R , Egypt Storage batteries To Canada	2,403 1,172 90 496 169 3,959 113	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	Searchlight and airport beacons To Mexico Electric cooking ranges To Iceland , Mexico , Peru	3,921 344 326 179 39 37	- 3,472 + 340 + 183 + 171 + 27 + 27
To Canada , United Kingdom , U.S.S.R. , Egypt Flashight batteries To Venezuela , U.S.S.R. , Colombia Stationary motors, 1-200 HP To Canada , Mexico , Chile , Brazil , U.S.S.R. , India , South Africa , South Africa , South Africa , South Africa , South Africa , Notited Kingdom , Australia , Australia , Australia , Household refrigerators To Mexico	942 531 317 429 68 8 9 49 5,042 712 327 114 162 2,070 102 185 869 269 269 269 269 269 269 211,806 315	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	Other domestic heating and cooking devices To Canada To Canada , U.S.S.R. , Iceland Therapeutic apparatus and parts To Canada , Brazil , South Africa , Dortable electric tools To Canada , Brazil , South Africa Other portable electric tools To Canada , United Kingdom , Australia Radio apparatus and parts Other telegraph and telephone aparatus and parts To Canada , United Kingdom , United Kingdom , United Kingdom , US.S.R. Wiring supplies, etc. To Canada	274 84 27 25 164 61 17 11 1,001 387 311 101 30,515 10,630 1,431 604 8,757 3,975 9,953	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$
,, Colombia ,, Venezuela ,, Brazil ,, India	120 113 166 170	+ 76 + 22 - 112 + 158	" Mexico	519 160 748 197	+ 457 + 98 + 574 + 135

of the United States in 1943. From these the items of the electrical trade shown in the accompanying table have been extracted, with a note of the increases or decreases in value compared with 1942.

The figures include lend-lease supplies and there were great increases in exports to the Soviet Republics, to bases of supply for the Allied Forces, and to countries which were supplying strategic materials.

In the slightly decreased radio trade, outstanding customer countries were Canada, U.S.S.R., India, Egypt and Australia. production of goods in general it could not take more than half of the heavier equipment. Thus it was essential for the United States to sell abroad great quantities of machinery and transport equipment and machine tools.

Colour Television in America.—A transmitter in the spire of New York's 808-ft. high Chrysler Building will be broadcasting colour television programmes before the end of this year, says New York Radio. The Columbia Broadcasting System is also developing colour television receivers in two models.—*Reuter*. on Dese

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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.

Birmingham.-October 4th. Electric Supply Department. 132-kV overhead lines. (September 7th.)

Brierfield. -September 20th. Electricity Department. Switchgear equipment and transformers. (August 17th.)

Bristol.-September 28th. Mental Hospital. Installation of a private automatic telephone and fire alarm system. (August 31st.)

Burnley. — September 20th. Electrici Department. E.h.v. cables. (September 7th.) Electricity

Burton-upon-Trent. — September 19th. El tricity Department. Cables. (August 31st.) Elec-

Eire.-December 14th. Electricity Supply Board. Civil construction work in connection with the hydro-electric development of the Erne, including dam, power station, etc., at Cathalcen's Falls (40,000 kW) and Cliff (10,000 kW). Specification, etc., from the Board's secretary, Mr. P. J. Dempsey, 60-62, Upper Mount Street, Dublin.

Manchester.-October 1st. Electricity Committee. Main gas duct between boiler and chimney, Stuart Street Station. (See this issue.)

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

Walsall.-October 5th. Electricity Department. Supply of materials and apparatus of British manufacture. (See this issue.)

Warrington.-October 1st. Electricity Department. Twelve months' supply of cables. (See this issue.)

Woolwich.-October 9th. Electricity Department. One 750-kW Diesel alternator and four 30-MVA outdoor reactors. (August 31st.)

Orders Placed

Bolton. — Electricity Committee. Recom-mended. Pumping plant for cooling towers at Back-o'-th'-Bank generating station .- Drysdale & Co

Chesterfield .-- Lighting Committee. Accepted. 219 concrete columns manufactured by Concrete Utilities, Ltd., and lanterns for trunk road lighting (£6,946).—G.E.C.

Dartford.—Electricity Committee. Recom-mended. Cooker wiring.—Wenham & Basford.

Radcliffe.—Electricity Committee. Recom-mended. Cables.—British Insulated Callender's Cables.

Sheffield.-Electricity Committee. Accepted. Removal of protection covers from turbo-alternators at Blackburn Meadows power station (£3,112).—Mitchell Engineering Co.

Wallasey.—Housing Committee. Accepted. Electrical installations at 16 houses in Hillcroft Road (£271).—W. A. Carter.

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.

Alcester.—Houses (46), Studley and Salford Priors, for R.D.C.; S. Sheppard, clerk, Council Offices.

Baguley.—Houses and flats, Brooklands Road and Maple Road; Halliday & Agate, architects, 14, John Dalton Street, Manchester, 2.

Banbury.—Houses (30), Adderbury site, for R.D.C.; Arthur Hunt, architect, Castle Wharf, Banbury.

Birkenhead. - Kitchen and dining room, Brassey Street Municipal School; B. Robinson, borough engineer, Town Hall.

Bolton.—Hostel for the aged, Watermillock;

borough engineer. Pump house, Halliwell works; Montague Burton, Ltd.

Cheetham.—Factory, warehouse and offices for Tideswell, Bailey & Tideswell, Ltd.; Pye & Bennett, architects, 2, Booth Street, Manchester, 2.

Chelmsford.—Houses (78); V. J. Willis, borough engineer, Duke Street.

Cheltenham. - Houses (30), for R.D.C.; Rainger & Rogers, architects, 29, Rodney Road.

Coventry.—Conversion of Cheylesmore Hostel into 114 flats; D. E. E. Gibson, city architect, la, Warwick Row.

Crich.—Restoration of St. Mary's Church after fire; Houfton & Kington, architects, Furnival Chambers, Market Place, Chesterfield.

Crosby.—Houses (50), four sites; J. R. Fothergill, borough engineer, Town Hall, Waterloo, Liverpool, 22.

Darlington.--Houses (120) at Heighington Road; R.D.C. surveyor.

Downham.—Houses (20), Stoke Ferry, Nor-folk, for R.D.C.; H. C. Hughes & Peter Bicknell, architects, 1, Tunwell's Court, Trumpington Street, Cambridge.

Droitwich .-- Houses (20), Fernhill Heath, for R.D.C.; Pritchard, Godwin & Clist, architects, Bank Buildings, Kidderminster.

East Retford.—Houses (108), Holly Road, Ordsall estate; Vallance & Westwick, White Hart Chambers, White Hart Street, Mansfield.

Epsom & Ewell.—Houses (118), Cox Lane scheme for Borough Council; W. G. H. Loveless, architect, 51-53, High Street, Epsom.

Eston (Yorks).—Houses at Grangetown; U.D.C. surveyor.

Gateshead.-Houses (80) on the Highfield estate; J. Clark and Son, builders, Seaham, Co. Durham.

Houses (95) on the Blue Quarries estate; borough engineer, Municipal Buildings.

Hebburn-on-Tyne.-Houses (73) for U.D.C.; T. A. Page, Son & Hill, architects, King Street, South Shields, Co. Durham.

Hemel Hempstead.-Houses (50), for Borough Council; Louis de Soissons, architect, Midland Bank Chambers, Welwyn Garden City, Herts.

Inverness.—Houses (40) at Dalneigh: burgh surveyor.

Kidderminster. — Houses (34), Rock and Kidderminster, for R.D.C.; A. S. Rew, clerk, Council Offices, Land Oak House, Kidderminster.

Kilmarnock.—Canteen, etc. (£700) and kiln and producer sheds (£8,800); Shanks & Co., Ltd., Longpark Pottery, Kilmarnock.

Lanarkshire.-Buildings at industrial estate, Newhouse (£200,000); Lanarkshire Industrial Estates, Ltd., Hamilton.

Lancaster.—Community centre, Paddington recreation ground (£25,000); T. H. Mawson & Sons, architects, Bank Buildings, Church Street.

Leyland.—Extensions, Balshaw's Grammar School (two extra classrooms); A. T. Nicholson, county architect, County Offices, Fishergate Hill, Preston.

Liverpool.—School kitchen, Fonthill Road County School; L. H. Keay, city architect, Blackburn Chambers, Dale Street.

Loanhead.—Permanent houses for Town Council; George B. Deas & Thomson, architects, Central Chambers, Kirkcaldy.

Middlewich.-Houses (80), Holmes Chapel Road; Pochin's (Manchester), Ltd., builders, King Street.

Newton Abbot.—Houses (32), for R.D.C.; W. Sadler, clerk, Kingsteignton Road, Newton Abbot.

Rochdale.-Church, Kirkholt estate; secretary to the Baptist Church Association trustees.

Seaton Valley.—Houses (50) on the Klondyke estate for the U.D.C.; T. W. Burges, surveyor, Council Offices, Seaton Delaval.

Stafford .- Extensions to Wedgwood Works, Barlaston; Josiah Wedgwood & Sons, Ltd.

Houses (14) in pairs, Adbaston, Forton and Moreton, for R.D.C.; C. M. Coombs, architect, County Buildings, Stafford.

Stockton-on-Tees.-Factory for making wooden doors and windows; F. Hills & Sons, Manchester.

Stoke-on-Trent. — Houses (354), Baddeley Edge; L. Bates, builder, First Avenue, South Porthill, Stoke-on-Trent.

Stretford. -- Church, Barton Road; Presbyterian trustees.

Works additions, Praed Road; Penmaenmawr & Trinidad Lake Asphalt Co., Ltd.

Sunderland.—Conversion of St. Mary's Vicarage, Seaham, into girls' remand home; education architect, John Street, Sunderland. Houses (370); J. E. Lewis, borough engineer.

Tottington. — Semi-detached houses, North Avenue, Greenmount; J. H. Ratcliffe (Builder), Ltd., Barnbrook, Bury.

Tow Law (Co. Durham).—Houses (50), Wear Street, for the North Eastern Housing Associa-tion; J. W. Hanson & Son, architects, 18, Eldon Square, Newcastle.

Uxbridge. — Proposed sports stadium (£50,000); S. A. Field & Co., builders, Uxbridge. stadium

Wallasey.-School kitchen, Poulton Road Municipal School; F. R. B. Grundy, borough engineer, Town Hall.

Wallsend.—Houses (299), Willington West Farm estate, for the North-Eastern Housing Association; P. L. Browne, Son & Harding, architects, Pearl Buildings, Northumberland Street, Newcastle-on-Tyne.

Walsingham.—Houses (20), Langham, South Raynham and Wighton, for R.D.C.; housing officer, 10, The Square, Fakenham, Norfolk.

Watford .--- Bus garage; London Passenger Transport Board.

Haisport Bord. Houses: North Orbital Road, Leavesden Green (70); C. H. Kempster, Ltd. Tudor Walk (12); Douglas Rogers, Ltd. Cassiobury Park Avenue (50); Lionel H. Fewster & Partners, 20, Conduit Street, W.1. Woodhurst Avenue (56); Rice Bros. Riverside Road (44); borough engineer.

Whaley Bridge.—Houses (40), Macclesfield Road, for U.D.C.; W. Thorpe & H. Hirst Smith, architects, 66, Deansgate, Manchester, 3.

Wooler.-Omnibus station; United Automobile Services, Ltd., Grange Road, Darlington.

Yiewsley & West Drayton.—Houses (118), Bell Farm, West Drayton, for U.D.C.; A. C. Kennedy, clerk, Yiewsley, West Drayton, Middlesex.

Forthcoming Events

Friday, September 14th.—Birmingham.— James Watt Institute, 6.30 p.m. Institute of Welding (Birmingham Branch). Chairman's address.

Saturday, September 15th.—Manchester.— Engineers' Club, 3 p.m. Association of Super-vising Electrical Engineers (Manchester Branch).

"Motor Control Gear," by Mr. Mathieson. Leeds. — Electricity Department, Whitehall Road, 2.30 p.m. I.E.E. North Midland Students' Section. Address by the chairman, A. C. Holmes, on "High-frequency Telephone Cables."

Saturday and Sunday, September 15th-16th.-London.-Portland Hall, Little Titchfield Street, W.C.1. Association of Special Libraries and Information Bureaux. Annual conference.

Monday, September 17th.—Birmingham.— Grand Hotel, & p.m. Birmingham Electric Club. Presidential address by D. Kingsbury.

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

Wednesday, September Crown Hotel, 7.15 p.m. (Wolverhampton Branch). Inaugural dinner.

Thursday, September 27th. — London. — Alliance Hall, Westminster, 6.30 p.m. Asso-ciation for Scientific Photography. "Recording Engineering and Other Work by Stereoscopic Photography," by R. Peel. Sheffield.—Royal Victoria Hotel, 6.30 for 7 p.m. Institute of Welding (Sheffield Branch). Industrial Application of Automatic Submerged Arc Welding." by R. Sillifant.

Arc Welding," by R. Sillifant.

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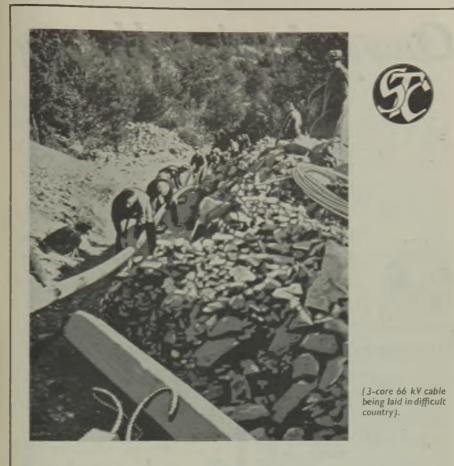


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September 14, 1945

ELECTRICAL REVIEW

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Chocolate Cake

Ingredients.

- I tablespoonful of treacle or syrup A little over § pint of hot water
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- 8 ozs. of self-raising flour
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Dissolve the treade in the hot water. Melt the fat. Sieve flour, cocca, and salt, and add sugar. Dissolve the bicarbonate of soda in the treadle and water, and at once stir into the dry ingredients. Lastly stir in the fat and bake in two sandwich tins at 450 for about 20 mnutes.

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

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Learn more about these Starters -Write for Descriptive List No. 81.

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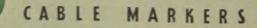
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For Street Lighting Control the Record Remote Operated Selective Switching Units set a new standard in low consumption, selectivity and consistency.

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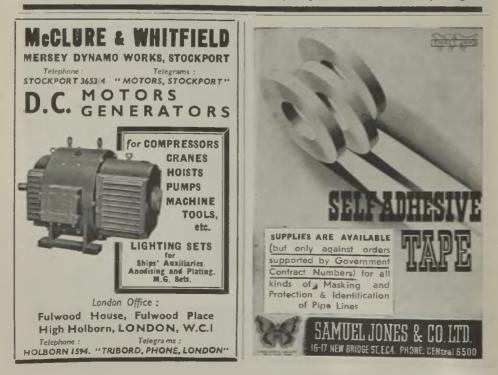
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September 14, 1945



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Typical outdoor pattern single ratio transformers for 33 kV, 66 kV and 132 kV 3-phase systems respectively.

Considerable saving in size and oil content is achieved as compared with older types shown in the background.

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ADVERTISEMENTS for insertion in the following issue are accepted up to First Post on Monday, at Dorset House, Stamford Street, London,

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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 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 Number should be addressed to the Box Number in the advertisement, clo ELECTRICAL REVIEW, Dorset House, Stam-ford Street, London, S.E.I. 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.

COUNTY BOROUGH OF WARRINGTON

Electricity Department

THE Electricity Committee invites TENDERS for TWELVE MONTHS SUPPLY of R.H.T. and L.T. PAPER and LEAD-COVERED and other CABLES. Specification and Form of Tender can be obtained from Norman T. Smith, M.I.E.E., Borough Electricital Engineer, Electricity Works, Warrington, on payment of 1 guinea, which will be charged for extra copies of the Specifica-tion. Cheques to be made payable to the Borough Treasurer, Warrington. Tenders, addressed to the Chairman of the Electricity Committee, Town Hall, Warrington, must be scaled with Vax, and endorsed "Tender for Cables," and delivered not later than 12 o'clock noon on Monday, October 1st, 1945. The Committee do not bind themselves to accept the

The Committee do not bind themselves to accept the lowest or any Tender. W. E. E. LOCKLEY

Town Hall. Warrington.

KLEY. Town Clerk. 2774

CITY OF MANCHESTER

THE Electricity Committee invite tenders for the pur-chase, dismantling and removal of TWO 50 kW DIESEL ENGINE-DRIVEN D.C. GENERATORS, with water pump, radiator and fan. fuel tanks, pipework and ewitch canel: in first-class working condition. (1 set at EARTON GENERATING STATION: 1 set at STUART STREET GENERATING STATION.) Conditions and Form of Tender may be obtained from Mr. R. A. S. Thwaites, Chief Engineer and Manager. Electricity Department, Town Hall, Manchester, 2. Tenders, addressed to the Chairman of the Electricity Committee, to be delivered not later than 10 o'clock a.m. on Tuesday, 2nd October, 1945. PHILIP B. DINCE.

Town Hall.	FHILI	р.	Town	Clerk.
Manchester. 2. 8th September,	1945.			2794

CITY OF MANCHESTER

THE Electricity Committee invites tenders for the supply, delivery and erection, at Stuart Street Cenerating Station, Bradford, Manchester, 11. of a MAIN AS DUCT BETWEEN No. 39 BOILER AND CHIM-YeY (Specification No. 837). Specification, etc., may be obtained from Mr. H. A. S. Iwaites, Chief Engineer and Manager, Electricity Dept., form Hall, Manchester 2, on payment of a fee of one nuna fide tender.

Tenders, which should will be related on receive of the sector of the se

PHILIP B. DINGLE. Town Clerk. Town Hall 2762 COUNTY BOROUGH OF WALSALL

Electric Supply Department

THE Electric Supply Committee invite tenders for supply of the undermentioned materials and appa-ratus of British manufacture, to be delivered as and when required during a period of twelve months commencing 1st January, 1946.

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Earthenware conducts. Tronghing Tiles. Bonding (Tamps Peeder Pillars and Substation Panels. Underground Link Boxes and Covers. Transformers (oil-immersed, self-cooled, 100 to 500 kVA). Transformers toil-immersed. self-cooled, 100 to 500 kVA). Forms of Tender, together with the General Conditions of Contract (which include the Corporation's usual fair wages and conditions of labour clause) and Specifications, may be obtained upon application (which should specify the form required) to the undersigned. The tenderers must state whether they are entitled to use the Seal of the National Scheme for Disabled Men. Tenders, enclosed in plain sealed envelopes, and en-dorsed as instructed in the tender form, must be delivered to the Town Clerk, Conneil House, Walsall, not later than PEIDAY, 5th OCTOBER, 1945. Tenders not complying with the foregoing will be rejected, and the Committee does not bind itself to accept the lowest or any tender. E. A. NEWBUEN, M

Electric Supply Dept., E. A. NEWBURN, Epper Bridge Street, Walsall, 7th September, 1945. 9795

SITUATIONS VACANT

None of the vacancies for women advertised in these None of the maanches for women antertisea in these columns relates to a women between 18 and 40 unless such woman (a) has living with her a child of hers under the age of 14, or (b) is reputered under the Bland Persons Acts, or (e) has a Ministry of Labour permit to allow her to obtain employment by individual effort.

MID-LINCOLNSHIRE ELECTRIC SUPPLY CO. LTD.

Engineering Assistant

A PPLICATIONS are invited for the appointment of an Engineering Assistant at a commencing salary of 5300 per a num. plus a cost of living bonus, which is at present 562 8s. per annum

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Mid-Lincolnshire Electric Supply Co. Ltd., North House, Grantham, Lincs.

2740

Manchester 2. 5th September, 1945.

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CITY OF PLYMOUTH

Electricity Department

Appointment of Junior Shift Charge Engineer

A PPLICATIONS are invited for the position of Junior Charge Engineer to carry out the normal duties of assisting the Shift Charge Engineer in the Generating: Station

Assisting the birth charge inighter in the detectations. Applicants must be between the ages of 25 and 40, and should have experience in a modern Power Station. Preference will be given to those who have passed the Graduateship examination of the Institute of Electrical Engineers or an approved equivalent. The salary will be in accordance with Grade 85, Class H, of the National Joint Board Schedule, at present £385 per annum. The appointment will be subject to the provisions of the Local Government and Other Officers' Suparannuation Act, 1987, and the successful candidate will be required to pass a medical examination. Applications must be made on special forms, to be obtained from the undersigned, to whom they must be returned not later than noon on 29th September, 1945. The Ministry of Labour and National Service have given permission under the Control of Engagement Order, 1945, for the advertisement of this vacancy.

for the advertisement of this vacancy.

H. MIDGLEY. Armada Street, City Electrical Engineer.

Plymouth September, 1945.

2782

MECHANICAL ENGINEER

A PPLICATIONS are invited from Class "A" ex A Servicemen and others excepted from the provisions of the Control of Engagement Order, 1945, for the position of Mechanical Engineer in the Power Depart-ment of a large industrial concern.

ment of a large industrial concern. Applicants, who should not be less than 35, or more than 45 years of age, should hold a British University Degree in Mechanical Engineering, or its equivalent, and must have bad a sound mechanical Engineering training, and good experience of the operation and maintenance of the mechanical equipment (turbo generators, feed and circu-lating water pumps, coal and ash handling plant, etc.) of modern steam power stations of not less than 50,000 kW installed capacity. In addition, they must be able to assist with the preparation of designs and specifications for new plant, and to carry out investigations and tests in connection therewith. Corporate membership of the Institution of Mechanical Engineers is also desirable.

The commencing salary is 2700 per annum, plus Supple-ment, and the selected candidate will be required to pass a medical examination.—Box S.982, Lee & Nightingale, Liverpool. 2775

PENMAENMAWR URBAN DISTRICT COUNCIL NORTH WALES

THE above Council invite applications for the post of THE BOVE council invite approximates by the period of Electrical Engineer at a commencing salary of £300 per annum, rising to £360 per annum by annual increments of £20 per annum, plus War Bonus, in accordance with the Whitley Council Scale, which is at present £59 16s. per annum

Terms and conditions of appointment with form of application (which must be returned by the 28th September, 1945) may be obtained from the undersigned on receipt of a stamped addressed foolscap envelope. R. M. L. BEVAN.

Clerk of the Council.

Council Offices, Penmaenmawr, North Wales.

ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS

A PPLICATIONS are invited for the position of Assistant A PPLICATIONS are invited for the position of Assis-tant Secretary to the Association at a commencing salary of 2500/£600 per annum according to qualifications. Applicants must possess negotiating and organism ability, sound knowledge of the electrical industry and employment conditions, practical and technical training. and experience in meetings procedure, correspondence and editorial work. Applications by September 25th, 1945, stating age and experience to the General Secretary, Association of Super-vising Electrical Engineers, 54, Station Road, New Barnet, Herts. Envelopes should be endorsed "Application." 2753

2753

CORPORATION OF GREENOCK

Electricity Department

Assistant Mains Engineer

A PPLICATIONS are invited for the above appointment from Electrical Engineers who are Corporate or Graduate Members of the Institution of Electrical Engi-neers, or hold equivalent qualifications. Experience in the control of workmen and the general operation of high the control of workmen and the general operation of high and low voltage distribution systems is essential. Salary and conditions of service will be in accordance with the National Joint Board Schedule, the present salary being 2445 (Class G, Grade 7). The appointment will be subject to the Local Govern-ment Superannuation Act, 1937, and the selected candidate will require to pass a medical examination. Applications, stating age and giving full particulars of training and experience, together with copies of testi-monials, should be forwarded to the undersigned not later than Saturday, 29th September, 1945. The Ministry of Labour and National Service (Technical and Scientific Register) have given permission under the Control of Engagement Order, 1945, for the advertising of this vacancy.

of this vacancy.

W. A. WOODROW, A.M.I.E.E., Chief Engineer and Manager. Electricity Dept., Dellingburn Street, Greenock. 2770

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY

Appointment of Charge Engineer and Relief Charge Engineer

THE above-named Authority invite applications for the following positions at Walsall generating station: Charge Engineer, Class F. Grade 8, £397 p.a. Relief Charge Engineer, Class F. Grade 8a, £371 p.a. Candidates must be experienced in the operation of steam turbo-alternator and boiler plant, together with auxiliary plant, in a modern power station. Corporate membership of either the Institution of Elec-trical Engineers or the Institution of Mechanical Engineers will be an advantage.

trical Engineers or the Institution of Mechanical Engineers will be an advantage. The appointments will be subject to the Authority's Superannuation Scheme under the Local Government Superannuation Act, 1937, and the selected candidates will have to pass a medical examination. Applications, stating age, particulars of training and experience, and accompanied by copies of three recent testimonials, should reach me not later than 22nd Sep-tember, 1945.

testimonials, situate react international Service, Technical The Ministry of Labour and National Service, Technical and Scientific Register, have given permission under the Control of Engagement Order, 1945, for the advertising of these vacancies. H. F. CARPENTER, Phœnix Ruildings. Clerk and Manager. Dudley Road. Wolverhampton. 1st September, 1945. 2747

COUNTY BOROUGH OF SOUTHAMPTON

Electricity Department

Appointment of Chief Assistant Engineer

A PPLICATIONS are invited for the above-named position, at a salary for Chass ".H." Grade 1, of the National Joint Board Schedule of £226 per annum, subject to the National increments and adjustments, and a deduction for superannuation. The successful applicant must pass a medical examination. Applicants should each possess an Engineering degree and/or be a Corporate Member of the Institution of Elec-trical Engineers, and must have held the appointment of Deputy Chief Official, or an executive position of consider-able responsibility. In a large undertaking operating a selected generating station, and be possessed of sound administrative ability. Previous experience in all engi-neering matters appertaining togeneration and discribution and in the commercial administration of an Undertaking is essential. is essential.

is essential. Applications, on forms to be obtained from Mr. W. G. Turner, Borough Electrical Engineer, Civic Centre, Southampton, and accompanied by not more than three testimonials, and endorsed "Chief Assistant Engineer," must reach the undersigned not later than noon on 28th September, 1945. Canvassing, directly, or indirectly, will disqualify. R. RONALD H. MEGGESON. Civic Centre, Southampton Southampton 2008

Southampton.

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BOROUGH OF SWINTON AND PENDLEBURY **Electricity Department**

Appointment of Distribution Superintendent

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The selected candidate will be required to pass a medical romination. Candidates should be Corporate Members of the Insti-ntion of Electrical Engineers, and have specialised know-dre and experience in the erection and maintenance of Substation Plant and Switchgear. Lavout Operation and Maintenance of L.T. and E.H.T. Distribution Systems. Public Lighting Schemes and Meter Testing Stations. Forms of application, together with conditions relating to the appointment, may be obtained on application to the Borough Electrical Engineer, Electric House, Swinton.

The Ministry of Labour and National Service have given prmission under the Control of Engagement Order, 1945, for the advertisement of this vacancy. Applications to be forwarded in sealed envelopes en-dorsed "Distribution Superintendent." and delivered to the undersigned not later than noon on 8th October, 1945. VINCENT COLLINGE, Town Hall. Town Clerk.

Town Hall. Swinton, Lancs. 3rd September, 1945.

CENTRAL ELECTRICITY BOARD N.E.E. and M.E.E. Areas

Assistant Section Engineers

Assistant Section Engineers A PPLICATIONS are invited for the posts of Assistant Section Engineer in the North-East England and Id-East England Areas of the Central Electricity Board Candidates should have a sound knowledge of E.H.V. massission and substation work, and have technical multifications at least of graduate I.E.E. standard. Appli-zions to be sent to the Manager, C.E.B., Grid House, S. Mary's Road, Leeds, 7. The Ministry of Labour and National Service have are permission under the Control of Engagement Order. 195. for the advertisement of these vacancies. 3th September, 1945. 2760

Sch September, 1943. 2760
 Sch September, 1943. 2760
 APLICATIONS are invited for the position of Chief Draughteman of a cable works drawing offlee situated South London. Applications from those over 51 or lass A ex-Servicemen only should be made in strictest indicates, giving details of age, previous experience and any required, to—Rox 2763, c/o The Electrical Review. AWATURE Winder for S.W. London, all classes A.C. and D.C. jobs. Good conditions of employment and premanency for experienced man. Vacancy open to Case A ex-Servicemen only. Immediate appointment refered, but we are prepared to wait. Write—Box 7564. Co The Electrical Review.
 AEMATURE Winders required for Midlands, used to all desses repairs, large and small. Class A ex Servicemen or over 51.—Box 2709. c/o The Electrical Review.
 ASUSTANT Electrical Engineers required by leading Ceylon engineering company. Applicants must have ment are winding. transmission, workshop rontine, summary batteries, designing, estimating, supervising and adding of labour. Age not over 30. The agreement wid be one of four years, with possible permanency. Mit fully, with copies of testimonials, etc.— Box Z. K. 63. Association of the string and st. 2000. Case and the company batteries designing, adving st. 2007.

A SUSTANT Production Controller required by engineer-ing establishment in South-East London. Previous experience with factory manufacturing electro-mechanical exists and pretered. Should be capable of under-uing all production control functions. Write, giving full deals of experience, qualifications and solary reod., to-bor 7851. A. Advg., 212a. Shafteshury Av. W.C.2. 2693 CHIEF Electrical Designer required by manufacturers of industrial range of rotating equipment from about to hp. to 2,000 hp. Experience in latest direct as well a liternating current practice necessary for success: wary 2600 to 51.200 p.a. according to qualifications and perience. Write, quoting D1274X.A. to Ministry of labour and National Service. Appointmente Department. Immaway. London, W.C.2. for application form. which may be returned completed by 21st Sept., 1945. 2736

L REVIEW 71
CHIEF Electrical Engineer required to take obarge of design and manufacture of control gear and switch fear. Applicants must have experience of modern develop-ments in lift control systems. Good permanent position wailable for suitable man. Please state age. experience of an experience of the system of the sys

from M.O.L. control.—Box 2786, c/o The Electricat Review.
 L'ECTRIC Cable Manufacturers and Electrical Engineers in North London require Chief Assistant Corfs and Retimating Clerk (Ref. No. P.S. 579), experienced in esti-mating and costing all types of Electric Cables, Fleribles, Wires and Strand. Salary £400 p.a. Also Cable Box Estimator and Cost Clerk (Ref. No. P.S. 549), with works experience. Salary £30-£400 p.a. Also Cable Box Estimator and Cost Clerk (Ref. No. P.S. 549), with works of the second strand. Salary £400 p.a. Also Cables, Fleribles, Wires and Strand. Salary £400 p.a. Also Cables, Box Estimator and Cost Clerk (Ref. No. P.S. 549), with works experience. Salary £30-£400 p.a. Also Cables, Solard must be in writing, stating date of birth, full details of qualifications and experience (including a list in chrono-logical order of posts held), and quoting appropriate Reference Number, should be addressed to-—The Ministry of Labour and National Service Appointments Department. 2783
 L'LCTRICAL Engineer, technically trained with manu-facturing and commercial experience and now engaged on installation work, wanted for electrical contracting firm in Manchester, with view of taking charge of branch. —Box 2745, c/o The Electrical Review.
 E'LECTRICAL Engineer with commercial and technical experience required for firm in Yorkshire, to take end salary required to—Box 2767, c/o The Electrical Review.

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motors, switchgear and generators. Give äge, experience and salary required to — Box 2767, 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. svinog full particulars. to—Box 2742, c/o The Electrical Review.
 ELECTRICIANS and Assistants, Class A ex-Servicemen or nan over 51. Apply. Svinog full particulars. to. Box 2742, c/o The Electrical Review.
 ELECTRICIANS and Assistants, Class A ex-Servicemen or nan over 51. Apply. Svinog full particulars. to, 65, Vincent Square, Westminster, Swin. Vacancies are available in London area and Provinces. A number of permanent men wanted. 2616
 ELECTRICIANS and Assistants required for London tree. A number of permanent men wanted. 2616
 ELECTRICIANS and Assistants required, permanenty for right men. Class "A" exServicemen, or otherwise free.—Box 44, c/o The Electrical Review.
 ELECTRICIANS and Assistants required, permanent work for suitable men in London and Provinces. Class A ex-Servicemen or over 51, apply—W. J. Furse & Co. (London) Ltd., 9, Carteret Street, Westminster, London, Sw.1.
 TECTRICIANS and Overhead Linesmen required by the Messer Electricit Company. Co. Utd., Finsorus Hall, Stowmarket, Sufolk. Applicants should be Class A ex-Servicemen or overn throm labour control. 7399
 ELECTRICIANS, Chass "A" ex-Servicemen or over 51, apply. Co. Ltd., Finsorus Hall, Stowmarket, Sufolk. Applicants should be Class A ex-Servicemen or exempt from labour control. 7399
 ELECTRICIANS, Chass "A" ex-Servicemen or over 51, apply. Co. Ltd., Provide Read, Sewbury, Berks. Apple. Shour control. 7399
 ELECTRICIANS, Chass "A" ex-Servicemen or over 51, apply. Co. Ltd., Finsorus Hall, Stowmarket, Sufolk. Applicants should be Class A ex-Servicemen or exempt from labour control. 7399
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ELECTRICITY Master required in the London area for teaching adult women students elementary domestic electricity. Teaching experience essential. Time 4 days per week, 3 Terms of approx. It weeks' duration. Duriss to commence January, 1946. Apply, stating age, experience and salary expected, to—Box 2758, c/o The experience and st Rectrical Review.

Eventual Review. ENGINEER with experience of works and production organisation, and control of personnel, required by important company in the electrical industry in the London area, in the capacity of Assistant Works Manager. Good prospects, salary and pension for man with the required qualifications.—Box 2708, e/o The Electrical Review

andifications.—Bax 2708, c/o The Electrical Internet EXPERIENCED Costing Engineer required, with practical knowledge of all types of electrical power and fighting installations. Apply, by letter only, giving details of age, training, experience and remumeration, to F. H. Wheeler & Co. Ltd., Imperial Buildings, Orford Road, Manchester, 1. Immediately the present employ-ment restrictions are removed, applicants will be con-sidered. 2756

G ENERAL Manager. Immediate appointment leading in near future to promotion to General Manager of electric cable works. Applicants, age 35-45, must possess electric cable works. Applicants, age actived by some sound electrical engineering training followed by some rears' experience in the manufacture of paper, robber and rears' experience in the manufacture of paper. synthetic insulated cable. Consideration will be given to suitable applicants who, while not having held a position suitable applicants who, while not having held a position of the rank of general manager, have exercised responsi-bility in an assistant managerial capacity. The appoint-ment is permanent and progressive and is eligible for superannuation. Commencing salary will be between \$1,250 and \$2,000 per annum, depending on previous experience. Applications, which will be treated in con-fidence, should give full details of age, education, prac-tical training and experience and he addressed to—Box \$2768, c/o The Electrical Review.

HEAD Foreman required for shop producing medical and X-ray equipment in the London area. cal and electrical experience essential, X-ray experience desirable. Full details age, experience, present salary and salary required to—Box 7601, e o The Electrical Review. INSULATING Varnish -- Technical Representative with

sound knowledge of Electrical Insulation, required as Assistant in Sales Dept. to operate mainly in the North and Midlands. Please state age, experience and salary required.—Box 277.6, c/o The Electrical Review.

L IPTS. Designing and Layout Dranghasman required by old-established London firm. Applications only from Class A er-Servicemen or those over 51. Write, gying age and details of experience.-Bux 2677, eto The Electrical Review.

MANAGER for office of elec. eng. and contractor, to take charge of small office. Must understand ordering, directing labour and book-keeping. State salary and exp. --Box 7612, c to The Electrical Review.

MANAGER required to take charge of technical de-velopment in the design and production of mal Rectric Motors. Phase send full details of experience and salary required.—Box 2.16, c/o The Electrical Review.

MANAGER required, with general experience in the manufacture of lead storage batteries. State ee and salary required.-Box 76, c/o The State perience Rec trical Review

QUALIFIED Electrical Engineer urgently required by well-known undertaking in the Möddle East, with headquarters in London, for administration and super-vision of mechanical and electrical operation staff of three vision of mechanical and electrical operation stati of three private Diesel electrical generating and transformer stations, associated transmission lines and substations. Equipment comprises 15 A.C. and D.C. machines aggre-gating 6,000 kW, generating at 6,300 volts. Permanent position. Apply at once, giving full statement of quali-fications, training, experience and salary required, to— Box 2748, c10 The Electrical Review.

REPRESENTATIVES required in Midlands by makers R of electric wires and cables. Must have five con-nection. Apply, with full particulars of experience, etc., to-Box 2703, c/o The Electrical Review.

SALPS Engineers required for A.C. and D.C. Motors and Control Gear: areas London. Ermingham, Gha-gow, South Wales. Apply in writing, giving full details of experience, etc. - Verity's Ltd., 6c, Quay Strees, Manchester.

SUPERVISING Engineer required with practical howledge of all types of first-class electrical power DESCENTION and lighting installations. Apply, by letter only, giving details of sze. training, experience and remuneration. to-F. H. Wheeler & Co. Ltd., Imperial Buildings, Oxford Road, Manchester, I. Immediately the present employ-ment restrictions are removed, appleants will be conbe con sidered

SUPERVISING Engineer, with organising ability required by old-established firm of Electric Engineers and Installation Constructors in Southern County ability ! Installation, plant, maintenance and commercial sapersess essential. Good prospects for man of miniative. Star-education, experience, see and salary required. For 2.5^{+} (> The Electrical Review. TETHNICAL Assessment. Young man required for wor of a linear partner in an electric laup factory

TECHNICAL Asistant. Young man required for wor of a second nature in an electric lamp matury applicants should have received a fair technical training and some industrial experience is desirable. Knowledge of electric lamp manufacture not necessary. Applicant model be Class A er-Servicemen or otherwest exempt bro-Ministry of Lahour control. Apply - Cryscleo Lamiter Kempston Works, Bedford. 25 TEGENT vacances exist for 2 Supervisors (Production Lengineer) for Telegraph Workshops at Cheman JubinIpore and Economy for manufacture of stores on netted with telecommunication development Qualifiers tons: Degree or diploms in mechanical or electric engineering and preferably AM Liberts. C or AM LEE. 10 years' workshop experience including 5 years in supe-visory capacity. Preference in a die strikung k. To years workshop experience firming o candidates win-expert knowledge and experience in a die sinking fa-posste moulding, ar to instrument designing. Age im 50 years. Appointment for 2 years, subject to 6 mounter probation, terminable by 3 months' notice on either sub-Pay between R. SOO-B2. 1.400 per mensem, accordin-ra allowance, at present, for single men whose pay and showance, at present, for single men whose pay have RE. 1000. 73%, and for marined men. 174° House rem and compensatory allowances of other stationed at Calculator and National Service. Applications Department, Technical and Scientific Reviser. Roam Ch Jork House, Kingway, London, Weitz, quoting C2454A. Ministry of Labour and National Service. Applications Department, Technical and Scientific Reviser. Roam Ch Jork House, Kingway, London, W. C.2, for applications form, which must be returned completed by 28to Set 1945

tember, 1945. YACANCIES for Telephone Installation and Maintenand Ź

Regimers. Class A ex-Servicemen required.—B: Tell also The Electrical Review. WANTED, Works Manager for electrical engineerin company. Most be good administrator and capability of controlling labour. Knowledge of switcheess an advan-tage but not essential. Write for particulars to-Bo-DCL e o The Electrical Review.

WELL-known company marketing necessary mentati materials has vacancy for technically qualitied B presentative to contact principal users for sales resent and development. Must be conversant with design destra and overcaptions. Sites the conversation transformers, switchgar, on densers and cables. Permanent and progressive post I energetic man. Salary required to—Box 2552, e/o The Ele-trical Review.

ORKING Manager required by small company er ploying 60-70 hands in electrical department. Mu have first-class knowledge of small induction coil windin Mp and test gear, also light assembly work. Good salary at percentage of profits. N.W. Landon -- Box 2704, c The Electrical Review.

APPOINTMENTS FILLED

Dissuisingtion having been so often expressed that an Description applicate as may need so other expressed tract the scarcessful applicates are left in generance of the fact the the position applied for has been filed, may we argue that Advertisers notify us to that effect when they have arrived at a decision? We will then meet a notice for haree under this heading.

BOX 2463. Junior Engineer

SITUATIONS WANTED

ABOUT DOMESTIC ELECTRICAL APPLIANCES

MANUFACTUREES who have not yet prepared the sales organisation are invited to communicate wit the advertiser, who is destrous of recottaining with the repute for an appointment as SALES MANAGER.

Experience offered includes a wide electrical encourse training, modern methods of selling, education of entry of salesmen, promoting of exhibitions, cookery demonstr DODS, CLC.

For further particulars please appay in first stand Box 7551, c o The Electrical Review.

ELECTRICAL Engineer (24), Figrew National Certi-rate and City and Guilds. Approvideship in suppl-li years industrial experience with 45 M/V A play 5 years development (Badarl), seeks permanent pr gressive position.—Box 7615, c/o The Electrical Review

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AS GENERAL MANAGER OR GENERAL WORKS MANAGER

MAACHE (44, B.Sc. (Eng.), M.I.Mech.E., ment carrying complete responsibility. Chemicals, textiles, Ministries, canning, etc. Experienced negotiator.

Box 7541, c/o The Electrical Review.

ADMINISTRATION AND SALES

HAJOR (31), due for release in November, requires suitable post. Experience includes five years with periodity Supply Companies, thorough knowledge of ands and all domestic appliances and installations up to see a superience of commercial refrigeration and thing. B.E.D.A. diploma. Would prefer appointment with manufacturers of domestic appliances selling to supply dhorities and large contracting firms. Willing to invest suitable firm.—Box 7605, c/o The Electrical Review.

A Mechanist Q.M.S. recently released from the Engineer Services in Class "A." 38. Grad.I.E.E., wm A.I.E.E., U.C.L. Diploma in Electrical Engineering, years experience civilian and military covering term motor, D.O. and test, materialstest and instrument thation, switchgear research. engineering estimating, setting installation supervision design of trans-tomation, and the setting and installation overhead lines and small power stations, design of trans-tomation, setting and provide the setting and installation states, design of Labour (British and states, design, Supervision of Labour (British and states, design, Supervision, Supervision, Teat, purster, Rolleston, Burton-on-Trent, 7631 A DVERTISER (32), at present and for a number of years foreman for well-known London contractors, sets position that will make full use of varied practical apenence, good technical knowledge and commercial aremess. Has worked abroad. Willing to travel.--bar 7630 c/o The Electrical Review. M.LE.E. (34). Sales Engineer, major R.E., available

Harmess. Has worked alorad. willing to travel.— ior 7620, c/o The Electrical Review.
 M.LE.E. (34). Sales Engineer, major R.E., available October, requires progressive post.—Box 7524, c/o
 Teatrical Review.
 MARTERED Electrical Engineer (35), nineteen years' experience heavy electrical manufacturing industry— ris, D.O., estimating, sales, administration—wide know-wige home and export markets. extensive connections me Counties, offers services to firm requiring efficient hemical Sales Administration, home or abroad.—Box 66, c/o The Electrical Review.
 YONTRACT Engineer, Assoc.Brit.I.R.E., Patentee (27), seeks appointment. Radio or Electrical. preferably port trade. Good workshop, D.O., sales and export preince.—Box 7581, c/o The Electrical Review.
 M.LECTRICAL and Mechanical Charge Engineer, 51 MW. A.M.LE.E. (34), good disciplinarian, keen, ambitious, sets responsible position, technical administrative, home urboad. Excellent references.—Box 7597, c/o The Determined Review.

strical Review.

And Excellent references.—Box 7537. c/o The Detrical Review.
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L EXTRICAL Engineer, honours degree, seven years' high electrical manufacture, seeks post. — Box 7548, c/o The Electrical Review.
The Service, lost own contracting business in 1940, not service, lost own contracting business of contracting on business. — Box 7583, c/o The Electrical Review.
Electrical and National Certificate (Mechanical), feedback of the set busines, construction, installation and operation. — Box 7582, c/o The Electrical Review.
Electricity Supply Undertaking Extensive experience in mains development, construction, installation and operations. London and Southern Counties, wishes to represent or act as agent for manufacturer of heating publiance, tresistances, transformers or general. Experience de estimating and schemes. Own car. Available settember. — Box 7549, c/o The Electrical Review.
ELECTRICAL Staff Foreman, with wide experience on large contracts, requires post in West Milands. Used to estimating, costing, organising labour and materials. Full responsibility. Box 7622, c/o The Electrical Review.

materials. Full responsibility. Box 7622, c/o The Elec-trical Reveiew. The dt tool maker, instrument maker, drawing, 26 yrs.' exp., age 40. Good organiser. London area.—Box 7539. c/o The Electrical Review. ENGINEER, aged 31, desires executive position in a factory organisation: 9 years' practical experience electrical manufacture, 3 years' production planning, esti-mating and rate fixing, 2 years investigator for M.A.P., Adm., M.O.S., etc., into methods and costs of production. Vicinity London preferred.—Box 7577, c/o The Electrical Review.

Ylcinity London preferrad. —Box 7577, c/o The Electrical Review.
 E'NGINEER, Grad, I.E.E., desires progressive post on tavel. Reply—Box 7610, c/o The Electrical Review.
 E'NGINEER (31), seeks progressive position. Ordinary and Higher National Certificates (Elec. Eng.). Free to take up immediate employment. Six years with well-known firm of industrial instrument manufacturers.
 Would consider sales or laboratory work. London area only.—Fitt-Barly, 59a, Oxford Gardens, W.10. 7606
 E'N.R.A.F. Officer, age 35, just released, seeks position only.—Fitt-Barly, 59a, Oxford Gardens, W.10. 7606
 E'N.R.A.F. Officer, age 35, just released, seeks position in electrical trade. 12 years' experience as electrician, contracting and maintenance. Accustomed to the control of men. Location immaterial.—Box 7625, c/o The Electrical Review.
 FOREMAN, experienced construction and maintenance, power lighting, etc., practical and technical, desires change.—Box 7616, c/o The Electrical Review.

Dower mining. Corr, platinization between. Change. Box 7616. c/o The Electrical Review. Change. Box 7616. c/o The Electrical Review. Changer, age 38, with a lifetime experience in the manufacture of fractional horse-power motors, seeks responsible post with reputable firm where expert know-ledge can be utilised to its fullest advantage. The adver-tiser, at present in London area, is willing to move to any part of the British Isles if suitable proposition presents itself. He is in possession of first-class references which can be substantiated by previous employers with every confidence. Will be pleased to give fullest account of experience on request, and treat replies with fullest con-fidence. Apply-Box 7544. c/o The Electrical Review. CRADUATE I.E.E. (30) requires position as Assistant to Works. Sales or General Manager of electrical manufacturers. Experience with production of batteries, cables, wires. Familiar with technical correspondence: administrative and executive experience. -Box 7573. c/o The Electrical Review.

The Electrical Review. L.T.-Colonel, Electrical Engineer (34), B.Sc., A.M.I.E.E., exp. industrial and domestic applications, develop-ment elec. supply, now holding senior appointment Services dealing German industrial survey. free Oct. desires responsible position with prospects or partnership. Salary 2800. Full particulars from—Box 7525, c/o The Elec-trical Review.

MAINTENANCE Engineer, returning from overseas post end of September, desires work. Experienced generation and distribution, switchgear, motors, etc., up to 11 kV. D.O. and supervision. Age 39.—Box 7547, c/o The Electrical Review.

The Electrical Review. MANAGER for the past 12 years of small concern specialising in the repair of motor car, commercial and 'bus type batteries seeks similar or representation position. The advertiser, 41 years of age, has had 25 years', including several years large works, experience in the accumulator trade; possesses sound technical and com-mercial knowledge, initiative, organising and administrative abilities. Salary £700.—Box 7630, c/o The Electrical Paviow. Review.

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A RET

N. Z. Engineer desires to contact manufacturers before returning to New Zealand, with view to repre-sentation in the Dominion and Australasia. Electrical and mechanical agencies contemplated. Write urgently.—Box 7617. c/o The Electrical Review. PRODUCTION Engineer in light electrical manufacture. Qualified electrical senter Deward control of the sector.

Productive Low Engineer in light electrical manufacture. Qualified electrical engineer. Power engineering experience. Requires appointment as Works Manager or similar position. Available October. Home or Abroad. Box 7603, c/o The Electrical Review. QUALIFIED Electrical Engineer (38), technical and administrative experience. seeke workling to a strategies of the section of the se

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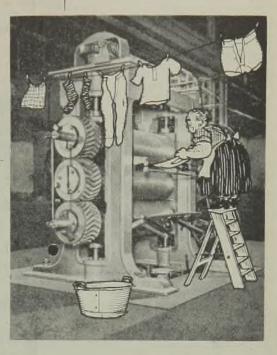
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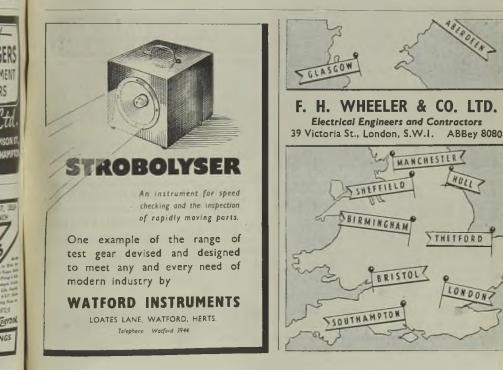


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