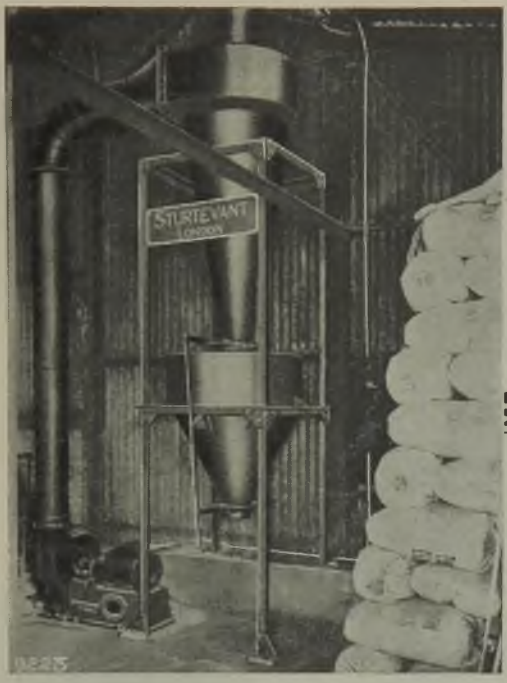
ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXVI. No. 3503 JANUARY 12, 1945 9d. WEEKLY



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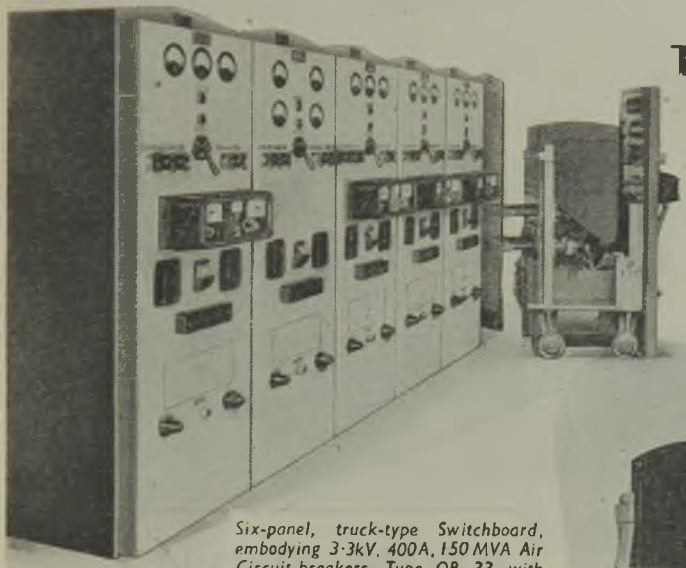
AIR-BREAK SWITCHGEAR



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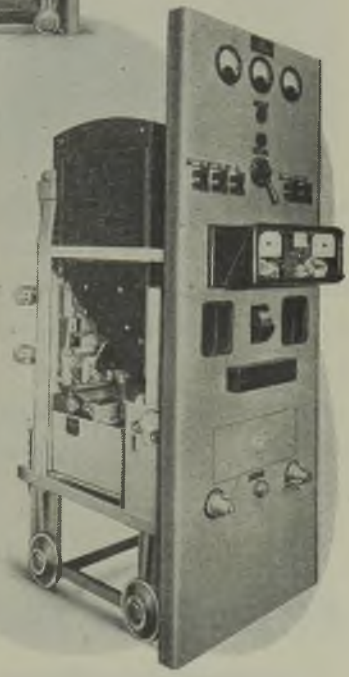

Larger view of a moving portion.

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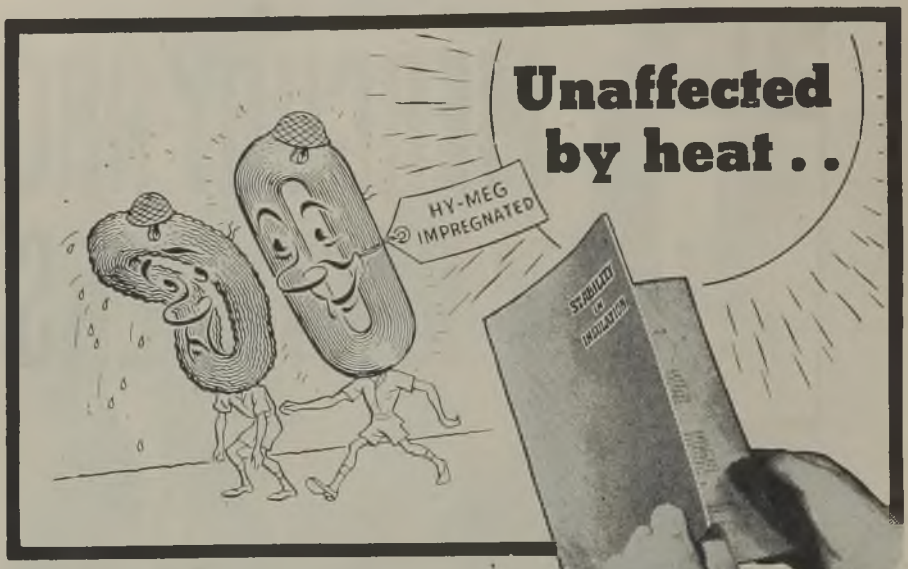

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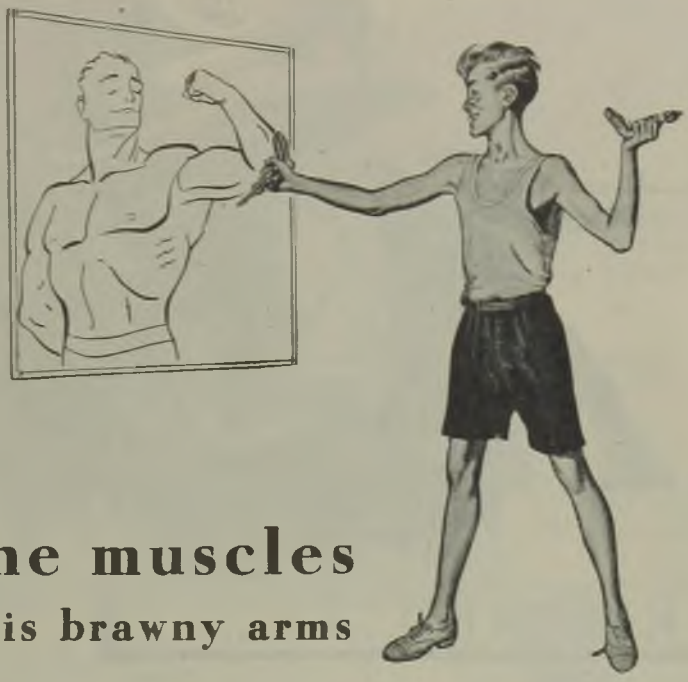

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C.R.C. 148

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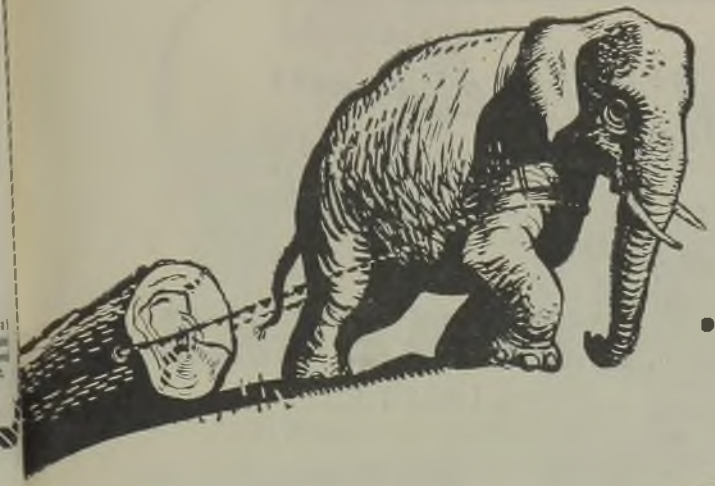
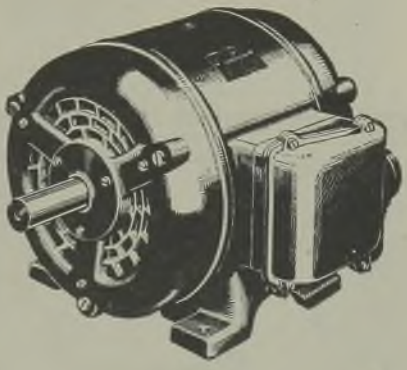
Extra starting torque?



. . . Here is your motor.



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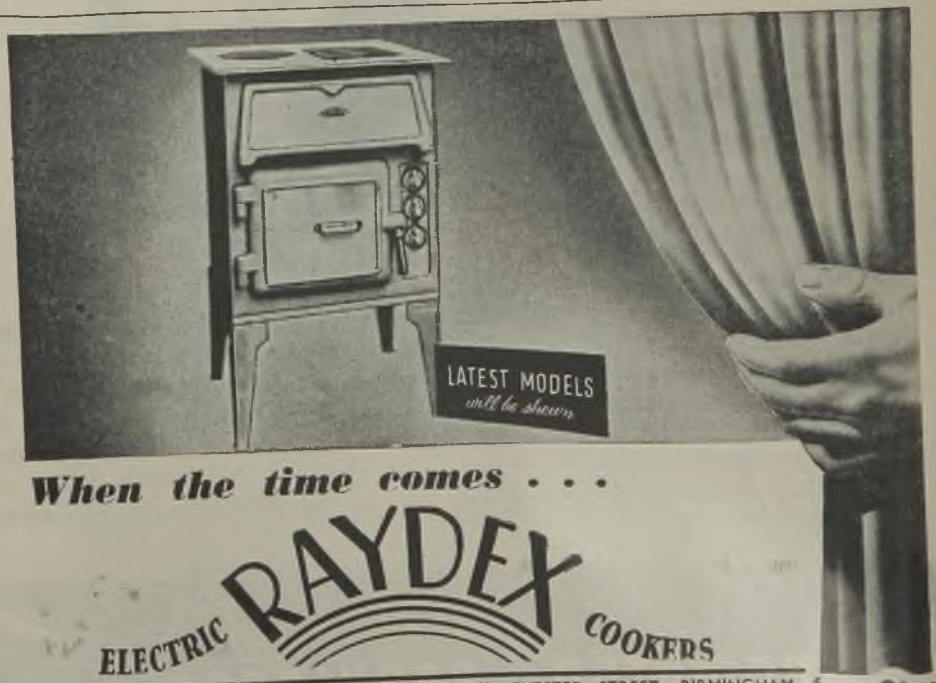

Pride of Possession...

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ELECTRICAL REVIEW

January 12, 1945

Managing Editor :
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Contents :—

EDITORIAL, ADVERTISING & PUBLISHING OFFICES : Dorset House, Stamford St., London, S.E.1
Telegraphic Address : "Ageekay, Sedist, London." Code : ABC. Telephone No. : Waterloo 3333 (35 lines).
Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage. Entered as Second Class Matter at the New York, U.S.A., Post Office.

Annual Subscription, Post free : British Isles, £2 7s. 8d. ; Canada, £2 3s. 4d. ; Elsewhere, £2 5s. 6d.

Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW LTD., and crossed "Lloyds Bank."

ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXVI. No. 3503. JANUARY 12, 1945 9d. WEEKLY

Peaks and Progress

How Can Overloading be Avoided?

IF electricity were not so firmly entrenched in the public mind permanent harm might be caused by the grave warnings and threats of deprivation which have been made recently by the Central Electricity Board and the Ministry of Fuel and Power. As it is, the public desire for electricity has been heightened by the present difficulty of obtaining connections, extensions and appliances. Consequently the possibility of being cut off has not had the repellent effect which it might have had in normal times when cold snaps are just as likely to happen.

Narrowed Margin

The necessity for the warnings is not in doubt but the causes which created it are not so clear. It seems that the margin between plant capacity and demand has so diminished that it threatens to disappear if large numbers of fires are switched on in the early morning. Although the war has worsened the situation, this cannot be regarded as a purely wartime phenomenon; the last pre-war cold snap stretched generating capacity to the limit.

Industry must be served first and therefore it is the smaller consumers, mainly domestic, who must be cut off to keep things running. But what will the position be in peacetime? Full employment means maintenance of the industrial load at quite as high a level as is now being experienced. In sudden cold weather there still will be that clash of demands from factories and homes. Is there then a danger that even in peacetime it will be necessary to implore the public to keep off the peak? If there is it must somehow be averted. If gas is constantly available (albeit at a lowered pressure) electricity cannot be intermittent.

But how is it to be done? The supply industry will never persuade housewives to have their breakfast and warm their rooms before the factories start up, or wait until the industrial peak is over before doing these things. Storage is out of the question, but district heating might help here and there. It seems that only by increasing the amount of marginal plant can the difficulty be surmounted. But this is uneconomical. A principal reason for the existence of the Central Board is the reduction in stand-by plant which it has brought about. How can it now increase that plant (and necessarily its charges) and still justify its establishment, unless continuity of supply be considered of greater importance than its cost? One way out might be to regard the " surplus " plant as preparation for meeting future demands a year or so ahead of the time now allowed.

Generating Efficiency

Related benefits of this anticipation of development would be to bring forward future work for the plant manufacturers, thus helping in the realisation of full employment, and the possibility of bringing into commission more economical plant and in this way saving coal.

The mention of coal brings forward another aspect of the sad story. We have seen it stated, apparently with official sanction, that coal has nothing to do with the case, but this must surely have related

to quantity only. Although ostensibly the supply undertakings may be getting the tonnages they require, what of the quality? Can the existing plant operate at maximum efficiency with the stuff the authorities now have to put up with?

Distribution Cables

WHILE the removal of general restrictions on the manufacture and jointing of armoured p.i.l.c. cables is a relief to be welcomed on several grounds, there is something to be said for the proviso that for the time being the relaxation will apply, except with the approval of the Electricity Commissioners, only to cables complying with B.S. 480/1942. During the next twelve months undertakings which have fallen into the habit of specifying variant features will have an opportunity of considering whether local conditions are sufficiently abnormal to make a departure from standard really necessary.

Further Training

COLLEGE courses for those who are entering the electrical industry are necessarily related to the general system of secondary education. Further technical education must therefore be in harmony with developments arising out of the recent Act. Its future also depends upon the expansion of teaching staffs of the right calibre, and in this manufacturers can afford considerable help. While the long-term value of the I.E.E. Report on part-time education (reviewed in this issue) is in laying down the lines of advance during the next five to ten years, it has an aspect of urgency as well. That is its insistence on the immediate need for a unified policy regarding the future of National Certificates and, more particularly, for the introduction of an Intermediate National Certificate. When this point has been settled plans can be prepared for the further education of electrical engineers released from the Services.

Raising the Average

THE restricted amount of time available for further education can be used most economically by apportioning it according to the ability of recipients to profit by it. Only in this way can full benefit be derived from the one hour a week allowed for part-time college training. The prominence given in the Report to the education of craftsmen is fully justified; upon this depends the effectiveness of the work of the others of the three main groups into which entrants into the electrical industry are divided. In this, as in the earlier Report, training of intelligence rather than the imparting of instruction is recognised as the essential purpose of education. While equal opportunity for all will yield more scope to those possessing exceptional ability, it is even more important to raise the average level.

Southend Tariffs

THE Southend proposals for reforming the electricity tariff structure are having an uneasy passage. At last month's meeting of the Town Council an amendment for the reference back of the scheme was defeated by four votes. Now a councillor has given notice that he will move the rescission of the proposals. His principal contentions are that they would operate unfairly against flat-rate and contract-rate consumers and that the adoption of rateable value as the basis of the proposed "block" tariff would also operate inequitably. With a multiplicity of rates and serious price anomalies such as have existed at Southend any rationalisation scheme will inevitably be detrimental to some consumers, but that does not mean it will be "unfair." An interesting point raised in the borough electrical engineer's report is that the new block-rate domestic tariff complies with the Electricity (Supply) Acts, whereas with the usual two-part tariff an alternative flat rate would have to be offered by the undertaking.

American Post-War Plans

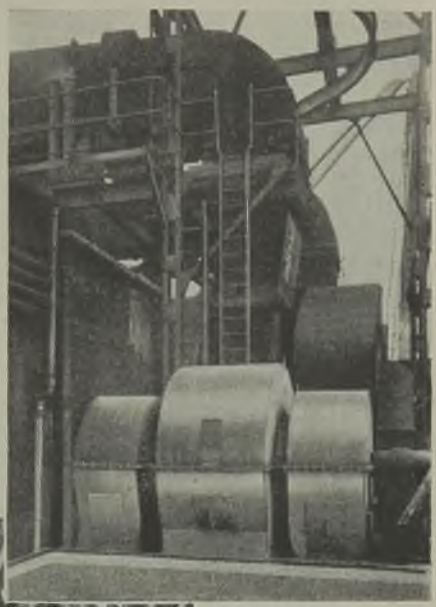
RECENT events in Western Europe have caused American manufacturers to adopt a more cautious attitude in the matter of reconversion. The American General Electric Co. had commenced a series of conferences upon post-war planning. It was considered by Army and Navy officials that these meetings might give the impression that the need for war-like products was declining and lead to a slackening of effort. So the company has postponed the remainder of its conferences until such time "as the Army and Navy appraisal of the nation's war situation will permit."

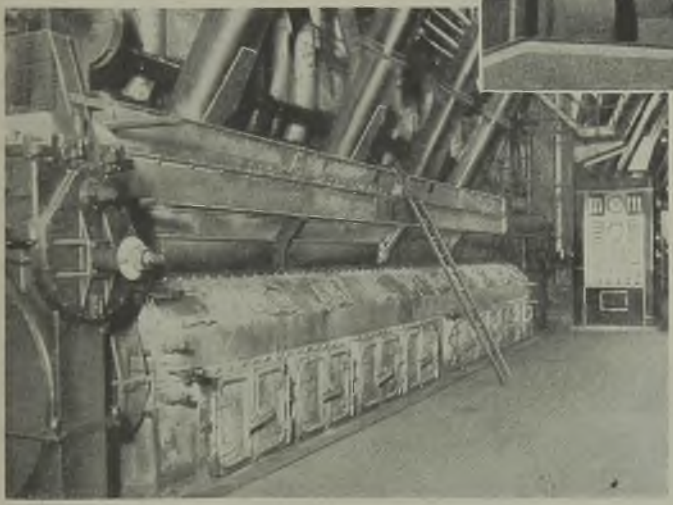
Liverpool Extensions

Firing Method and Steam Conditions Changed at Clarence Dock

THIS article relates to the wartime extensions of the Clarence Dock generating station of the Liverpool electricity undertaking. The extensions may be regarded as two interim stages in the development of an installation with a total ultimate generating capacity of a few hundred thousand kilowatts, the first stage, which has been completed for some time, having brought the station up to about half its ultimate capacity. This first stage consists, in the main, of a 51,500-kW turbo-alternator set and a 250,000-lb. per hour boiler, and is in line with an earlier extension which involved the raising of the steam conditions above those initially adopted for the station to 630 lb. per sq. in. and 825 deg. F., at the superheater stop-valve.

So far the station is completely stoker fired, the boilers all being equipped with chain-grate stokers, but for the second stage of the extensions, which will be the subject of a future article, pulverised fuel has been adopted in view of the varied qualities of coal which have to be dealt with nowadays. This second stage, which is in an early phase of erection, consists of two 350,000-lb. per hour pulverised-fuel-fired boilers with electrostatic grit precipitation plant, one turbine-driven feed-water pump, works switchgear and the necessary civil and building works.





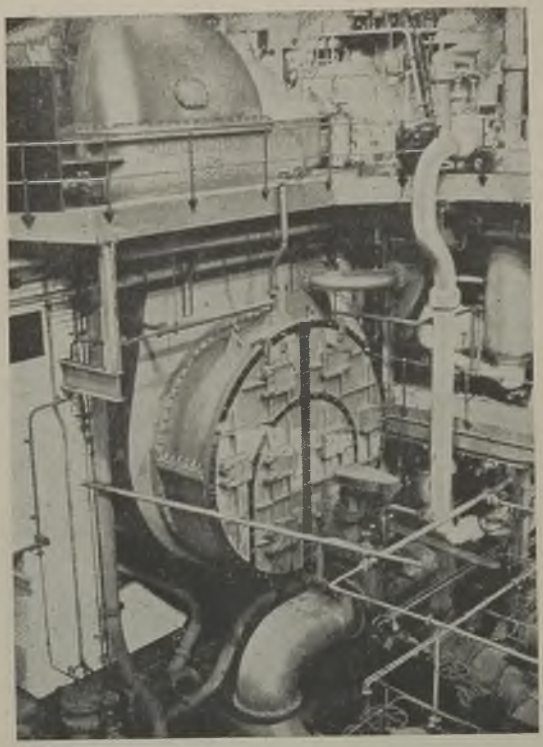
Above : The speed of the induced-draught fans on the boiler-house roof is regulated by hydraulic couplings

Left : The 250,000-lb. per hour boiler has individual supervisory remote control ; control cubicle at end

The boiler plant of the completed extension is a Babcock & Wilcox high-head unit, stoker fired, with an integral superheater and economiser. This unit has a maximum continuous rating of 250,000 lb. per hour, with an efficiency of 80 per cent., whilst the economic rating of the boiler is 220,000 lb. per hour with an efficiency of 81 per cent., based on the I.C.E. code.

Coal from the bunkers is passed through two Avery weighers, the inside of the weighers and delivery pipes to the boiler hoppers being rubber lined. The boiler has one twin chain-grate stoker, 24 ft. long and 30 ft. wide, which is served by two constant-speed driving motors, but there is mechanical provision for eight grate speeds from 0·224 to 1·131 ft. per minute. After combustion the ashes are discharged from the grates into the pans of the

paddle ash system in which they are quenched by water and then fed by a rotary arm on to belt conveyors which take the ashes to a ferro-concrete tank whence they are grabbed by an overhead crane and delivered to an elevated bunker which serves road or rail vehicles.



The condenser is of the central-flow tubular design and has a cooling surface of 39,000 sq. ft.

An interesting feature is a horizontal cross-flow tubular air heater in which the air passes through the tubes and the gases are on the outside. The tubes of this heater are arranged in four horizontal banks and soot-blowers are provided between each bank of tubes. Combustion air is fed to the stoker at 280 deg. F., by two Davidson forced-draught fans, each of which can deal with a net volume of 49,500 cu. ft. of free air per minute at a temperature of 100 deg. F., at the fan inlet. These fans are designed for a total pressure of 10·25 in. w.g. under maximum rating conditions. Each fan is driven by a 129-HP, 980-RPM motor, the fan speed being regulated through hydraulic couplings.

The air and flue gases open out into a combustion chamber with a volume of 9,532 cu. ft., which represents 13·2 cu. ft. per sq. ft. of grate area. The combustion chamber has Bailey water-cooled walls with a total effective area of 1,312 sq. ft. The rear wall and the rear water-cooled arch have an effective area of 687 sq. ft. The actual boiler heating surface served by the combustion air and gases is 11,682 sq. ft. The net volume of flue gases passed on by each induced-draught fan to the chimneys is 63,000 cu. ft. per minute at a temperature of 312 deg. F. at the maximum continuous rating of the boiler. Each of the induced-draught fans is, however, designed for a maximum capacity of 85,000 cu. ft. of gas per minute at a temperature of 340 deg. F. and a suction pressure of 8·4 in. w.g. The speed of the fans is regulated by hydraulic couplings in the transmission systems.

The designed water volume of the boiler, including the water walls and water-cooled arch, but excluding the economiser, is 10,900 gallons. The steam space in the boiler drum is 400 cu. ft., and in the boiler drum and superheater 925 cu. ft. The superheater is of the continuous multi-loop type with a heating surface of 13,620 sq. ft.

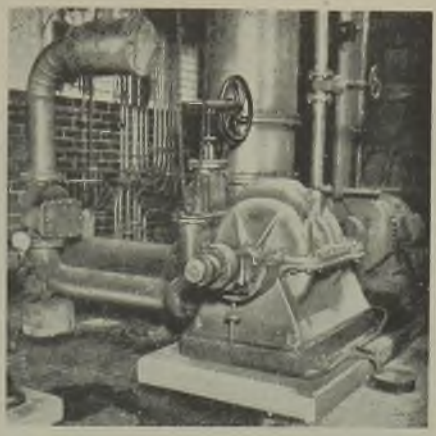
In common with the other boilers in the station, individual central supervisory control is provided by an Electroflo floor-mounted desk-and-panel type control cubicle situated

The 50,000-kW set has h.p. and l.p. cylinders and main and auxiliary alternators in tandem

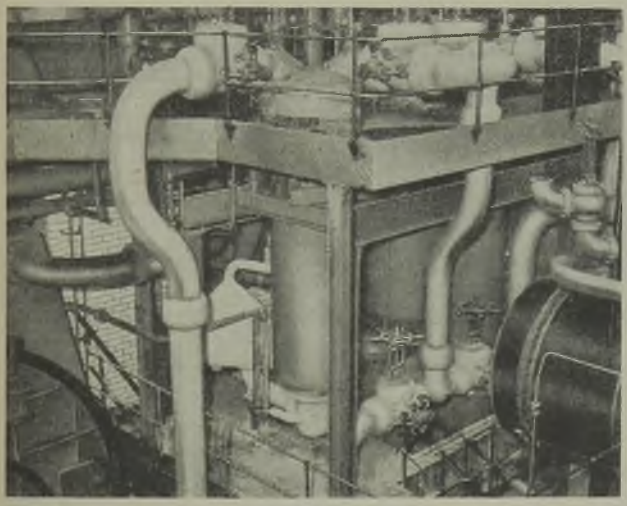
at the front of the boiler on the firing floor. From this the fan motors for speed control are remotely operated. The panel also carries all the boiler pressure, temperature, draught, etc., instruments, so that the operating conditions can be quickly observed and adjusted to maintain the maximum possible efficiency at any load. Soot-blowers, which are also controlled from a central panel situated adjacent to the boiler at the firing floor level, are hydraulically operated by means of Lockheed equipment.

The Metropolitan-Vickers 1,500-RPM turbo-alternator set has a two-cylinder condensing turbine, a 50,000-kW main supply alternator and a 1,500-kW house alternator for supply to the turbo-alternator and boiler auxiliaries. The turbine is an impulse-type equipment with 28 stages in the high-pressure cylinder and 18 stages in the low-pressure cylinder. The blading down to 500 deg. F. at the m.c.r. is of "Hecla" steel and the remainder is of stainless steel. The stop-valve conditions are 600 lb. per sq. in. and 800 deg. F. The governor setting can be adjusted by hand at the turbine as well as by a squirrel-cage motor which is remotely operated from the control room.

The condenser is of the central-flow tubular design and has a cooling surface of 39,000 sq. ft. It is served by river water at from 50 to 65 deg. F., and with normal steam conditions full output is obtained with the circulating water at 38 deg. F., when 15 per cent. of the tubes are blanked off. About two million gallons of circulating water is taken per hour from the near-by river through two large concrete ducts and is discharged through two similar ducts at a point higher up the river. The duplicate circulating-water pumps are in the turbine-house basement near the condenser, and each is capable of dealing with well over a million gallons of water per hour, so as to provide 50 per cent. of the cooling water required by the condenser, air coolers, turbine air coolers, and flushing the circulating-water strainer. Each of the pumps is driven by a 226-HP 485-RPM directly coupled slip-ring motor. The water strainers are of the Bailey & Jackson rotary-screen type, the straining medium being lignum vitæ.



Each rotary extraction pump can deal with the whole of the condensate

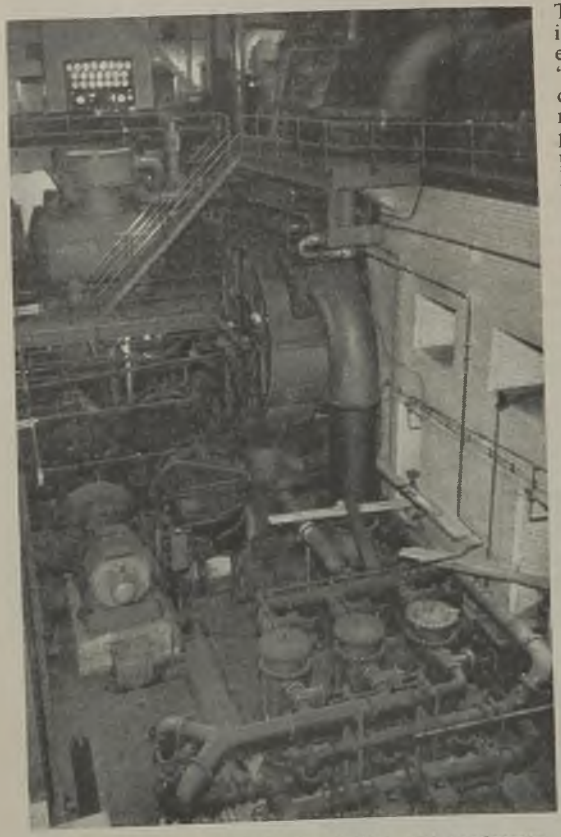


Three high-pressure feed-water heaters are arranged on the discharge side of the boiler-feed pumps

For maintaining the designed vacuum in the condensate chamber there are three sets of steam-operated air ejectors, any two of which are capable of handling all the air which may enter the condensate system. They are of the three stage type, and include surface coolers, so that the heat contained in the steam employed in each stage of the ejector may be utilised for the purpose of raising the temperature of the condensate. The quantity of steam required by each set of air ejectors is 1,000 lb. per hour. The ejectors are located below the turbine-floor level, but all the instruments and regulating valves can be operated from the turbine-floor level.

The condensate is handled by two Mather

& Platt rotary extraction pumps, each of which can deal with the whole of the condensate under any conditions of steam pressure and temperature and condenser vacuum. Each has a capacity of 43,500 gallons per minute and is directly driven by a 80-HP 965-RPM motor. The extraction pumps are situated on the condenser basement floor and the condensate is delivered through the lower-stage feed heaters to the boiler feed pump, which is situated in the pump room near the boiler house firing floor. A low pressure evaporator for dealing with the condensate make-up draws steam from the low pressure end of the turbine and returns it to the system. This evaporator is capable of supplying a maximum make-up quantity of 5 per cent. of the normal full-load consumption of the turbine.



A low-pressure evaporator for dealing with condensate make-up draws steam from the l.p. end of the turbine and returns it to the system

The plant operates on a heat regenerative cycle, the feed water being heated at m.c.r. to 358 deg. F. by means of multi-stage bled-steam feed-water heaters. These feed heaters are of the vertical hair-pin type, the three high-pressure heaters being designed for a normal pressure of 800 lb. per sq. in. on the water side. They are arranged on the discharge side of the boiler feed pumps, and by this arrangement the pumps are only called upon to operate with feed water at a temperature of about 205 deg. F. Two new feed pumps have been installed in conjunction with this extension. They are Mather & Platt "Plurovane" sets each capable of delivering 918 gallons of water per minute at 225 deg. F., against a total pressure of 800 lb. per sq. in. Each pump is driven directly at 1,480 RPM by a 780-HP motor. The pumps deliver directly through the feed heaters to the economiser which has a water capacity of 2,660 gallons.

The 50,000-kW main alternator generates at 33,000 V and can be connected to the main or auxiliary busbars through one of two 1,600-A 1,500-MVA oil circuit-breakers and isolating switches. Its windings are protected by Merz-Price balanced-current equipment. The neutral point is permanently earthed through a 400-ohm liquid drain resistor and may also be earthed, if desired, through the station main earth resistor. In order to limit the prospective third-harmonic current circulating through the system and alternator neutral when the machine neutral is earthed through the station resistor, a reactor is connected in the neutral circuit. This is designed to offer a low impedence to normal earth-fault currents and yet to reduce the third-harmonic circulating current to a negligible value.

The machine has closed-circuit ventilation, the alternator air cooler water being passed through auxiliary water coolers mounted outside the alternator block. The latter are connected to the sea-water circulating system. The air circulation through the alternator is provided by fans mounted on the rotor shaft which can be supplemented by a separate external fan. Coupled to the main alternator shaft is a 1,500-kW, 3-phase, 3,300-V auxiliary alternator for works supplies, together with main and auxiliary exciters. The main exciter consists of two machines mounted in a single frame. One machine excites the main alternator and the other the auxiliary alternator. All the main alternator auxiliaries are supplied at 3,300-V from either the auxiliary alternator or from the works substation which is fed from the station busbars. The smaller auxiliaries are supplied at 400 V.

Views on the News

Reflections on Current Topics

SO excellent are the E.D.A. model post-war kitchens and their equipment (see last week's *Electrical Review*) and so far ahead of pre-war designs that I can find little to criticise. A visit to the Building Centre did, however, make me ponder over a few things, particularly with regard to the cooker. The inclusion of a horizontal type in all four models seems to indicate that it will be widely adopted in the more commodious kitchens of the future. Too long did designers follow gas models: now it is more likely that the gas people will do the copying.

* * *

It has been said that the new buffet cooker does away with stooping. It would be more correct to say "so much stooping," for though the oven is much higher than in the vertical type it is still not so high as some people would like it, namely with its base at hob level. The objection against the latter arrangement is that it breaks up the desirable continuous working level.

The omission of drop-down oven doors in the new cookers does not, I gather, necessarily indicate preference on the part of the designers for side opening, but the considerably extra cost of the former is not considered justifiable in a mass-produced line such as this. I should have thought that the elimination of the necessity for constructing both left and right handed doors would have gone a long way to counterbalancing this cost. In any case we may expect to see drop-down doors on the de luxe models.

* * *

From my own unhappy experiences with boiled-over milk, etc., I was glad to see that the hingeing of the flap of the grill compartment eliminates the usual cavity which just cannot be properly cleaned without unscrewing the flap. Though all the four cookers are similar in general design they are not all made by the same manufacturer and they have slight individual characteristics. They are, of course, all "prototypes" but it seems that a long exposed hinge extending the whole 42 in. width of one unit is just asking for trouble. As thermostatic control is provided the addition of a thermometer in another model seems an unnecessary expense.

* * *

Following the more or less general agreement that thermostatic control of ovens will become standard in post-war electric cookers, the next logical step would seem to be to apply it to hot-plates. Many consider this further development unnecessary, an added expense and "something else to go wrong." There is, of course, something to be said for this attitude in the early stages but as hob unit control is the sole surviving advantage of the gas cooker, the electrical industry must not neglect it.

Investigations into the problem before the war resulted in the production of the Sunvic "Simmerstat" device embodying a bi-metallic strip. With its war-time experience in the industrial field which has resulted in the development of control units accurate to within $\frac{1}{100}$ deg. F., the company has now developed a new hot-plate control unit only $2\frac{5}{8}$ in. deep excluding the knob (as compared with $3\frac{5}{8}$ in. in the old model) and $2\frac{1}{4}$ in. square. Having a standard bush mounting and terminal arrangements it can be fitted to any cooker in replacement of the ordinary three-heat switch and takes only about a quarter of an hour to fix. Its non-linear scale gives the most accurate control in the lower heating zone where it is most desirable. The cost of the unit is not expected to be much more than that of a three-heat switch.

* * *

Electrical contractors are frequently reminded of the value of combining the retailing of appliances with their installation work and I have often wondered what proportion of them run dual businesses. It appears from inquiries made among its members by the Electrical Contractors' Association that about 56 per cent. of them are in the selling business. From a recent report of the E.C.A. Council's proceedings it seems as though doubt has been expressed regarding the practicability of retailing electrical goods only. They are certainly retailed as a side line by numbers of odd people, which makes the contractor-retailer's position difficult.

* * *

Tendering for a large contract always involves the tenderer in expense—sometimes pretty heavy expense. But what about a case reported by the Liverpool branch of the E.C.A.? In this instance six electrical contracting firms were asked to produce a specification and lay-out for a large contract. This having been done, it was proposed to select one of the six schedules and issue it to each of the six firms as a basis for quotation. It was rightly considered by the branch that "this was unfair and involved a tremendous amount of unnecessary expense and work." Of course it would save the inquirers the expense of employing a consultant.—**REFLECTOR.**

Manufacturers' Activities

Special Features of Last Year's Production

Ferguson, Pailin, Ltd.

DURING the past year the export market has absorbed a considerable part of a heavy output of small substation switchgear from the Ferguson Pailin factory. Overseas contracts also include 4,000-A, 10-kV, 1,000-MVA cellular-type circuit-breakers and a considerable number of high-breaking-capacity 33-kV outdoor units for Australia. A notable development has been the completion of a design of outdoor " Duo-Blast " 66-kV circuit-breaker (which in the extension of the principle to 132-kV operation was described in the *Electrical Review* of September 15th). Tests are in hand to increase the range to 220 kV. Another new feature is a 132-kV outdoor wound-primary current transformer. Orders for low-oil-content metal-clad switch units rated at 1,000 and 1,500 MVA at 33 kV and for additional 132-kV C.E.B. switching stations are being executed.

Designs of the " RS " rotary change-over switch are now available for carrying up to 60 A, AC. A similar design of quick-make-and-break switch to carry 10 to 25 A has been developed for use on DC systems up to 600 V.

Control boards are arranged with flush-mounted instruments and with the mimic diagram at eye level. The red and green indicating lamps are incorporated in the control switch which is in line with the mimic diagram; they flicker while the control switch is being turned, remaining steady after the switch has been pressed and turned farther through 45 deg. to complete the control operation.

Bruce Peebles & Co., Ltd.

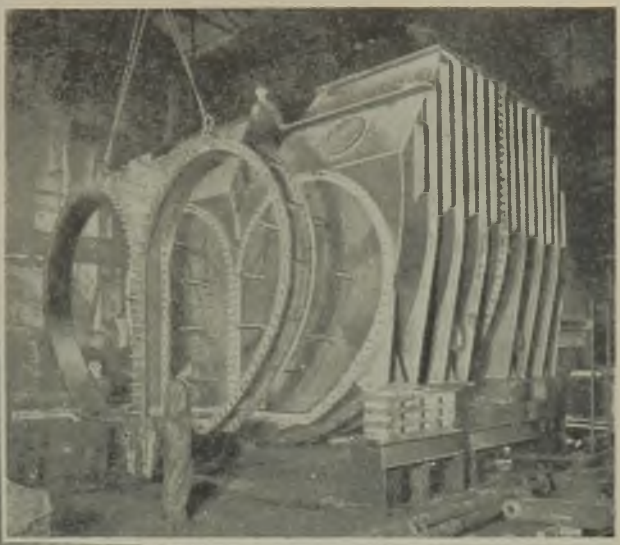
Considerable growth in demand for geared steam turbines, oil-engine driven alternators and marine-type motors and generators for ship propulsion and auxiliaries is reported by Bruce Peebles & Co., Ltd. An example of the tendency towards direct-on-line starting of large squirrel-cage motors is provided by an order completed for a 650-HP machine developing 70 per cent. of full load torque to start with 350 per cent. of full-load current. Progressive mechanisation in the coalfields led to manufacturing activity in mining type motors and control gear, many of flameproof construction, including a number for Russia and New Zealand. A new development is a mercury-break switch unit for starting motors in conditions covered by Groups 1 & 2 of gases and vapours.

Orders received for transformers covered a range which extends from several thousands of small units for mobile wireless transmitters up to large power units for 132 kV for both home and abroad. Within this range have come large numbers of pole-mounted distribution transformers, mobile colliery substations of 15-kV/440-V units for war-devastated areas, including Russia, and a high-voltage transformer for use with a 15-kV mercury-arc rectifier for wireless transmission. Orders for mercury-arc rectifiers included one for eight 250-kW equipments for an English supply undertaking. In order to meet an increasing demand for battery-operated cars in coal mines, a mobile oil-immersed rectifier equipment has been introduced. Like other electrical manufacturers, Bruce Peebles have been closely concerned with special war work, their contribution including components of the " Mulberry harbour," A.A. rocket guns and anti-tank mortars.

C. A. Parsons & Co., Ltd.

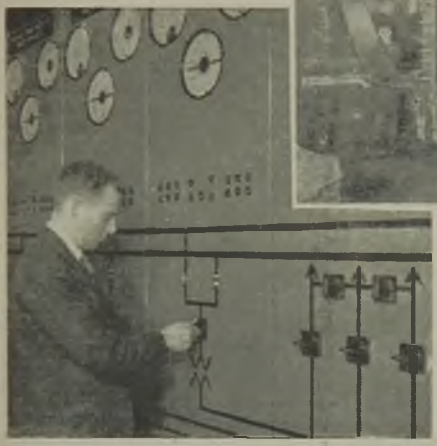
A good proportion of the larger turbo-alternators on order from or completed during the past year by C. A. Parsons & Co., Ltd., is destined for Australia. Among these are two 30,000-kW sets and a 50,000-kW set, all for 3,000 RPM. The latter is similar to the two machines installed in the same power station in 1940, having three cylinders with a double-ended l.p.unit; in both cases the condensing plant is being made in Australia to Parsons' designs. A 25,000-kW, 3,000-RPM tandem turbo-alternator with a single-ended l.p. cylinder was put into commission in another Australian station to operate at steam conditions of 600 lb. per sq. in. and 825 deg. F. The alternator is designed for generation at 34 kV. A duplicate machine is on order. A further set put in hand was for 30,000-kW at 1,500 RPM (*i.e.* for 25 cycles); the turbine consists of a single cylinder, while the alternator stator is wound with twin-core concentric conductors for 20 kV. The turbine of a 15,000-kW, 3,600-RPM set started up in Canada is a single-cylinder unit with two sets of exhaust blading in parallel. Of a number of 2,500-kW sets, five for the U.S.S.R. incorporate pass-out turbines for delivering process steam.

Turbo-alternators being built for home power stations include one each of 40,000- and 53,600-kW capacity with condensing plant and 33-kV alternators. Those lately put into commission here include two of 15,000-kW (single-cylinder type) for steam conditions of 400 lb. per sq. in. and 800 deg. F. A turbo-blower to deliver 30,000 cu. ft. of free air per minute at 35 lb. per sq. in. (gauge) is under construction. Another



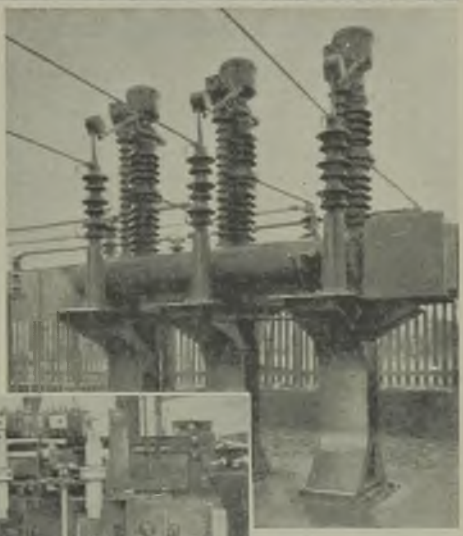
Steam condenser with cooling surface of 30,000 sq. ft. for 40,000-kW turbo-alternator

(C. A. Parsons & Co. Ltd.)



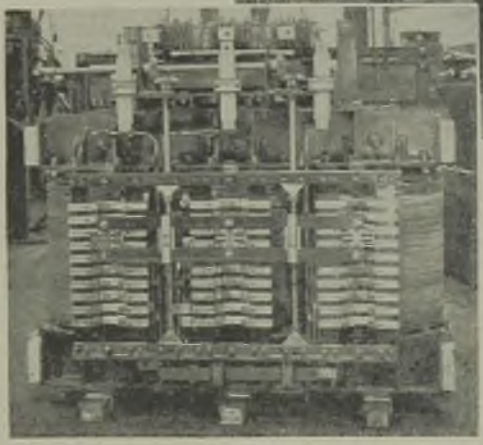
Portion of mimic diagram on control board incorporating "FLC" control switch

(Ferguson, Pailin, Ltd.)



Air-blast 66-kV switchgear in out-door sub-station

(A. Reyrolle & Co. Ltd.)



Tapping switch side of high-voltage transformer associated with 15-kV mercury-arc rectifier for radio transmission

(Bruce Peebles & Co., Ltd.)

important contract is for the propulsion machinery for three turbo-electric ships; the stator bore of each driving motor is 12 ft. 4 in. in diameter and the casing weighs about 15 tons.

Of the many orders for transformers now being executed, the most notable comprises four 10,500-kVA single-phase units, which will form a three-phase 31,500-kVA, 115/10·5-kV bank with one spare unit. They are of the divided-core oil-immersed type with O.N. cooling and each has a separate tapping winding over the high-voltage winding for a large range of off-load tap changing. Other large transformers nearing completion include three-phase units of up to 15,000 kVA at 121 kV for export and up to 20,000 kVA for use in this country. Distribution transformers in considerable numbers, arc-welding transformers, static balancers, neutral-point compensators, magnetically shielded reactors up to 33 kV and arc-suppression coils for use on 121- and 38·5-kV systems are also going through the shops at the present time.

A. Reyrolle & Co., Ltd.

Apart from improvement of design details and standardisation of components that have secured economies in materials and labour, the outstanding event of 1944 in their works is regarded by Reyrolle's as the commissioning of 66-kV air-blast switchgear. Other orders in hand for this type of circuit-breaker include some for 110 and 132 kV; single turbulators are employed with gear for normal breaking capacities and double turbulators for the higher ranges.

Orders for power-station switchgear up to 33 kV and 1,500 kVA have been executed, while the demand for the metal-clad type with horizontal draw-out circuit-breakers for 3·3 to 33 kV and 75 to 1,000 MVA continues. A 75-A contactor for motor starting has been added to the range of switch-and-fuse distribution gear, substantial quantities of which have been supplied for AC welding in shipyards, among other purposes. Marine work in progress includes control gear and motor-boosters for a number of electrically propelled 10,000-ton single-screw vessels.

A growing volume of orders from overseas is reported. One example is provided by twenty-seven 750-MVA metal-clad units of the horizontal-draw-out compound-filled type for indoor use at a 22-kV terminal switching station in Victoria, Australia; the arrangement calls for five-fold physical and electrical separation. A second is a contract for all the switchgear required for a new power station in Southern Rhodesia by the Electricity Supply Commission.

A considerable amount of 66-kV, 1,000-MVA and 132-kV, 1,500-MVA pneumatically operated small-oil-volume switchgear has been sent to Australia. Among the equipment supplied to the U.S.S.R. are 400 6·6-kV flameproof mining-type units rated at 30 and 50 MVA as well as 100 6-kV, 250-MVA, horizontal metal-clad distribution units, for which existing relay design and circuit arrangements have been adapted to meet local conditions. Power station switchgear for plants up to 25,000-kW capacity at voltages from 115 kV down to 400 V, together with control boards and complete automatic protection form another feature of current activities. In addition large shipments of distribution gear have been made to India and New Zealand.

A compact flameproof starter panel has been made available for local or remote control of mining machines. The range of the company's flit-plugs has been extended by a 60-A standard. The demand for AC variable-speed commutator motors has been substantially greater during the past year. AC arc-welding orders have been mostly for six- and twelve-operator sets and the variable-reluctance regulator has been well received. For DC welding, the output of engine-driven single- and twin-generator sets has been well maintained.

Economic Heating

Thermal Insulation of Buildings

THE thermal insulation of buildings is dealt with in a paper prepared by MR. N. S. BILLINGTON for the Institute of Fuel. The calculation of the thermal " transmittance " of a structure is discussed, the author's formulae indicating that resistance to loss may be improved by the employment of materials of low conductivity; a valuable degree of insulation results from the provision of closed air spaces, irrespective of the materials used to form them. Some of the properties of different kinds of insulating substances are briefly reviewed.

Proper insulation can lead to economies in the size of heating plant needed as well in the amount of fuel consumed and, in some cases, may even reduce the total capital cost of a new building. There is, however, a limiting thickness of insulation beyond which the increased cost will exceed the estimated saving and the economic thickness needs to be evaluated for each building according to individual circumstances.

Insulation of the walls and roof of a building has a material influence on the temperature of the surfaces of the building; hence it affects the feeling of warmth and sense of comfort of its occupants, while the exclusion of solar heat is an important aspect of the subject. In cases of intermittent heating the inner surfaces of the building should preferably be lined with materials of low thermal capacity, which will also tend to reduce the nuisance of temporary condensation of moisture on interior surfaces.

The increasing employment of insulation will call for modifications in the design of heating appliances to enable low outputs to be attained with good efficiency as well as to allow close control of the actual output.

The paper ends with a bibliography of 35 references to the literature of the subject.

CORRESPONDENCE

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

Educational Opportunities

IT seems appropriate that the letter from Mr. W. C. S. Phillips in your issue of December 29th should be followed by the one from "Graduate I.E.E." The former indicates that it is no mean performance for a part-time student to obtain the Higher National Certificate, whilst the latter indicates how much value the employer attaches to it.

The case of "Graduate I.E.E." is not an isolated one. I, for instance, find myself with a Higher National Certificate in one hand and a bag of tools in the other. The chance of promotion to a technical post or even to foreman is remote, although some of the technical assistants employed by my firm are without technical qualifications. During this war I have been offered two technical posts of some importance elsewhere, but my employers with the aid of the Essential Work Order have refused to release me.

I should be glad to know the views of the profession regarding the Higher National Certificate. In my opinion, obtaining it is just an interesting hobby, and future candidates should be advised of this before they embark upon their five years' course.

ANOTHER GRADUATE.

I.E.E. Examinations

IN view of the recent correspondence on the new regulations for the associate membership examination, it seems advisable to explain that it was realised that the raising of the educational requirements for graduates of the Institution might not universally be regarded as the most appropriate first step in bringing about the desired improvement in the education of professional electrical engineers, but there were strong reasons for first defining the necessary qualifications for graduate and corporate membership.

The difficulties in meeting these requirements by the existing system of part-time technical education were, however, fully appreciated, but it was also clear that they could, and ought, to be surmounted if the future of British engineering was to be assured. This subject had already been discussed in the first Report on Education and Training for Electrical Engineers which was issued in 1943, and a second Report has just been published which deals in more detail with the problems of part-time further education at technical colleges. The high regard in which technical college work is held and the importance attaching to it are, it is hoped, fully apparent in that Report.

I would suggest that those who are considering the revised examination regulations should also study the first and second Reports and the model papers for Joint Section "A," particularly the revised papers in "Applied Heat (with Light and Sound)" which were issued shortly after the publication of the original model papers. The revised model papers may be obtained free of charge by those who have already purchased copies of the original papers.

Those concerned in these problems may be assured of ready sympathy in the appropriate committees of the Council, by whom written communications on specific points are always welcomed and given the fullest consideration.

*London, W.C.*2. W. K. BRASHER,
Secretary,
Institution of Electrical Engineers.

[A review of the second Report mentioned by Mr. Brasher appears in this issue.—Editors, *Electrical Review*.]

Compulsory Registration

REFERRING to Mr. Cureton's letter on this subject in your issue of December 29th, I think it is as well to remember that the maintenance engineer in most factories and works is responsible for a number of services, as well as plant, and therefore has to have some knowledge of all of them and cannot specialise easily in any one. It is only in larger and less numerous establishments that the electrician can stick to his trade and does not have to attend to other emergencies which arise.

The proposed scheme for compulsory registration of contractors and operatives applies also to "others engaged in or upon electrical installation work." It also provides for a Licence "F" to apply to "any person employed at any works or other places and engaged upon maintenance or other similar work," so that it will be seen that the maintenance engineer is provided for, as in fact are all others in the contracting industry under Licences "A" to "F."

To overcome the difficulties of installation work in factories or works being carried out by other than specialists, managements might be well advised to call in a contractor who specialises in additions and repairs to factory installations. Many do already.

I cannot agree with the suggestion that compulsory registration might produce a shortage of contractors; the reverse is likely to be the case. The trouble at present is that a number of people undertaking wiring work are in no way entitled to be termed electrical contractors. The qualified contractor recognises certain advantages of

working under a consulting engineer but many shoddy bits of work arise from extensions to an otherwise good job which do not warrant the employment of a consultant. I would also remind your contributor that many contractors are members of the I.E.E. while many others are equally well qualified in other directions.

I think that there is no adaptation of the existing systems which will make unnecessary the operation eventually of some scheme of compulsory registration. Any consulting engineer would much prefer to work with a qualified contractor employing qualified operatives rather than battle through a job with a so-called contractor who cannot "make the grade" owing to inexperience, or who attempts to make a profit out of a cut price.

Hereford. J. P. INGLIS (E.C.A.)

Fuel and the Peak

AN authority on London's electricity states in the *Sunday Express* of January 7th that the crisis in electricity supply has been due to low-grade coal being foisted on the generating stations and, as a result, the capacity of the plant available has been reduced by one third and this applies to 95 per cent. of our generating stations.

The British Coal Utilisation Research Council in November, 1943, held a conference of the leading fuel engineers and users of fuel on the utilisation of small coals, and blending was stressed as being the most important factor in the utilisation of small coals. It was also stated at that time that large blending plants in London were not being used to their capacity. In December, 1943, a summary of the conference proceedings was published. Perhaps if a closer study had been made of this, and action taken prior to December, 1944, we should still have had the margin originally planned by the engineers who created the grid.

Worcester Park, Surrey. E. H. WHATTON, A.M.I.E.E., M.Inst.F.

Municipal Reports

Southend-on-Sea

HOW the undertaking's domestic electrification policy before the war has laid the foundations for future successful operation is shown in the 1943-44 report of Mr. A. C. Johnson, borough electrical engineer and manager at Southend-on-Sea.

A table shows how domestic apparatus and wiring purchased by the Corporation between 1934 and 1939 has been disposed of. Apparatus remaining in the possession of the Corporation is still in good condition and as it embodies the latest improvements, such as thermostatic control of cookers and high loading of water heaters, it is not likely to become out-of-date. By March next the original capital expenditure of £224,000 on apparatus and wiring will have been reduced to £30,000, while the estimated present-day value of the equipment still in the Corporation's possession, without taking purchase tax into consideration, is £232,800. Hire charges for 1945-46 are estimated at £27,000.

During the war a considerable number of domestic appliances have been removed from vacant premises for use elsewhere, but the wiring remains in these houses and represents a potential demand. Mr. Johnson estimates, for example, that 4,000 new water heaters will be needed in the early post-war period. He has been informed by the Board of Trade that licences have been issued for substantially increased supplies, and that before long it is anticipated that these will be adequate.

A change in the method of issuing accounts is proposed in consequence of the growing popularity of the all-electric house. Accounts are assuming large proportions, and it is suggested that they should be rendered monthly. This would avoid a large demand for expensive prepayment meters and offer definite advantages in the way of service and promotional activities.

Tabular information shows that 45,566,000 kWh was sold last year. This was an advance on the previous year (39,383,000 kWh) but still falls far short of the 1938-39 total of 70,652,000 kWh. Income from the sale of electricity amounted to £268,749 and total income to £301,186. There was a deficit of £28,418 on the year's working, making the aggregate amount charged to rates since the beginning of the war £99,874. A note on the undertaking's Diesel plant states that the cost of fuel has risen from £3 17s. 3d. to £9 5s. 8d. in ten years; the plant, however, is in good condition and the saving in bulk supply charges which fell to less than £5,000 in 1942 may well be increased again to over £12,000.

Erith

Pillar graphs are used to illustrate the principal trading statistics of the Erith undertaking (engineer, Mr. E. A. Logan). These show that total sales of energy have increased from 32,306,000 kWh in 1938-39 to 45,227,000 kWh last year. Although the annual value of domestic electrical appliances sold has been drastically reduced (from £12,560 to £2,112), domestic electricity consumption has continued its upward trend, advancing from 12,917,000 to 19,292,000 kWh. From only a hundred cookers connected in 1936 the number was increased by the undertaking's active development work to 4,616 in 1940, since when there has been little change, the present number being 4,655. Electric water heaters, of which there were sixty in 1936, numbered 1,900 at March 31st, 1939, and reached a "peak" of 3,396 in 1942, receding to 3,056 at the end of March last.

The undertaking's accounts show that from £109,377 in 1938-39 revenue from the sale of energy increased to £189,291 in the past year, while total income rose from £115,171 to £202,627 and expenditure from £91,295 to £146,257. In 1938-39 a contribution of £300 was made to the rates, although this meant carrying forward a debit balance of £562. In the following two years there was no rate aid, but contributions were resumed in 1941-42 and last year £4,142 was allocated, leaving a balance of £19,587 to be carried forward after transferring £1,037 to reserve.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE principal items of electrical interest in the New Year Honours List were given in our last issue. The second instalment contained the names of many men and women who had been awarded the O.B.E. Among them were **Mr. M. T. Greenwell,** assistant general secretary of the Electrical Trades Union; **Mr. B. Haviland,** works controller, S. Smith & Sons (England), Ltd.; **Mr. S. C. Laws,** principal of the Northampton Polytechnic; **Mr. F. Smith,** general manager, M.O. Valve Co., Ltd.; **Dr. F. C. Williams,** principal scientific officer, Telecommunications Research Establishment, Ministry of Aircraft Production; and **Mr. R. O. Herford,** managing director, Renold & Coventry Chain Co.

Messrs. S. C. Laws, F. Smith and M. T. Greenwell who receive the O.B.E.

Among those who are made members of the Order of the British Empire (M.B.E.) are the following:—Mr. H. R. Angell (Westinghouse Brake & Signal Co.); Mr. W. Bird, M.I.E.E. (chairman St. Albans District Committee, M.O.P. Eastern Regional Board); Mr. S. H. Brewell (A. H. Hunt, Ltd.); H. F. Buckmaster (McMichael Radio, Ltd.); Mr. J. Bunyan (Allen West & Co.); Mr. G. Casemore (lately telephone manager, Tunbridge Wells); Mr. F. Clark (British Oxygen Co.); Mr. W. F. J. Dowley (Enfield Rolling Mills (Aluminium), Ltd.); Mrs. E. L. J. Gambazzie (Telegraph Condenser Co.); Mr. F. O. Hickling (Ransome & Marles Bearing Co.); Mr. J. H. McFarland (Cammell Laird & Co.); Mr. A. G. Newman (Wireless Telegraph Section, G.P.O.); Mr. A. G. Pearce (G.E.C. Research Laboratories); Mr. H. C. Perry (Normand Electrical Co.); Mr. R. G. Powell (Decca Radio & Television, Ltd.); Mr. J. M. Sinclair (A.I. Electric Welding Machines, Ltd.); Mr. H. S. Walker (head of Valve Dept., B.B.C.); Mr. K. M. Whyte (General Electric Co., Ltd.); and Mr. J. Wooldridge (Johnson & Phillips, Ltd.).

The British Empire Medal (B.E.M.) has been awarded to the following:—Miss S. Alston (M.O. Valve Co.); Mr. A. Andermahr (A.C. Cossor, Ltd.); Mr. W. C. Brown (Hoffmann Manufacturing Co.); Mr. B. Chambers (E. N. Bray, Ltd.); Mrs. E. Chipps (Joseph Lucas, Ltd.); Miss C. M. Cooper (Rist's Wires & Cables, Ltd.); Mr. A. J. Coventry (S. Smith & Sons (M.A.), Ltd.); Mr. W. A. Dawson (Whiteley Electrical Radio Co.); Miss A. S. Forster (Standard Telephones & Cables, Ltd.); Mr. R. C. Hill (Metropolitan-Vickers); Mr. D. Hodgson (Cammell Laird & Co.); Miss F. B. Kiff (Osram Lamp Works, Ltd.); Mr. J. F. King (London Electric Firm); Miss M. King (Telegraph Condenser Co.); Mr. E. Manns (North-Eastern E.S. Co.); Mr. W. Morrison (A. & R. Brown, Ltd.); Mr. H. Neal (E.M.I. Research Laboratories); Mr. F. B. Nightingale (De La Rue Plastics, Ltd.); Mr. J. H. Nixon (Robson & Coleman); Mr. H. Poulton (Marconi's Wireless Telegraph Co.); Mr. C. Price (Brush Electrical Engineering Co.); Mrs. D. E. Simcock (Marconi's Wireless Telegraph Co.); Mr. H. E. Smith (Bush Radio Ltd.); Mr. H. Tennant (Dover Electricity Dept.); Mr. K. Warwick (Philco Radio & Television Corporation); and Mr. A. S. Wilson (Rosyth Dockyard).

Alderman W. Walker, who as announced last week receives a knighthood, asks us to thank all the members of the electricity supply industry and others for their congratulations, as they are so numerous that it is not possible for him to deal with them individually.

Mr. L. A. Catlin has retired from the position of general manager of the E.M.B. Co., Ltd., and has resigned his seat on the board.

Mr. A. E. Marchant, M.Sc. Tech., who in 1940 was appointed deputy borough electrical engineer and manager at Barking, is to succeed Mr. A. B. Catling as "chief" on his departure to take up a similar post at Willesden. Mr. Marchant, who was born in neighbouring West Ham, is only thirty-eight. He was educated at Stretford Grammar School and afterwards served a three years' apprenticeship in the workshops and drawing office of the Lancashire Dynamo & Motor Co., Ltd. Trafford Park, and later with Manchester Corporation Electricity Department. He then took a three years' course at Manchester University, followed by a year's research work on high-voltage transmission problems. He subsequently joined the Mid-Cheshire Electricity Supply Co., Ltd., as assistant mains engineer and in 1932 went to Warrington as technical assistant to the borough electrical engineer, taking over the consumers' side of the undertaking in 1938. He is an associate member of the Institutions of Electrical and Mechanical Engineers.

Mr. A. E. Marchant

The Midland Electric Manufacturing Co.'s Social and Athletic Club held its annual Christmas dinner and concert on December 20th. **Mr. T. Birkett,** director and former general manager, presided and made awards by the company for long service. This year twenty-two members were admitted to the M.E.M. " gold watch brigade " on completing ten years' service with the company, including Mr. G. Smith, an employee in the foundry recently repatriated from a prisoner of war camp in Germany. Seven employees were also presented with illuminated addresses to mark the completion of twenty-one years' service.

Mr. R. Ll. Rees has been appointed chief chemist to the London Power Co. in succession to **Mr. G. W. Hewson,** who has retired.

A comprehensive apprenticeship scheme has been prepared by Lancashire Dynamo & Crypto, Ltd., and will be put into operation immediately after the war. Meanwhile, the various enterprises comprising the group are showing keen interest in their apprentices. At the Willesden works a successful experiment was tried some time ago whereby a sponsor was appointed for every apprentice to act as " works father " to his charge throughout the indenture period.

At the Gayton Rooms, Harrow, on December 29th apprentices, sponsors and other senior executives met together for their second annual dinner under the chairmanship of **Mr. W. G. Swain,** one of the company's directors. The guests included Mr. S. C. Laws, M.A., M.Sc., principal of the Northampton Polytechnic, and Mr. J. G. Shaw, vice-chairman of the company. Mr. H. W. Bosworth, managing director, sent a message regretting his inability to be present and expressing his enthusiasm for all that could be done to further the interests of the apprentices.

Mr. D. C. Lorkin, joint general manager of the Willesden organisation, in proposing a toast to " The Guests," welcomed Mr. Laws, who for forty years had played an important part in the education of the potential practising engineer, and Mr. Shaw, their former chief. Replying, Mr. Laws appealed to the apprentices to cultivate as many interests as they could—literature, politics and the arts, saying that a single-track mind would not get them very far. He contended that it was impossible for apprentices to acquire the appropriate technical knowledge to equip themselves for their work by evening study alone; they should be released from the factory at least one day a week to supplement their evening studies. Mr. Shaw, who also responded to the toast, briefly reviewed the history of the old Crypto Company, founded in 1888.

In proposing a toast to the apprentices, one of the sponsors, Mr. L. E. Saker, said there was great scope in industry for them, largely due to the development of electricity for heat, light and power. The senior apprentice, Mr. H. J. Uphill, in reply, expressed his appreciation of the guidance given by the sponsors and thanked the technical institutes through Mr. Laws for their study facilities.

The final toast, " The Works Executives," was proposed by another apprentice, Mr. J. B. Groocock. Mr. J. A. Brown, the production manager, and Mr. F. Paradine, one of the foremen, responded.

Mr. F. C. Fuke, A.M.I.E.E., has been elected to the board of the General Accessories Co., Ltd., Bristol. In consequence he is relinquishing the position of general manager of British Mechanical Productions, Ltd., but will continue as the company's chief electrical engineer. Mr. Fuke's headquarters remain at 1, Church Road, Leatherhead, Surrey, the registered office of both companies. Both British Mechanical Productions, Ltd., and the General Accessories Co., Ltd., are members of the Philco group.

At the sixth annual general meeting of the Coventry Electric Club on January 2nd at the Electricity Showrooms, **Mr. F. W. Godden,** chief electrical engineer and manager, was returned unopposed as president for the coming season. The Club membership now numbers 125. As an indication of interest in the Club's lectures, it was mentioned that a letter had been received from South Africa asking for further details of one given on " Earthing,"

Lancashire Dynamo & Crypto apprentices and sponsors at their second annual dinner

as the peculiar circumstances prevailing in that country caused the electrical undertakings some considerable trouble.

Long-service certificates were recently presented to thirty-two employees of the Brush Electrical Engineering Co., Ltd., who have left the company's service during the past two years. One of them, Mr. J. E. Grey, had fifty-four years' service. The presentation of the certi-

ficates was made by **Mr. Alan P. Good**, managing director, and the recipients were entertained to luncheon, during which a concert was given by the works choir, the Brush Military Band and vocalists. Seventeen long-service certificates are also being presented to the next-of-kin of employees who have died.

The Erith Electricity Players (mainly past and present members of the staff of the Corporation Electricity Department) won further laurels by their presentation of the satirical comedy "The Torch Bearers" on December 28th and 30th. The play was produced by Mr. H. A. Stephens.

Mr. L. Drucquer

As reported in our last issue, **Mr. L. Drucquer,** M.I.E.E., has been appointed manager of the switchgear department of the British Thomson-Houston Co., Ltd., in succession to Mr. C. B. Kingsford, who has retired. We now reproduce a portrait of Mr. Drucquer, who has been with the company since 1920 and was responsible for the erection of the first rotary substation on the London Underground Railway.

Capt. (temporary **Major**) **G. J. S. Drury,** R.E. has been awarded the M.B.E. for gallantry and distinguished service in Italy. Major Drury has been a member of the Newcastle office staff of the B.T.H. Company since 1930, and is well known on the N.E. coast, especially in connection with colliery electrification. He joined the T.A. 50th Division in 1931.

Miss Caroline Haslett, director of the Electrical Association for Women is visiting Sweden to lecture for the British Council.

Mr. F. H. Brandreth has retired after thirty-six years' service with Edmundsons Electricity Corporation. He is to be succeeded as manager of the Urban Electric Supply Co. at Grantham by **Mr. R. H. M. Barkham,** B.Sc., A.M.I.E.E., who has been in Grantham for eighteen months looking after the interests of the Edmundson Corporation in this area. Mr. Barkham joined the organisation as a technical assistant at Stowmarket about fourteen years ago. He later became personal assistant to the managing director of the Corporation, Mr. A. Anderson.

Mr. R. J. Spicer has retired from the position of general manager of the switch works of Laurence, Scott & Electromotors, Ltd., after forty-six years' service with the company. **Mr. H. Worship,** formerly manager of the instrument department, will take over the management of the whole Thorpe Road branch works. Mr. Spicer joined Laurence, Scott & Co., Ltd., as it was then, in 1898, and has been associated with much development work, particularly in connection with variable-speed DC equipments and in marine motor control gear of various kinds. When the switch works was built about twenty years ago to handle the growing control gear business, he was largely responsible for the works layout. He was appointed works manager in 1929 and general manager in 1939, and will continue to assist the firm in a consultative capacity.

Obituary

Mr. H. G. Hughes.—We regret to record the death in his sixty-eighth year of Mr. H. G. Hughes, who was for many years with Siemens Brothers Dynamo Works, Ltd., and subsequently with the English Electric Co., Ltd. The latter part of his business career was spent with the Electrical Research Association and after retiring in 1937 he devoted much time to the E.I.B.A. as a voluntary worker. On the outbreak of war he took up a position in Coventry with H. M. Hobson, Ltd., and was active to the last.

Lieut. J. N. Campling.—We regret to learn that Lieut. (E.) J. N. Campling, M.B.E., R.N., son of Mr. P. G. Campling, chief engineer and general manager of the Bedford Electricity Department is reported missing and is presumed to have lost his life on active service. He was serving in the destroyer H.M.S. *Aldenham* which was lost due to enemy action.

Lieut. Campling obtained his B.Sc. degree at London University, was an associate of the City and Guilds Institute, and a corporate member of the Institutions of Electrical and Mechanical Engineers. Before volunteering for naval service, he was on the staff of Preece, Cardew and Rider. He had seen service in most theatres of war, including Dunkirk, Narvik, and the Mediterranean, and was awarded the M.B.E. for enterprise and skill in salvaging his ship after it had been engaged in the operations which culminated in the capture of Sicily.

Mr. B. S. Hornby.—We regret to report the death on December 30th, at the age of seventy, of Mr. Benjamin Shuttleworth Hornby, for thirty-six years chief assistant electrical engineer to Bolton Corporation. He retired in 1936. Mr. Hornby was educated at Dunstable Grammar School, receiving his mechanical engineering training at the works of Phillips & Co., London, S.W. From 1894 to 1897 he served with Mr. J. G. W. Aldridge, A.M.I.C.E., the Southern Railway at Southampton Docks, and the Southampton Harbour Board. Then for two years he acted as electrician-in-charge to the Bradford Corporation at the start of the Valley Road Works and the supply for traction, joining the Bolton Corporation as engineer-in-charge in 1899.

The late Mr. B. S. Hornby

Mr. P. K. O'Brien.—We regret to learn from Murphy Radio, Ltd., that Mr. P. K. O'Brien, assistant managing director of the company, died on December 31st after a brief illness.

Mr. G. A. G. Davies, a director of Davies, Kent & Stewart, Ltd., died on December 31st, at the age of seventy-three.

Will.—**Mr. H. W. Lee,** chairman of the Superheater Co., Ltd., director of the Chloride Electrical Storage Co., Ltd., and late managing director of J. Stone & Co., Ltd., left £264,342 (net personalty £232,434).

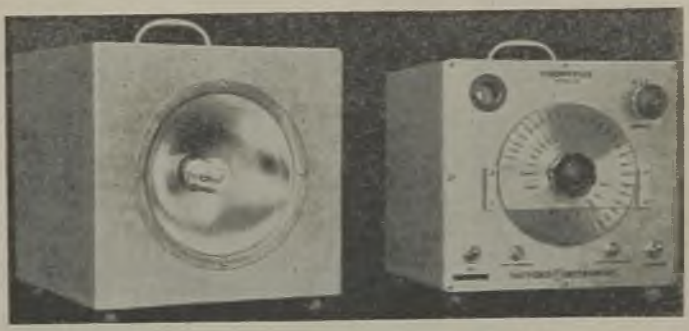
RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Speed Strobolyser

STROBOSCOPIC equipment for the investigation of recurrent motion and the measurement of rotation and reciprocation, or oscillation time, is now being made by WATFORD INSTRUMENTS, Loates Lane, Watford, Herts.

Model B is a mains-energised multivibrator with means for varying its speed of actuation, adjustment being aided by a dial graduated in flashes per minute. An electronic relaxation oscillator is employed to drive a tubular (neon discharge) lamp mounted in a reflector built into the welded steel case (9 in. cube weighing 15 lb.)



Front and back views of the Strobolyser

fitted with a carrying handle and rubber feet. Releasing two special nuts permits withdrawal of the welded steel chassis on which are mounted the valves, silver-mica condensers and associated resistances, so disposed as to be least affected by heat. The circuit is designed to be as insensitive as possible to ageing effects and mains voltage fluctuation as well as for constancy, the graduated dial of each instrument being individually calibrated against frequency substandards by stroboscopic means. A calibration-checking circuit is incorporated, utilising a " magic eye " oscilloscopic tube of the form used for radio receiver tuning.

This indicator is fed with a small voltage derived from the mains input as well as a fraction of the output voltage from the neon lamp. The two voltages beat together, causing the indicator to open and close ; the frequency of movement of the indicator is zero when the lamp output matches the input frequency (50 c/s or multiples thereof) which corresponds to 3,000 flashes per minute, two drift correctors being provided at the bottom edge of the front panel for adjustment by screwdriver.

Heavy-coil Holders

A pedestal holder, known as a "swift," intended to carry a coil of strip metal weighing up to 2 cwt. with a quadrant top adjustable at any angle from the horizontal to the vertical for feeding inclined presses is made by FRANK WHITTLEGG, 90, Robinhood Lane, Sutton, Surrey. The pedestal has a circular cast base of sufficient weight to enable it to stand firmly, holes being provided for floor bolts and a screw-clamped rod for raising the head, which carries adjustable fingers for accommodating strip material of different widths. A compression spring with a locking collar acts as an adjustable brake, the rim of the head is removable and all small adjusting bolts have tommy-bars. Lighter models for supporting smaller coils are available.

Plastic Clips

Neatly fashioned cable and pipe clips made of a plastic substance under the trade name of " Plasklip " are suitable for a great variety of fixings including the anchoring of extensive wiring systems. They are of superior strength, although resilient, and are claimed to be proof against weather, rust and rot. Their insulation value is high and electrolysis cannot occur at the fixing points. The edges of these clips are rounded to avoid any risk of chafing the wires. A range of circular clips is available at present while special sizes and shapes can be produced.

The manufacturers of these devices are the INSULOID MANUFACTURING CO., Ford Street Mills, Chestergate, Stockport, whose London representative is Mr. F. C. Brian, 44, Petherton Road, N.5.

Motor Gears

To meet the demands for a smaller size of " Radicon " worm gear to transmit from fractional up to about 2¼ HP (according to ratio), DAVID BROWN & SONS (HUDDERSFIELD), LTD., Huddersfield, Yorks, have introduced an addition to their range. It is styled the 2¼ Radicon worm reducer and is available in a comprehensive range of ratios, six of which can be dispatched from stock. It retains many of the characteristics of the larger models, but, on account of the lower peripheral velocities and the generous radiating surfaces, it has been shown by prolonged tests that supplementary fan cooling is unnecessary, even when the gear is used in conjunction with high-speed motors.

Speed reduction unit

Power Engineers' Salaries

Upward Revision from January 1st

AS was stated in last week's *Electrical Review* the rise in the cost of living in the latter half of last year has necessitated the revision of the salaries of the staffs of electricity supply undertakings as from January 1st.

In the table column (*a*) gives the salary for the first two years; (*b*) the salary for the third and fourth years; and (*c*) the salary after the fourth year. Employees in the London area are entitled to an additional 5 per cent.

Plant Capacity or Maximum Demand in Kilowatts

Grade	Class A 1,000–2,000			Class B 2,001–4,000			Class C 4,001–6,000			Class D 6,001–8,000			Class E 8,001–13,000			Class F 13,001–25,000			Class G 25,001–50,000		
	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)
1	538	549	561	572	588	605	621	631	641	652	666	681	—	—	—	—	—	—	—	—	—
2	473	482	493	502	518	532	546	556	564	574	588	602	616	639	645	—	—	—	—	—	—
3	431	439	449	457	471	485	498	506	516	523	537	549	563	569	576	583	595	608	621	635	650
4	377	388	400	411	419	428	435	447	459	471	482	493	504	512	518	524	541	557	573	585	596
5	359	367	375	384	394	405	415	422	430	436	447	456	467	477	489	499	505	513	519	534	548
6	329	340	350	361	367	375	382	391	402	411	417	424	430	439	450	459	469	477	487	497	506
7	302	311	319	329	340	350	361	366	371	377	386	395	404	412	422	431	435	440	445	458	472
8	302	306	311	316	320	324	329	338	347	356	361	366	371	380	388	397	405	412	420	425	429
8a	285	288	291	296	299	302	306	314	321	329	335	341	347	355	364	371	379	386	393	398	404
8b	268	271	274	277	280	283	287	293	299	305	310	317	322	330	338	346	353	360	366	372	379
9	—	—	—	—	—	—	268	273	278	283	289	295	301	306	314	320	327	333	340	347	354
9a	—	—	—	—	—	—	—	—	—	268	273	279	284	287	290	293	298	302	307	314	319
10	—	—	—	—	—	—	—	—	—	—	—	—	268	270	272	274	276	277	280	285	290
10a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	268	273	278

Grade	Class H 50,001–100,000			Class J 100,001–150,000			Class K 150,001–200,000			Class L 200,001–250,000			Class M 250,001–350,000			Class N 350,001–450,000			Class O Over 450,000		
	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)
3	664	685	705	724	742	759	777	796	814	833	854	875	895	917	938	960	975	991	1007	1024	1040
4	608	622	637	652	667	684	699	717	733	750	768	786	805	824	844	864	878	892	906	920	936
5	564	573	584	593	608	622	636	652	667	683	699	716	733	751	768	786	799	812	825	838	853
6	517	531	545	560	573	586	600	614	629	643	658	674	691	707	724	741	752	764	776	788	801
7	485	493	501	509	522	534	546	560	572	586	600	613	628	643	658	673	684	696	706	718	729
8	433	445	457	469	480	491	502	516	527	540	552	565	578	592	606	620	630	640	650	660	671
8a	409	419	429	439	450	460	471	482	493	504	518	529	542	555	567	581	590	599	608	618	629
8b	385	393	402	410	420	430	439	450	460	471	482	493	504	518	529	542	550	559	567	576	586
9	361	367	375	382	390	400	409	418	428	437	448	458	469	480	491	502	510	520	527	536	543
9a	326	334	341	349	358	365	374	383	391	401	410	420	430	440	450	460	468	475	482	490	497
10	295	301	309	317	324	331	339	347	356	364	372	381	389	399	408	417	424	431	437	444	452
10a	283	289	294	300	306	313	319	327	335	341	350	359	366	375	384	392	398	405	410	417	423
10b	268	273	278	283	289	295	300	306	313	319	327	335	341	350	359	366	372	378	384	389	396
10c	—	—	—	268	273	279	284	290	296	301	306	314	320	328	336	342	349	354	360	365	371
11	—	—	—	—	—	—	268	273	279	284	290	296	301	306	314	320	325	331	336	341	347
11a	—	—	—	—	—	—	—	—	—	268	273	279	284	290	296	301	305	309	314	319	323
11b	—	—	—	—	—	—	—	—	—	—	—	—	268	273	279	284	288	291	296	300	303

The increase in the cost-of-living index figure, calculated on the 1939 basis, amounts to 30 per cent., that is, six "cycles" of 5 per cent.; the existing salaries were based on an adjustment of five points.

The revised salaries are given in the accompanying table. It should be noted that to some of the grades specific titles are attached, as follows:—1. Deputy chief official; 3. Power station superintendent or mains superintendent (with charge of substations); 4. Mains superintendent (without charge of substations); 7. Shift charge engineer (Class J and over); 8. Shift charge engineer (Classes A to H inclusive); 8b. Substation charge engineer; 9a. Switchboard attendant.

in the stated salaries and in any district where conditions justify lower remuneration a reduction of 5 per cent. in the rates can be made by agreement.

Use of Chromic Acid

Notes on how to use chromic acid economically in chromium plating, anodising and such non-electrolytic immersion treatments as pickling and metal finishing have been issued as Technical Memorandum No. 1 by the Electrodeposition Technical Advisory Committee representing the Ministries of Supply and Aircraft Production as well as the Admiralty. The advice is intended to prevent wastage of chromic acid, which is in short supply, so as to avoid restriction of its uses.

Part-time Technical Training

I.E.E. Post-war Planning Committee's Report

A REPORT on Part-Time Further Education at Technical Colleges has been prepared by the Post-War Planning Committee of the Institution of Electrical Engineers (chairman, Mr. J. R. Beard). It is supplementary to the Report on Education and Training for Engineers published last year and, like it, is the work of Sub-Committee No. 1, of which Dr. A. P. M. Fleming (whose name, as stated in last week's issue of the *Electrical Review*, appears in the list of New Year Honours as the recipient of a knighthood) is chairman. Other members of the Sub-Committee are Mr. H. J. Allcock, Brigadier F. T. Chapman, Mr. S. E. Goodall, Dr. H. L. Haslegrave, Mr. D. B. Hoseason, Prof. Willis Jackson and Dr. E. B. Moullin.

Since the publication of the first Report, a new Education Act has been passed which, it is pointed out, is likely to accentuate the importance of part-time courses. By raising the school-leaving age first to 15 years and then to 16, the Act (which requires employers to release youths up to 18 for one whole day each week) will eventually bring some measure of secondary education within the reach of all young people.

Three Main Groups

A fundamental proposal of this second Report is the development of a system of part-time education that will provide for the needs of three main groups of engineering personnel, *viz.* craftsmen (mainly manual skill), technicians (*e.g.* draughtsmen, erection engineers, technical assistants and senior testers), and professional engineers (who will devise methods for the solution of problems arising out of technological advances and will control their application in accordance with scientific principles). This development should be accompanied by improvements in the practical training of apprentices, which it is hoped to deal with in a later report. Craftsmen require education of a liberal and technical rather than an academic kind and should be trained to deal with the type of problem encountered in their work. There should be a three-year's course for a craftsman certificate followed by a more general course of two years in workshop administration. Mathematics would be minimised and would be related to quantities and processes in practice. Much of the teaching, which would be on qualitative lines rather than from the more scientific approach of the Ordinary and Intermediate National Certificate courses, would include the reading of engineering drawings, knowledge of engineering materials, use of tools and economy of effort.

Craftsmen destined for day-to-day control of factory administration and production would receive further education in such subjects as foremanship, rate-fixing, time and motion study, stock control, stores, systems and machine loading.

For the technician group, the existing course for the Ordinary National Certificates in Electrical and Mechanical Engineering should be co-ordinated as a basic course and this should be followed, where necessary, by a course in advanced technology of a type already developed by the City and Guilds of London Institute. Technicians should receive instruction in the basic ideas of electrical and mechanical engineering, with no more mathematics than is essential.

Intermediate Certificate Proposed

One difficulty of part-time technical education as a means of training professional engineers has been a lack of courses in the basic scientific principles. A scheme is outlined which, it is hoped, would markedly increase the ability of professional engineers who had attended part-time courses. Pupils who do well in the first two years of the course for the Ordinary National Certificate should be combined with those who have reached the standard of a good school certificate in mathematics and physics to undergo a two-year course leading to an Intermediate National Certificate designed to meet the requirements of Section A examination of the Institutions of Civil, Mechanical and Electrical Engineers. This course would lead to the Higher National Certificate in Electrical Engineering and kindred subjects.

It is estimated that the number of professional engineers required per annum by the electrical engineering industry in all branches would be 400 from universities and 600 from technical colleges. In addition there would be 1,800 technicians and 3,200 craftsmen and foremen from technical colleges. The attention of the regional and local technical colleges and technical institutes should be directed chiefly to part-time senior and advanced courses and to post-advanced and post-graduate courses particularly suited to the needs of local industry. Attention is drawn to the merit of the " sandwich system," under which whole-time training is received alternately in industry and in technical colleges.

Some research and development should be carried out in technical colleges (especially the regional kind) in collaboration with local

industry. Hours of teaching duties should be reduced, as recommended in the recent McNair Report, in order to give time for research ; teachers should be granted leave to work on development problems with the more elaborate equipment to be had in industrial laboratories and should be permitted to receive remuneration for research carried on outside their teaching hours. Transfers of technical men with aptitude for teaching should be permitted from industry either for whole-time working or for from one-half to one full day a week.

Over 2,500 graduates and students of the I.E.E. are at present in the Services and their absorption by industry will probably be limited more by available facilities for further education than by the immediate post-war production requirements. Many of these will have domestic and other commitments and should receive allowances on an adequate scale to enable them to enter the profession by the most suitable route in each case. They should receive short-term refresher courses, possibly while awaiting demobilisation, which would act as filters for sorting them into their appropriate grades. Practical training up to two years would also be required in addition to the academic courses outlined. Machinery resembling the Joint Recruiting Board in reverse seems to be indicated for interviewing candidates.

Rural Cottages

Arrangements at Norwich

ALTHOUGH, in 1943, the Government arranged for the erection of suitable houses for agricultural workers in areas where they were particularly required, a good deal of both temporary and permanent accommodation will still be needed. Of the seven rural district councils in the supply area of Norwich Corporation, one has ordered 200 emergency houses and the remainder about 100 each. These are in addition to 1,000 needed by the City of Norwich itself.

The emergency houses are not equipped for solid-fuel heating for cooking ranges, wash-boilers, etc., and, although some townships have a small local gas works, it is not desired that consumers should use electricity under duress, but rather that they should be convinced of its value.

In the Norwich rural area, practically all the isolated houses were fully electrified, the only important variation occurring through some tenants preferring solid - fuel - fired wash-boilers. As a result of the satisfaction given to these consumers all emergency houses so far ordered by the rural district councils in the area have been all-electric.

Left : A block of four cottages.

Above : One of the kitchens

Each house is fitted with nine lighting points and five 5-A socket outlets, and the equipment purchased by the rural district council includes an electric cooker with a set of enamelled iron pans and an electric wash-boiler for each pair of houses. The head demonstrator of the electricity department visits each incoming tenant to give a complete cooking demonstration and general instruction in the use of electrical equipment.

The tariff for these cottages is 12s. per quarter plus 1d. per kWh taken through a prepayment meter. Consumptions between May 1st and October 31st, 1944, for four typical houses situated ten miles from Norwich, were as follows: Family of three, 610 kWh; man and wife (out all day), 750 kWh; six persons (no electric wash-boiler), 480 kWh; three persons, 1,040 kWh. The average cost of energy was thus about 3s. per week or 1½d. per kWh.

Labour-saving Kitchen

Suggestions from an Oxford Exhibition

WE do not think we have yet seen a model kitchen in which electrical aids have been employed more extensively or effectively than in the one which forms the centre of attraction of an exhibition now being held jointly by the Oxford Electricity Supply Department and the Wessex Electricity Co. at the Electricity Showrooms, 37, George Street, Oxford. No effort has been spared to ensure that the kitchen is easy to run and that the work of the housewife is accomplished with the minimum of effort and time.

Incorporated in the unit cabinet and cupboard construction are one of the new horizontal cookers (Jackson); a 4-cu. ft. "Prestcold" refrigerator; a Hotpoint sink unit, comprising an electric washing machine, wringer and "two-in-one" water heater, an electrically heated drying cabinet; a radio receiver; and an electric clock. Five 5-A plug points are provided above the unbroken working table space for the kettle, iron, toaster, mixer, etc., and a special cupboard accommodates the vacuum cleaner, brushes and other domestic equipment. All the cupboard doors are fitted with magnetic catches.

Extract fans (Vent-Axia) have been fixed above the cooker, over the sink and at the top of the drying cabinet, which is fitted with two 750-W Belling heaters. Three fluorescent tubular lamps provide excellent illumination without shadow or glare, and low-temperature convectors have been let into the walls each side of the door. Other interesting features are a tradesmen's service hatch; a recessed cupboard for toilet requisites, etc.; and a large serving hatch so arranged that access to the drawers and china cupboard is possible both from the dining-room and the kitchen and so that the telephone can be used from either side. The colour scheme is yellow with green relief.

Accompanying the kitchen is a model bathroom equipped with an electric water heater, towel rail, reflector fire, illuminated mirror and an exhaust fan. A separate display of post-war appliances includes a new cabinet type Burco wash-boiler; English Electric and Hotpoint washing machines; a Westinghouse dish washer; Sadia, Santon, Heatrae and Berry water heaters and Jackson, Revo, English Electric and G.E.C. cookers.

In opening the exhibition, Captain Quintin Hogg, M.P., said that housewives had a right to have as many electrical appliances as possible to assist them in their work. The model kitchen on view was a dream kitchen and it rested with those responsible whether it was translated into reality. He thought that if we showed the same determination in peace as we did in war it could be.

Visitors to the exhibition are being invited to suggest further improvements in the arrangement of the kitchen.

Two views of the model kitchen at the exhibition now being held at Oxford

Railway Supply at Liverpool

The Liverpool Corporation has applied to the Ministry of Fuel and Power for authority to supply electricity to the L.M. & S. Railway Co. for the Liverpool to Southport section of the railway, whether within or without the area of supply of the Corporation. The Liverpool-Southport railway is electrified.

COMMERCE and INDUSTRY

Extra Payment for Boilers. Fees Dispute at Bolton.

E.D.A. Post-war Kitchens

OFFICIALLY opening the display of the British Electrical Development Association's four model post-war kitchens (see our last week's issue, page 13) at the Building Centre, London, last week, Lord Brabazon, president of the Association, pointed out that they were modern, practical kitchens, produced, after a great deal of research and investigation, by experts and they had the approval of the Ministry of Works. Many post-war appliances were to be seen and he drew particular attention to the merits of the buffet cooker, the use of an overhead reflector fire, and the laundry with its washing machine and really adequate drying room. He also congratulated the designers on not putting the plug points down close to the floor.

Lord and Lady Brabazon in one of the kitchens

Halifax Boiler Plant Contract

Halifax Town Council has adopted a report of the Light, Heat and Power Committee recommending the payment of £10,440 to Babcock & Wilcox, Ltd., in full settlement of the company's claim for war extras in carrying out a contract dated May, 1939, for boiler plant at the electricity station. Alderman Radcliffe, who unsuccessfully opposed the recommendation, said that the Committee was under no legal obligation to pay the extras. The contract was made in 1939 without any conditions. The Corporation had paid the contract price.

All-electric Mobile Canteens

Liverpool now has two all-electric mobile canteens, which, when they take up their stands, draw a supply of electricity from street terminal boxes. Five of these terminal boxes have been provided. Each canteen is fitted with an electric stove, an electric geyser and two electric urns for hot water.

Industrial Reconversion

To assist firms in their change-over from war to peacetime production the Board of Trade is establishing a regional organisation, the four main functions of which will be: The reconversion of industry, with particular reference to engineering; the derequisitioning of factories and storage places and the allocation of surplus Government factories; the distribution of industry, with special regard to the new development areas; and the deconcentration of industry and the release of labour and materials.

Thirteen regional controllers, all of them business men, have been appointed, twelve in the civil defence regions of the United Kingdom and the thirteenth in Northern Ireland. As already announced, Sir Charles Bruce Gardner will be in charge of industrial conversion and Sir Philip Warter, Controller-General of Factory and Storage Premises, will be in charge generally of the new organisation.

Explaining the objects of the new organisation, Mr. Dalton, President of the Board of Trade, said that it aimed as far as possible at avoiding the "Whitehall bottleneck." It was an important piece of preparatory planning work ready for the cessation of the war against Germany when the functions of the Board of Trade would assume much greater importance than at present. Industrialists were invited to take their problems to the regional controllers immediately.

Payment for Additional Services

The principal topic discussed by Bolton Town Council on January 3rd concerned proposed grants to the borough electrical engineer (Mr. H. E. Annett) and some of his staff for extra work on extensions at the Back-o'-th'-Bank generating station. Ultimately, the Electricity Committee was given authority to arrange terms with the electrical engineer for his professional services in the extensions which are to be completed by September, 1946.

Mr. Annett wrote that he would not accept any payment in respect of extensions in 1940-41. The amount offered was considerably less than engineers of other authorities had received, and less than the Central Electricity Board would have been willing to pay. It was evident that the suggestion of payment had been reluctantly made, and this together with the prolonged controversy and ill-informed Press comments created an atmosphere in every way distasteful to him. He did not feel justified in accepting

the work and responsibility for the 1946 extensions. Mr. Annett, in declining the offer of £3,000 for the 1940-41 extension, expressed the hope that his action would not prejudice the position of others who assisted him. It had been proposed to allocate them £2,000.

Councillor A. Lawson said he was not convinced Mr. Annett was entitled to ask for a penny. The advertisement at the time Mr. Annett was appointed contemplated these extensions and it was too late for Mr. Annett to say he was not obliged to do the work.

Councillor Dr. Savage said he had opposed these payments at the beginning. They were now told the issue was whether they should pay £35,000 to consultants or £5,000 to their own engineer. If that were the issue it would be simple. But he saw a more dangerous precedent. In future officials of other departments would have to carry out extensions and it would be difficult to refuse extra payments if these grants were authorised. In view of the urgency of the 1946 extensions he agreed to some payment, but he would fight the principle in future developments.

Councillor R. Aspinall considered that the extensions were not comparable with what other engineers had done in the past, because they were not solely for Bolton's benefit and Councillor A. Hollas pointed out that when Mr. Annett was appointed there was no Central Electricity Board, and extensions on a large scale were not contemplated. These extensions were for national purposes, and did not come within the terms of Mr. Annett's appointment.

Alderman W. W. Tong said the Council could either refuse the extensions—in which event the C.E.B. would get some other authority to take over the work—or they could call in a consultant whose fees would be £35,000 and who would himself be able to give Mr. Annett £7,000 for his assistance and advice. It was a business proposition. If they insisted on Mr. Annett doing the work and he either resigned or the Council terminated his appointment they would not be able to get another engineer because the Association would boycott Bolton.

Application for Electric Vehicle

At a meeting of the Cheltenham Corporation Electricity Committee the borough electrical engineer (Mr. R. W. Steel) reported that he had applied to the Ministry of War Transport for an additional electric vehicle. The Ministry refused, stating that no more electric vehicles were available and suggested that the application should be renewed in four months. Mr. Steel added that he was now taking the matter up with the Electric Vehicle Association to see whether some pressure could be brought to bear on the Ministry to secure higher priority for the supply of the vehicle.

Local Government White Paper

No direct reference to electricity supply is to be found in the White Paper on "Local Government in England and Wales during the Period of Reconstruction" (Cmd. 6579, Stationery Office, 4d.) although there are mentions of services which might be taken to include electricity. In a consideration of wider administrative areas it is stated that the Government considers that where co-ordination of services between two or more areas, whether counties or county boroughs, is necessary it should be sought by the established procedure of joint boards or committees. Later, in dealing with the difficulty of forming suitable county districts in sparsely populated agricultural counties, it is suggested that a partial solution might sometimes be found in establishing combinations of authorities for specific purposes—housing, water supply "and so forth."

But it is also noted that "the Government have at present under consideration the future organisation of the fire service and certain of the public utility services. These latter are in a rather different category from the other local government services and their control is at present fortuitously divided between municipal and private enterprise."

New Fluorescent Lamp

The latest variety of fluorescent lamp to become available is called the "Warm-White" and is claimed to possess a mellow sunlight quality. It differs only in the colour of the emission from the "daylight" type that has been made for the last five years. The new lamp costs the same as the original lamp (the price of which was recently reduced) and is identical with it. Both models are interchangeable without alteration of circuit. Particulars of the new lamp have been sent us by the General Electric Co., Ltd., British Thomson-Houston Co., Ltd., and Siemens Electric Lamps & Supplies, Ltd.

Transformer Brochure

A bound booklet of 64 pages, liberally illustrated, has been compiled to describe the manufacturing methods of the British Power Transformer Co., Ltd., Queensway, Ponders End, Middlesex. It is intended to be a book of general reference, between the usual publicity brochure and the text-book. It contains information that is not always readily available as well as dealing with some technical aspects of design. Several pages of overall dimensions are included together with an index and specimen order-inquiry forms.

Built-in Switches

A comprehensive technical brochure (No. TL) published by Diamond H Switches, Ltd., Gunnersbury Avenue, Chiswick, W.4, should serve as a helpful source of reference for designers of appliances having built-in toggle or trigger switches. It covers in 24 illustrated pages many sizes and types, both metal and moulded varieties, circuit wiring diagrams and fully dimensioned drawings being included with mounting details. Ratings range from 3 to 40 A at 250 V for DC and in some cases extend up to 660 V for AC.

Calendars

"Cornered," a portrait of chessplayers, illustrates the calendar of Fitter & Poulton, Ltd., Vincent Parade, Balsall Heath, Birmingham. Monthly sheets are provided.

A novel continuous calendar sent by Easco Electrical Service, Brighton Terrace, London, S.W.9, permits instant computation of the exact time in weeks and days between one date and another.

The Davenport Engineering Co., Ltd., Bradford, has sent us a calendar with sheets showing three months at a glance.

Mass Radiography at G.E.C. Works

A mass miniature radiography apparatus made in this country by Watson & Sons (Electro-Medical), Ltd., has been installed temporarily by the Birmingham City Corporation at the G.E.C. Engineering Works, Witton, Birmingham, for the examination of the large personnel employed there. The apparatus is installed in a building originally intended as a gas decontamination centre which lends itself to the purpose very well.

Mass radiography apparatus in use at the Witton works

T.V.A. Film

We are informed that the film recently issued by the American Office of War Information portraying the development of the T.V.A. scheme can be borrowed free of charge on application to the hon. director, American and British-Commonwealth Association, 18, South Street, London, W.1. The film, which shows the construction of the numerous Tennessee Valley dams and describes the main advantages accruing to the population, is of considerable scientific, agricultural and scenic interest.

Trade Publications

Dover Engineering Works, Ltd., Watford By-pass Road, Watford, Herts.—Illustrated and dimensioned catalogue of Elkington "Gatic" covers and frames of different types and forms for street manholes, underground transformer chambers, switchroom floors, subways and ducts.

Easco Electrical Service, 6, Brighton Terrace, Brixton, London, S.W.9.—Four leaflets briefly specifying a life-jacket light to assist marine rescue, a watertight Morse signalling torch, a raft or buoy light and a portable search floodlight, all battery operated.

Zinc Alloy Die Casters' Association, Lincoln House, Turl Street, Oxford.—Technical folder giving information about the specialised subject of welding zinc-alloy die castings.

Copies can be obtained by bona fide applicants from the companies concerned.

New Zealand Electrical Imports

During the June quarter of last year electrical apparatus (excluding radio) valued at £N.Z. 1,125,570 was imported into New Zealand, as compared with £836,942 in the corresponding period of 1943 and £479,084 in the second quarter of 1942. Insulated wire and cable was the principal item—£215,548 (against £407,568 in 1943). The United States was the chief supplier (£111,978); the United Kingdom's share was valued at £78,663 and others came from Canada and Australia. Electric motors were valued at £77,194 (against £67,371), the principal suppliers being the United Kingdom (£64,021) and Canada (£7,224). The value of imported lamps was £28,751 (United Kingdom, £25,036), against £22,747. Radio imports were valued at £284,899 (against £129,496). The United Kingdom's share showed a substantial increase as did that of Australia.

TRADE MARK APPLICATION

APPLICATION has been made for the registration of the following trade mark. Objections may be entered within one month from January 3rd:—

BIRCH. No. 623,247, Class 9 and No. 623,248, Class 11. Electrical resistances and electrical heating elements.—H. A. Birch & Co., Ltd., Willenhall, Staffs.

INFORMATION DEPARTMENT

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

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

"Super Magnum" heater for curling tongs.

Severn Barrage

Conclusions from Tidal Model

AT a meeting recently arranged by the South Wales and Monmouthshire Bulk Supply Association in Cardiff Dr. J. Jordan gave an address on the experiments carried out between 1926 and 1933 by Professor A. H. Gibson, D.Sc., Professor of Engineering in the University of Manchester, with a tidal model of the Severn Estuary.

It had been contended that a barrage in the estuary would so reduce current velocities that serious silting would be caused in the ports and their approaches. Professor Gibson showed by means of his model that below the barrage there would be no interference with shipping while above it, after a moderate amount of dredging, the channels would be at least as good at high water and considerably better at other states of the tide. Moreover, with a barrage the tendency to flooding in the upper estuary would be brought completely under control.

These conclusions, said Dr. Jordan, had not been generally accepted by the interests concerned mainly because they mistrusted evidence drawn from models, particularly as regarded the exaggerated vertical scale. After explaining in detail the basis on which the model was constructed and operated, Dr. Jordan said that it was incorrect to criticise the conclusions with regard to silting on the grounds of distortion of the vertical scale. The effect of this distortion was to produce excessive shoaling at certain points of the model and hence would tend to overestimate the amount of silting likely to result from the introduction of a barrage.

Subsequent experiments carried out with several different types of barrage all tended to show that no major effects detrimental to shipping, drainage and flood control need be feared. The lecture was illustrated by epidiascope projection of a number of valuable diagrams and photographs from the Cardiff Library.

Professional Appointments

Ministry of Labour's Resettlement Plans

LAST week we reported the intention of the three leading engineering institutions to encourage the formation of a Professional Engineers' Appointments Bureau which, it was stated, would co-operate with the Ministry of Labour in the machinery which was being set up for guiding and planning the redistribution of technical man-power in the years immediately after the war. Particulars of the "machinery" referred to were announced by the Minister of Labour last week.

The plan, which aims at resettling men and women in "higher appointments," *i.e.*, posts above that of foreman, is based on recommendations by the committee appointed, under the chairmanship of Lord Hankey, to report on the reorganisation of the existing Appointments Department of the Ministry. To meet a proposal that larger areas were desirable for the purpose, the Ministry is reducing the number of its appointments offices from thirty-one to thirteen. The filling of posts requiring engineers with full professional qualifications will continue to be dealt with centrally.

Advice will be given by a Careers Research Section upon the choice of a career and upon the training for it; handbooks are to be published on the subject. Advice will also be obtainable by those who propose to invest capital in business enterprises. The existing advisory committees on public utilities, electrical engineering, scientific research, etc., have agreed to continue their work. The Appointments Department will work in close co-operation with university appointment boards and the co-operation of industry and commerce will be welcomed in the Department's endeavour to ensure that the best use is made of specialised knowledge and ability.

Close attention is being given to the prospects of post-war overseas jobs and contacts are being made with the appropriate Government Department and with undertakings having overseas establishments.

To meet the needs of the Service man and woman an expert Inter-Service Advisory Committee is being set up and a special section has been opened in the London Appointments Office for the purpose of placing ex-Regular officers in suitable employment when they leave the Services. Attention is drawn to the existence of the further education and training scheme for Service men and women with little or no experience who wish to train for a professional career.

Provision is being considered for those who have developed their abilities during their war service to enable them to take higher positions upon their discharge. Help will also be given to the many men and women who will have neither an occupation nor a job upon leaving the Services and the co-operation of employers in this work is being sought.

Cable Restrictions Relaxed

Use of Steel and Lead

ELECTRICITY supply authorities have been notified by the Electricity Commissioners that the Cable Planning Officer of the Ministry of Supply has informed them that certain restrictions on the use of lead and steel in the production and jointing of cables can be removed forthwith.

In consequence the restrictions on the use of armoured cable set out in previous circular letters of the Commissioners may now be regarded as having been withdrawn, and undertakers may purchase armoured paper-insulated lead-covered cable which complies with B.S. 480/1942 or any later Specification without submitting the orders to the Commissioners for endorsement. It will still be necessary for the undertakers to submit the usual "M" application form for an authorisation to purchase the steel.

It has been decided for the present to retain Regulation 12 of the Electricity Supply Regulations, 1937, as amended by the Commissioners' circular letter of July 9th, 1940. Accordingly, undertakers who desire to purchase paper-insulated lead-covered cable to a Specification other than B.S. 480/1942 or any later Specification, will still require the Commissioners' approval.

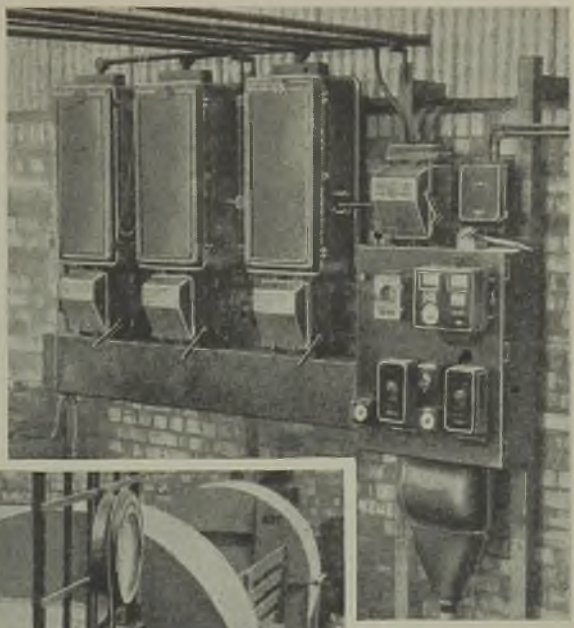
The restrictions imposed in previous letters on the use of lead sleeves for cable jointing are also now withdrawn.

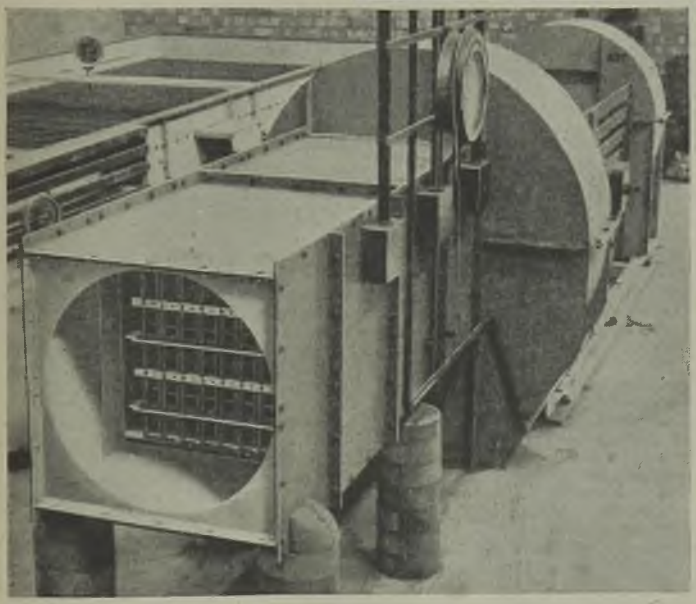
Drying Grain Electrically

Successful Installation at Spalding

EXPERIMENTS that are being undertaken in various parts of the country in connection with the drying of grain by electricity are being followed with considerable interest both by the electrical industry and by farmers. The first all-electric plant installed in this country, at Bedford, was described in our issue of November 5th last year. Now we have had an opportunity of inspecting an installation of quite a different type which the Spalding U.D.C. Electricity Department (Mr. F. R. C. Roberts, engineer and manager) has designed for Elsom's (Spalding), Ltd.

Though hitherto used mainly for drying sugar beet seed, the plant has also proved eminently satisfactory for peas, wheat, barley, etc. Before drying, the seed or grain is given a preliminary cleaning. From a hopper holding 30 cwt. it is blown by a fan, driven by a 7½-HP Brook motor, to an "Invincible" cleaner, from which it is discharged *via* a chute to the dryer. The latter is a Ransomes, Sims and Jefferies "B.C.D.8" unit of the continuous, open type, with the standard coke-heating component removed and replaced by electric heating elements inserted in an especially designed hot-air intake ducting.





Above: Contactors and switchgear controlling the banks of heating elements
Left: Hot-air intake of the grain dryer in which the elements and thermostats are fitted

In this type of dryer the grain is slowly carried along a perforated plate conveyor, first over a current of hot air and then over one of cold, the air being blown from beneath. Separate fans, each giving an air flow of 12,000 cu. ft. a minute are used for the hot and cold sections of the plant, but both of them, as well as the conveyor, are driven by the same 15-HP, 1,500-RPM Brook

motor through V-belts, reducing the shaft speed to 650 RPM.

To suit the moisture content of the grain being dried the speed of the conveyor can be varied mechanically from 2·2 in. to 30·8 in. a minute, the time taken for the grain to travel the whole length of the conveyor being from 164 to 10 minutes as desired. The average speed of drying the grain is a ton an hour.

After leaving the conveyor the grain is again blown up to a hopper with a capacity of five tons which feeds three further cleaning machines driven from one shafting by a 5-HP Brook motor. The large holding capacity of the above hopper has been arranged to enable the cleaning machines to continue during peak hours when the drying plant is idle.

The heating elements, which have been made by the Cressall Manufacturing Co., Ltd., have a total loading of 225 kW arranged in three banks, two of 81 kW and one of 63 kW. Each bank is itself split up into three units of equal loading (27 kW in the case of the former two banks and 21 kW for the other). The three 21-kW elements are thermostatically controlled, the remainder being hand operated. Three triple-pole Igranic contactors are provided for each bank of elements, indicator lamps shunted across the contactor coils showing whether the temperature control mechanism is operating properly.

Normally the drying temperature employed is about 110 deg. F., but the plant is designed to give temperatures of up to 155 deg. F. (with an ambient temperature of 50 deg. F.) if required. The three Satchwell thermostats employed for controlling the temperatures are fitted in the hot-air trunking and cover a range of temperatures from 65 to 180 deg. F. With this arrangement the temperature is maintained constant to within 2 deg. F.

A safety thermostat in the hot-air trunking cuts off the heaters should the temperature exceed 175 deg. F., due, for instance, to the breaking of a V-belt drive, while should the motor stop through some mechanical or electrical failure the automatic opening of the starter switch (Allen West) simultaneously opens the contactor coils for the heaters. In addition to a Cambridge temperature recorder, Rototherm thermometers are fitted both in the hot-air inlet and at the point in the dryer where the hot and cold air currents meet, the latter instrument providing a fairly accurate indication of the moisture content.

Apart from the constant temperature obtainable the plant scores heavily over a coke-operated unit in the time taken to heat up, about four minutes being all that is required to achieve a 65 deg. F., rise in temperature. Mr. Roberts tells us that so far nothing like the full load has been required, 145 kW of heating being the maximum recorded after the initial heating up. A further reduction in consumption would undoubtedly be secured if a re-circulation system were to be incorporated. As it is, with a special off-peak tariff for heating (employing a time switch) and the flat rate for power, it is considered an economical proposition, in view of the very high quality and constancy of the grain treated, to employ electricity for heating even if the cost is twice that of coke.

Electricity in the Textile Industry

Raising Productive Capacity

THAT the modernisation of the textile industry was almost impossible without electrification was the comment of Mr. R. H. Harral, Blackburn Corporation electrical engineer and manager, in a paper read by his deputy, Mr. E. Barrell, to the local Chamber of Commerce on December 20th.

He said that increased trade (especially exports) had been secured by engineers who had adopted electrification, and the application of electricity to cotton would raise the productive capacity of worker and machine to an extent larger than was realised by cotton manufacturers.

The cotton industry was alarmingly full of inefficient plant, which should be replaced by electric drives. There was also a considerable amount of bad lighting in factories. Generating plant in a municipal power station was operated on a twenty years' financial life basis. But experience had shown that it was more economical to replace the plant after seventeen or eighteen years.

He had had many local examples of steam engines being run because they were "paid off," and operating costs were accepted as a foregone conclusion regardless of inefficiency. Mechanical transmission losses were high and not enough attention was paid to textile engineering. Group driving of looms and individual motors for new looms would eliminate shafting and permit more natural light in mills. Power costs were often not more than 5 per cent. of the total production cost compared with labour at 60 per cent. Labour-saving equipment and well planned lighting, with the addition of canteen and welfare facilities, would do much to improve the status of the industry.

The Blackburn electricity undertaking, he said, had played its part in co-operating with manufacturers in the past and it was encouraging to state that fourteen mills had installed electricity for lighting on approved systems. As production had been improved by 20 per cent. with improved lighting, it was difficult to understand why Government Committees' recommendations had not been universally accepted.

Mr. Harral suggested a British Industries Fair for Blackburn which the Chamber of Commerce might sponsor.

ELECTRICITY SUPPLY

Birmingham Extensions. Cooling Methods at Lincoln and York.

Belfast.—INCREASED OUTPUT.—The output of the Belfast Corporation's electricity undertaking in the year ending March 31st last was 358·5 million kWh. an increase of 70·8 million kWh (24·6 per cent.). The maximum demand upon the system was 114·1 MW against 90·6 MW in the previous year. Many new industries were supplied and the number of consumers increased by 1,264 to 87,155.

UNDERTAKING'S JUBILEE. — Application is being made for sanction to an expenditure not exceeding £100 in connection with the jubilee celebrations of the electricity undertaking.

Birmingham.—POWER STATION EXTENSIONS.—Proposals for power station extensions estimated to cost £3,333,154 are made in a report of the Electric Supply Committee presented to the City Council this week. The Committee states that it has received a direction from the Central Electricity Board to make arrangements immediately for the extensions, and that fulfilment of the programme necessitates immediate steps to put the work in hand. The ultimate maximum capacity, the report adds, will meet estimated requirements for four or five years ahead. The plans provide for two turbines each driving a 50,000 kW main alternator and a 3,500 kW auxiliary alternator, four boiler units each having a maximum continuous evaporative capacity of 320,000 lb. of steam per hour and a cooling tower to deal with 5,000,000 gallons of water per hour. One turbo-alternator, two boilers and the cooling tower are to be ready by September, 1947, and the rest by September, 1948. The cost of extension of the main transmission system is estimated at £611,527.

Darlington.—SUPPLY TO WORKS.—The Corporation is to supply electricity to the works of T. Ness, Ltd.

Easington.—LOWER CHARGES URGED.—The Rural District Council is seeking a " considerable reduction " in electricity charges for the district, and also an improved supply. It is intended to meet representatives of the electricity undertakings to discuss the matter. The Easington area has several electrical suppliers including local colliery concerns. It is considered that electricity charges by these firms are too high, and the Council is seeking to have them brought to the level of the North-Eastern Electric Supply Co., Ltd.

Edinburgh.—POST-WAR SCHEME.—A report on the extension of electricity supply in connection with post-war reconstruction was considered at a meeting of the Public Utilities Committee recently. It was shown that the cost, exclusive of the erection and equipment of a proposed switch-house, amounted to £365,130. This sum included £127,393 for 33,000-V and pilot cables.

Great Yarmouth.—" CORNER TURNED."—During the war the accounts of the Electricity Department have shown losses aggregating £90,000, which has been met out of reserves. Councillor H. S. Matthes, vice-chairman of the Electricity Committee, reporting to the Council ast week, expressed the view that, financially, the undertaking had now " turned the corner." He said that the Committee had been faced with two alternatives, a drastic increase in charges or the claiming of Government assistance. Assistance from the Government would have been at the price of restrictions, with a certain number of onerous conditions on the expenditure of the few reserves the undertaking still had left. Fortunately the Committee took the courageous course and decided to stand on its own feet, and the charges, already raised by 20 per cent., were increased to 33⅓ per cent. He emphasised that in spite of the increase the tariff still compared favourably with all the undertakings in the area. All the losses had been written off from the reserves. They had continued to pay off their loans and the net loan debt in March last was £431,000, which represented a reduction in the five years of £192,000, a considerable achievement under the conditions in which the undertaking had been operated. Sales were now getting back to normal, and he prophesied that the next alteration in charges would be downward.

Hull.—LOANS.—The Corporation Electricity Committee has obtained sanction to borrow £1,312 for electricity supply to the Hessle Road trolley-bus system and is seeking sanction to borrow £2,403 for overhead line and substation equipment.

Lincoln.—POSSIBLE ALTERNATIVE TO COOLING TOWERS.—Prospects that Lincoln may be able to extend its generating station without cooling towers, the subject of the recent inquiry, were raised at a recent meeting of the City Council. The town clerk stated that the Witham and Steeping Catchment Board had now approved in principle a scheme for pumping water from the Trent to Fossdyke and the River Witham for cooling purposes, and had appointed its chairman (Alderman Sir Robert Pattinson) and the engineer of the Board to attend a conference to be held at Lincoln.

London.—PURCHASE OF KETTLES.—The Southwark Electricity Committee reports that it is necessary to provide all possible facilities for cooking and heating under rehabilitation schemes. Unfortunately, while the undertaking is in a position to provide most of the requirements, there are no kettles in stock, many having been lost through war damage. There is now a possibility of being able to purchase 500 kettles at 36s. each and the borough electrical engineer is to make every effort to acquire them. Application is to be made for sanction to borrow £1,000 for kettles for hire and £3,000 for the purchase of meters.

Meriden.—STREET LIGHTING.—The Rural District Council is negotiating with the Birmingham Corporation Electric Supply Department in connection with a supply of electricity to Hampton-in-Arden for street lighting.

Morley.—REASON FOR GAS CHOICE.—The Council's post-war houses at East and West Ardsley, Gildersome and Drighlington, in the area of the Yorkshire Electric Power Co., are to be provided with gas services. Councillor

H. A. Bradley, chairman of the Housing Committee, informed the Town Council at its last meeting that the sole idea of this move was to show the Yorkshire Electric Power Co. that its rates were excessive.

North Scotland.—INQUIRY CONCLUDED.—When the public inquiry into the objections to the first constructional scheme of the North of Scotland Hydro-Electric Board was resumed on January 3rd before Mr. John Cameron, D.S.C., K.C., counsel for Perth and Kinross Joint County Council and Inverness County Council withdrew from the inquiry. This left the Dumbarton County Council, the Clyde Valley Regional Planning Advisory Committee and Mr. E. Lowes, of Glenfalloch, as the only objectors. Mr. H. O. Hill, chartered civil engineer, and Mr. Malcolm Ross, county engineer, Dumbartonshire, gave evidence regarding sources of public water supply and contended that Loch Sloy was the most suitable: it was nearly 300 ft. higher than Luss Water and had a greater rainfall. The hearing of evidence was concluded and on the following day the Commissioner heard submissions by counsel.

Norwich.—LOAN PAID OFF.—Presenting the accounts of the Electricity Department for 1943-44 at last week's meeting of the City Council, Councillor S. A. Bailey, chairman of the Electricity Committee, said that £73,954 had been written off on capital account for the amount paid for the goodwill of the former company, the loan for which had now been paid off.

Salford.—RATES "GIFT" TO SWINTON.—Last week the City Council approved the proposed extensions at the Agecroft power station directed by the Central Electricity Board. One effect of the scheme which was not to the liking of the Finance Committee was that the Corporation would thus be guaranteeing a £3,500,000 loan to create property which would present the Swinton and Pendlebury Council with £61,500 of new rateable value, equal to 3s. in the £. Alderman J. Park, chairman of the Committee, said that he took the strongest possible objection to this, and his Committee had put forward certain suggestions to secure some of the benefit for Salford.

South Shields.—CONVERSION OF LIGHTING SYSTEM.—The Corporation has considered a report from the borough electrical engineer which states that the estimated cost to the Electrical Department of converting the present gas street lighting to electric lighting is £25,000, which includes the automatic control of 500 hand-switched electric lamps and 1,426 gas lamps to be converted. The estimated revenue is £11,726 and the expenditure including interest and sinking fund £10,689. The Council has adopted the plan in principle, the conversion to be carried out over a period of five years.

Southport.—GAS CHOSEN BY ONE VOTE.—By 21 votes to 20 the Town Council last week decided in favour of the installation of gas cookers, boilers and refrigerators in temporary houses. Councillor H. W. Barber pressed for all-electric houses, saying that since plugs had to be installed in the electrical circuits he did not see why electricity should not be used for all the domestic services. Councillor J. J. Irvin considered that in such small houses vitiation of the air would reach serious proportions if gas were used, and Councillor F. Speakman also supported electricity on health grounds. Councillor J. W. S. Wilkinson stated that in Committee gas had beaten electricity by five votes to four, adding that all housewives were not in favour of electricity as Councillor Barber had led the Council to believe. Councillor Mrs. Haigh expressed the view that in large rooms gas was "quite the best," but where accommodation was limited a trial of the all-electric house would be a good thing. Electricity, she thought, cooked just as well as gas.

York.—WATER FOR COOLING.—The fear has been expressed that further cooling towers will be built at York electricity station as part of the proposed extensions. At a meeting of the City Council, however, Alderman C. T. Hutchinson said it was probable that the water for cooling purposes would be obtained by means of a pipe line from the Ouse to the Foss near the generating station and that there would be no need for a tower.

TRANSPORT

Liverpool.—POST-WAR POLICY.—In a report on the post-war reconstruction and development of the Liverpool Corporation passenger transport undertaking, Mr. W. G. Marks, the general manager, deals separately with the advantages and disadvantages of electric tramways, motor buses, trolley-buses and underground electric railways. The Committee has now asked him to report on the relative capital and maintenance costs of each form of transport. Although no decisions have been reached, the Committee is disposed to the view that, as a long-term policy, it should aim at abolishing trams and replacing them with a dual system of buses and fast electric coaches running on light railways comprising reserved tracks only.

New Zealand.—MORE TRAM PASSENGERS.—After reaching a peak of 167·7 million in 1925-26, the number of tram passengers decreased to 119·8 million in 1933-34. Since then there has been a steady growth of traffic and in 1943-44 a new record of 220·2 million passengers was established.

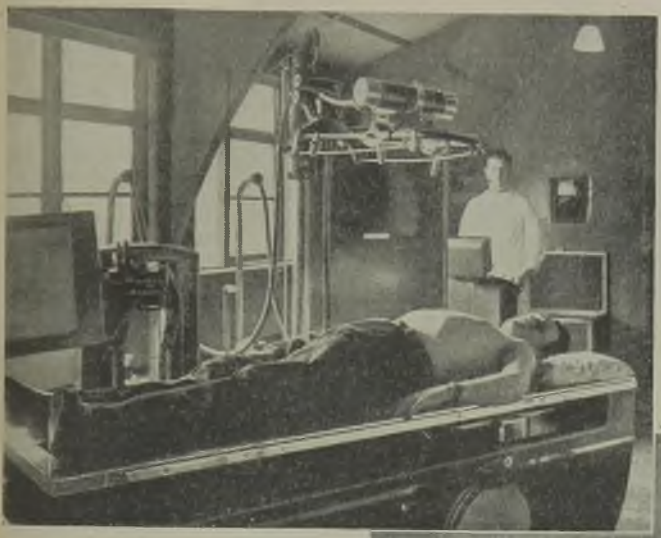
Insulating Varnishes

A PAPER prepared by MR. W. P. WALTERS for the London Students' Section of the Institution of Electrical Engineers deals with insulating varnishes. Manufacture, properties and uses are dealt with, the author explaining that the commoner impregnating varieties are made of resin or bitumen bases dissolved in either or both linseed or china wood oils. Before the resins are graded they have to be rendered soluble by heating, the melting of the lumps being accompanied by frothing and a considerable change in volume. During this gum-running process, which needs to be carried out with the accuracy of skilled experience, evaporation causes a loss of about 30 per cent. in weight. The cooked resin is next cleaned in a sodium-carbonate solution and then rinsed in water to remove any alkali. It is stirred into preboiled oil at about 250 deg. C. with the addition when cooling of such thinners as petroleum or white spirit to adjust the viscosity, as well as metallic driers to promote oxidisation. After straining and filtering the solution is allowed to mature for some months in settling tanks, so that solid particles in suspension can gravitate to the bottom.

U.S. Army Hospital

Electrical Aids to Diagnosis and Treatment

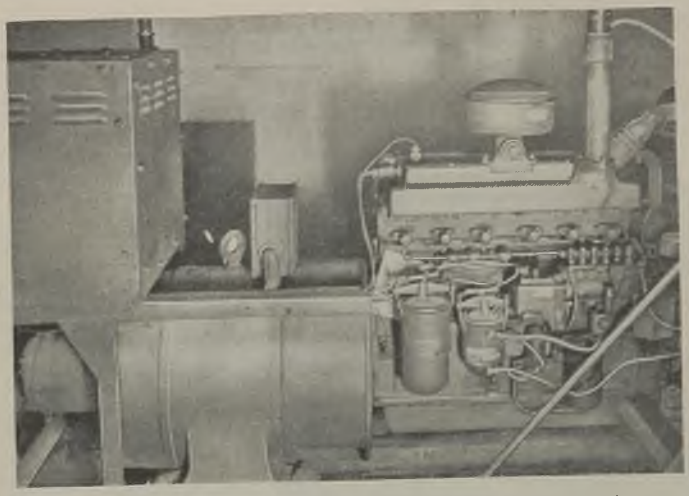
IT was recently announced that an Allied soldier wounded in France had ninety-seven chances out of a hundred of living, and that if he reached a hospital in Great Britain his chances of survival improved to 269 to 1. After a visit to one of the United States Army's large general hospitals in this country it is not difficult to understand why this is the case, and it is noteworthy to what an extent electrical apparatus is now employed both for diagnosis and for actual treatment.



Westinghouse heavy-duty X-ray equipment for general use and, right, portable Packer X-ray unit specially designed for the U.S. Army

The hospital in question has beds for about 1,200 accommodated in Nissen huts arranged roughly in the form of a large "V." Both for surgical and medical cases X-rays are of course employed very largely; every month 1,600–1,800 patients visit the radiological department. To meet all possible requirements several different types of equipment have been provided, both fixed and portable. For general work a Westinghouse heavy-duty machine is normally used. It has two tubes, one above and one below the fluoroscopic-röntgenographic tilt table. In chest radiography a great deal of time is saved and better results are achieved by the use of a stereoscopic cassette changer. Among the mobile X-ray equipment probably the most interesting is the field unit (manufactured by the Picker-Waite Co.) specially designed for the American army for general radiography and fluoroscopy under field conditions. At this hospital two of these equipments are used, one fixed permanently in the radiological department and the other fitted on a mobile stand in the operating theatre of wards wherever it is required. The X-ray tube can be rotated and carried underneath the table, and there is a tray carriage for examining from above, together with a foreign body locator. Safety devices are incorporated to prevent operation if the circulator and blower motors are not energised, and there is also a thermal safety switch which operates if a predetermined temperature is exceeded. Shockproof cables have been arranged so as to be interchangeable and great care has been taken to protect all cable fittings during transportation. To

reduce strain on the cable it is free to rotate both at the transformer end and at the tube end. Besides being fitted with plastic windows to prevent breakage, the instrument panels



Petrol-driven generator for operating X-ray and other electrical equipment when no main supply is available

are mounted on " Airform " rubber to absorb vibration.

The chassis of the equipment is mobile, in fact the whole apparatus can be stowed away in three medium sized chests. Such care has in fact been taken with the packing arrangements that it is possible to drop the apparatus by parachute without risk or damage. Though here run on standard 230-V, three-phase, 50-cycle supply, the apparatus is designed for use on 120 V as well, and where no main electricity supply is available, it may be operated by means of a specially designed portable, petrol-driven generator supplying single-phase 60-cycle AC at 120 V and having a capacity of 2,500 W at unity power factor. Generators of this type can also be employed for use with other electro-medical apparatus under emergency conditions.

Another type of mobile X-ray plant, " Solus," is utilised not only for general work but in the field as well : two units of this type are available. A portable apparatus, the Watson " MX 2," is adaptable for 70, 110 and 230 V and its compact control panel has the transformer built in. It can be taken apart quickly and carried to the bedside.

In the physiotherapy department, where about 2,000 electrical treatments of all kinds are given each month, the comprehensive collection of electrical apparatus includes Hanovia ultra-violet ray equipments, Sollux, Burdick, Hanovia and Walter S. Edwards infra-red ray apparatus; and a galvanic, sinusoidal, faradic unit (J. Beebe & Co.). For the treatment of nerves and muscles good results are achieved with galvanic and faradic current stimulators, while a gentle form of massage is provided by means of an Ille under-water therapy tank, a whirlpool bath, the water of which is agitated by means of a ½-HP motor ; for safety this is fitted with a thermal overload protector. Stiff joints, arthritis, etc., are relieved by Ingleby paraffin wax baths, which are heated to a temperature of 130–140 deg. F., by means of small immersion elements.

In the operating theatres special lamps are arranged for use from 230 or 115-V main supplies, storage batteries or dry cells. Other electrical equipment in use in the operating theatres includes a coagulator (for bloodless surgery) and suction apparatus for removing blood from incisions.

I.E.E. London Students

THE second half of the present session of the I.E.E. London Students' Section opens on January 15th with a paper by W. P. Walters, B.Sc., on " Insulating Varnishes." This will be followed on February 13th by the Students' Lecture on " The Cathode Ray Tube and its Applications " by Dr. W. Wilson. On March 5th T. M. Ellison will present a paper on " Mercury Arc and Mercury Vapour Rectifiers in Transmitters," and on March 28th the President of the Institution, Sir Harry Railing, D.Eng., will give an address. A paper on " The Lumen Method of Illumination Calculation " will be presented by G. S. H. Mogford, on April 16th and the meeting on May 1st will be devoted to discussion of the reports on " Education and Training for Engineers " and " Part-time Further Education." On May 14th a paper on " AC Generator Protection," by D. S. Daoud, is to be read by P. W. Castle and G. Lyon, B.Sc.(Eng.), and the session will close with the annual meeting on May 28th.

A full programme of visits—numbering fourteen in all—has been arranged, including Battersea power station (February 10th), Furzehill Laboratories (February 17th), St. Bartholomew's Hospital (April 7th) and the Brimsdown power station (May 5th). The first informal evening dance of the session was a most enjoyable event and those who took part will look forward to the next, which has been fixed for March 10th.

NEW BOOKS

How Steel is Made. Demonstrating the Properties of Metals.

Steel Manufacture Simply Explained. By E. Gregory, Ph.D., M.Sc., and E. N. Simons, Third edition. Pp. 205; figs. 53. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, London, W.C.2. Price 12s. 6d.

This book was first published in 1940, a second edition appearing in 1942, and now the third is available. In a foreword to the book on publication, the chairman of Edgar Allen & Sons, Ltd., Mr. C. K. Everitt, made the following observations: "I have been employed in the manufacture of steel for the last fifty-eight years, and still am. During these many years I have frequently come across situations in steel manufacture of which I should have welcomed a simple explanation. Dr. Edwin Gregory and Eric N. Simons are explaining in a simple manner the whole manufacture of steel. I hope readers will have their appetites whetted by this book, and that they will delve deeper still into the study of steel manufacture and seek the explanations of many matters still puzzling steel manufacturers to-day." It would appear that Mr. Everitt's hope has been well-founded and that many engaged in this industry have been helped by this book.

The authors have taken advantage of the call for a new edition to direct attention to the ever-increasing use of the high-frequency electric crucible process and have considerably extended the chapter on this subject, much help having been given in this respect by Mr. L. F. Keeley. The introduction of a method for accurately measuring the temperature of molten steel at various stages of the melting process is bound to influence the technique of steel manufacture in the near future and in view of this, a chapter has been added on "The Quick Immersion Thermo-Couple" with the assistance of Mr. T. Land, M.A. This thermo-couple was designed by Dr. Schofield and Mr. A. Grace, the essential feature being a 13 per cent. rhodium-platinum: platinum couple of wire 0·5 mm. in diameter, lightly sheathed in vitreous (glassy) silica. Unlike normal pyrometers, it is not in constant contact with the furnace atmosphere but is designed to be plunged into liquid steel and quickly withdrawn, the temperature being read just before withdrawal, and it is claimed that the instrument will give accurate readings in from 10 to 20 seconds.

Additions have also been made to the chapter on "From Ingot to Finished Steel" and other improvements are the addition of a glossary of the principal technical terms used in steel-making. Last, but not least, the English has been still further deflated and improved.—T.F.W.

Metallurgical Experiments. By F. Johnson. D.Sc. Pp. 78. Paul Elek (Publishers), Ltd., Africa House, London, W.C.2. Price 5s,

Metallurgy might not incorrectly be called the father of engineering because were it not for the various metals and alloys produced by the metallurgist, the creations of the engineer would of necessity be vastly different from what they actually are. And yet, most engineers know very little of the science of metallurgy, and except for the routine strength tests they are usually content to accept the metals and alloys which they use without endeavouring to find out anything about their physical properties. This is undoubtedly a considerable handicap, particularly in engineering design, in view of the large number of metals and alloys which have been developed in recent years.

This little book has been written in order to remedy this state of affairs by describing briefly some 114 different experiments demonstrating the chemical reactions, physical changes and physical properties upon which the applications of metals and alloys to their diverse uses in engineering practice depend. No attempt is made to deal with the production of metals from their ores and all the experiments both quantitative and qualitative can be carried out with the more or less simple apparatus usually found in the normal chemical and physical laboratory.

The experiments cover the ferrous and non-ferrous metals together with their alloys and in addition to dealing with the investigation of chemical and physical properties include simple tests for the determination of strength, hardness and so on. A feature of some of these tests is that they are carried out on wires the drawing of which is the object of a previous set of experiments. The making of anti-friction alloys is dealt with as also is the production of the different fluxes used by the metallurgist. Useful tables of physical constants, heat colours, etc., are also included.

We would have liked to have seen a few experiments covering the investigation of the electrical properties of metals and their alloys but with this reservation we have nothing but praise for this valuable little book. The engineer or designer who has worked systematically through the experiments which it describes should be very well equipped to deal with the correct choice of the most suitable metals or alloys for his purposes.—A.R.

Electrical Installation Rules and Tables. By W. S. Ibbetson, B.Sc. Third edition. Pp. 164; illus. E. & F. N. Spon, Ltd., 57, Haymarket, London, S.W.1. Price 6s.

This useful little book, measuring only 3 in. by 5 in., can easily be carried in the pocket to afford ready reference to the tables and regulations which wiremen, contractors, engineers, architects, etc., require on the job. In addition to the essential parts of the eleventh edition (1939) of the I.E.E. Regulations, it includes extracts from the recommended war relaxations of the Regulations, together with other recent alterations and additions.

Electrical Perils and Safeguards. By F. G. W. Tree, A.M.I.E.E. Pp. 48; figs. 5. Sir Isaac Pitman & Sons, Ltd. Price 1s. 6d.

The war, on account of the increased use of electricity in industry and of the disturbances caused to electricity supply systems by bombing, has increased the risk of shock to some extent. This little book describes in simple language the causes of electrical hazards, how to avoid them, and methods of dealing with persons suffering from electric shock and with fires caused by electrical faults.—W.R.C.

Forthcoming Events

Friday, January 12th.—*Newcastle-on-Tyne.*—Mining Institute, 6 p.m. North East Coast Institution of Engineers and Shipbuilders. "Measuring Instruments for Use in Engineering and Shipbuilding," by B. A. Robinson.

Saturday, January 13th.—*London.*—Lighting Service Bureau, 2, Savoy Hill, W.C.2, 2.15 p.m. Association of Supervising Electrical Engineers. "Theatre Lighting," by L. G. Applebee.

London.—Institution of Mechanical Engineers, Storey's Gate, St. James's Park, S.W.1, 3.30 p.m. Graduates' Section. Display of films (lady guests invited).

Leeds.—Electricity Department Offices, Whitehall Road, 2.30 p.m. I.E.E. North Midland Students' Section. "Early Power Station Equipment," by E. Lunn. The address will be illustrated by lantern slides.

Crumlin.—Monmouthshire Mining and Technical College, 5 p.m. Association of Mining Electrical and Mechanical Engineers (South Wales Branch). "Flameproof Electrical Apparatus," by H. Rainford.

Monday, January 15th.—*London.*—Institution of Electrical Engineers, 7 p.m. London Students' Section. "Insulating Varnishes," by W. P. Walters, B.Sc.

Tuesday, January 16th.—*London.*—Institution of Electrical Engineers, 5.30 p.m. Radio Section. Discussion on "Frequency Allocation for Long-distance Communication Channels (Over 1,000 Miles)," to be opened by Dr. R. L. Smith-Rose.

Manchester.—Engineers' Club, 6 p.m. I.E.E. North-Western Centre. "Influence of Resistance Switching on the Design of High-voltage Air-blast Circuit-breakers," by H. E. Cox and T. W. Wilcox.

Wednesday, January 17th.—*Manchester.*—Engineers' Club, 6.30 p.m. Women's Engineering Society (Manchester Branch). "Mechanical Mishaps and Industrial Accidents," by G. E. Windeler.

Friday, January 19th.—*London.*—Institution of Electrical Engineers, 5.30 p.m. Measurements Section. "Fixing of Confidence Limits to Measurements," by H. J. Josephs.

London.—Institution of Mechanical Engineers, 5.30 p.m. Informal meeting. "The Engineer and the Nation's Money," to be introduced by A. R. Vickers, B.Sc. (Eng.).

Newcastle-on-Tyne.—Neville Hall, 6.30 p.m. I.E.E. North-Eastern Students' Section. "Electrical Properties of the Human Body," by J. M. A. Lenihan.

Sheffield.—Metallurgical Club, West Street, 6.30 p.m. Junior Institution of Engineers (Sheffield Section). Presidential address: "Steel and the Engineer," by A. Roebuck.

Saturday, January 20th.—*Manchester.*—Engineers' Club, 3 p.m. Association of Supervising Electrical Engineers (Manchester Branch). "Electrical Rules and Regulations," by T. Storrs.

Swansea.—Guildhall, 3 p.m. I.E.E. West Wales (Swansea) Sub-Centre. "Maintenance of Distribution Plant Installations on AC Networks," by F. N. Beaumont, B.Sc.(Eng.). and F. A. Geary.

Monday, January 22nd.—*London.*—Institution of Electrical Engineers, 5.30 p.m. Informal meeting. Discussion on "Applications of Electricity to Water Supply," to be opened by J. F. Shipley.

London.—Northampton Polytechnic Institute, St. John Street, E.C.1. Electrodepositors' Technical Society. "Chromate Passivation of Zinc," by Dr. S. G. Clarke and J. F. Andrews.

Manchester.—Engineers' Club, 6.30 p.m. I.E.E. North-Western Students' Section. "Development of the Stroboscope," by D. T. Broadbent.

Newcastle-on-Tyne.—Neville Hall, 6.15 p.m. I.E.E. North-Eastern Centre. "The Electrical Aspect of Farm Mechanisation," by C. A. Cameron Brown, B.Sc.

Bradford.—Technical College, 6.45 p.m. Bradford Engineering Society. "The High-rupturing-capacity Fuse and Equipment for Medium-voltage Systems," by J. Collins.

Tuesday, January 23rd.—*Luton.*—Town Hall, 7.30 p.m. Luton Electrical Society. "Fluorescent Lighting," by C. R. Bicknell, B.Sc.

Additional I.E.E. Meetings

AN additional ordinary meeting of the Institution of Electrical Engineers is to be held on Thursday, January 18th, to discuss a second report on education and training for engineers. This will deal with part-time further education at technical colleges (including courses for those returning from the Services). The report will be presented by Dr. A. P. M. Fleming, C.B.E., M.Sc., on behalf of the Education and Training and Personnel Sub-Committee of the Institution, by whom it was prepared.

An extra meeting of the Radio Section will be held on Wednesday, January 24th, when a paper on "Television Broadcasting Practice in America—1927-1944" will be presented. The author is Mr. Donald G. Fink who is at present abroad, and the paper will therefore be read by Dr. David B. Langmuir.

Television Society

THE 1945 session of the Television Society opened last week with a paper on "Separating Sound from Vision," by Dr. K. R. Sturley. Forthcoming meetings, all at the Institution of Electrical Engineers in London, are as follows:—January 24th, 5.30 p.m.: "American Television Broadcasting Practice, 1927-1944," by D. G. Fink. February 27th, 6 p.m.: Annual general meeting and discussion on "The Social Aspects of Television," to be opened by Capt. C. H. Cazaly. April 4th, 5.30 p.m. (joint meeting with I.E.E. Radio Section): "Studio Technique in Television," by D. C. Birkenshaw and D. R. Campbell. April 27th, 6 p.m.: "Beam Electrodes," by S. Rodda, B.Sc. May 29th, 6 p.m.: "The Human Eye and the Photo-cell," by Dr. W. Sommer.

Visitors are welcomed at all the Society's meetings. Tickets of admission for non-members can be obtained from the general secretary, O. S. Puckle, 8, Mill Ridge, Edgware, or the lecture secretary, G. Parr, 68, Compton Road, Winchmore Hill, N.21.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Turner & Newall, Ltd.—In a statement accompanying the accounts, Mr. W. W. F. Shepherd, the chairman, says that the company already has under detailed consideration expansion schemes entailing expenditure of over £1,500,000 on capital account within two years. These are expected to be covered comfortably from existing resources and no new issue of capital is contemplated. The consolidated balance sheet shows net current assets amounting to £6,594,000.

Thos. Bolton & Sons, Ltd., are maintaining their interim dividend at 2½ per cent.

New Companies

Radio & Television College, Ltd.—Private company. Registered in Edinburgh, December 29th. Capital, £500. Objects: To carry on the business of a college or school for the teaching of the principles and practice of radio and telecommunication and carry on the business of buyers and sellers of radio apparatus, etc. Directors: A. M. Cowie, 25, Heathwood Drive, Orchard Park, Thornliebank, Renfrewshire; W. Nightingale, 15, Woodside Terrace, Glasgow, and S. Barclay, Boden Street, Glasgow. Registered office: 45, Renfrew Street, Glasgow.

Eddy's (Nottingham), Ltd.—Private company. Registered December 28th. Capital, £100. Objects: To acquire the business of retail dealers in wireless and electrical goods, etc. carried on by Edward Abrams, as Eunice Radio, at 135, Alfreton Road, Nottingham. Directors: E. Abrams and Eunice Abrams, both of 32, Pattendale Road, Woodthorpe, Notts. Registered office: 135, Alfreton Road, Nottingham.

Imp Radio, Ltd.—Private company. Registered December 28th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, radio and television sets, electrical apparatus, batteries, etc. Subscribers: D. L. Hickson and D. Sutherland, 76, New Cavendish Street, W.1.

D. Bradman, Ltd.—Private company. Registered January 3rd. Capital, £2,000. Objects: To carry on the business of manufacturers of, and dealers in, electrical fittings, shades, lamps, accumulators, batteries, wireless sets, etc. Directors: Annie Bradman, D. Bradman and H. Bradman, all of 61, High Road, N.15. Registered office: 61, High Road, Tottenham, N.15.

Wipac Development, Ltd.—Private company. Registered December 30th. Capital, £100. Objects: To carry on the business of electrical and mechanical engineers, electricians, etc. Subscribers: C. B. Jarman, The Retreat, Castlethorpe, Bucks and C. Akers, C.A., 1, Queen Victoria Street, E.C.4. Solicitors: Hyman Isaacs & Co., Audrey House, E.C.1.

E. A. Harvey, Ltd.—Private company. Registered December 28th. Capital, £1,500. Objects: To acquire the business of an electrical engineer and contractor carried on by Ernest A. Harvey, at Burton Street, Nottingham, and to carry on the business of electrical, motor, mechanical and general engineers, wireless service agents, etc. Directors: E. A. Harvey, 64, Cromwell Street, and H. Haw, 7, Forest Grove, Colville Street, both of Nottingham. Registered office: 26, Burton Street, Nottingham.

Companies Struck Off the Register

The following companies have been struck off the Register and are thereby dissolved:—Gainsborough Radio, Ltd., and the Pluperfect Refrigeration Co., Ltd.

Companies' Returns

Statements of Capital

London Electric Wire Co. & Smiths, Ltd.—Capital, £1,250,000 in £1 shares (750,000 ordinary and 500,000 preference). Return dated July 6th, 1944. 684,070 ordinary and 400,000 preferred shares taken up. £350,035 paid. £734,035 considered as paid. Mortgages and charges: Nil.

Frinton-on-Sea & District Electric Light & Power Co., Ltd.—Capital, £100,000 in £1 shares. Return dated July 19th, 1944. 80,000 shares taken up. £80,000 paid. Mortgages and charges: Nil.

Monmouth Electricity Co., Ltd.—Capital, £50,000 in £1 shares (all ordinary). Return dated July 19th, 1944 (filed August 14th, 1944). 35,000 shares taken up. £35,000 paid. Mortgages and charges: Nil.

Mortgages and Charges

Electrical Utilities, Ltd.—Satisfaction in full on December 1st, of mortgage dated November 2nd, 1942, and registered November 6th, 1942.

Liquidations

I.C.I. (Plastics), Ltd. and **I.C.I. (Alkali), Ltd.**—With a view to the transfer of the whole of their undertakings, assets and liabilities to Imperial Chemical Industries, Ltd., these two companies are being wound up voluntarily. Mr. C. S. Guthrie, of I.C.I. (Plastics), Ltd., Ltd., Black Fan Road, Welwyn Garden City, has been appointed liquidator of the former company, and Mr. J. K. Batty and Mr. D. Drummond, both of I.C.I. (Alkali), Ltd., Winnington, Northwich, liquidators of the other company.

Bankruptcies

D. F. Wilkinson, electrical engineer, lately carrying on business at 238, Stockingstone Road, Luton.—Order made November 30th suspending discharge for twelve months.

P. W. Penty, electrical contractor, trading as Sackville Electrical Co., 38, Mannville Terrace, Morley Street, Bradford.—Proofs for dividend by January 20th to the trustee, Mr. E. T. Sanders, Hallfield Chambers, 71, Manningham Lane, Bradford, Official Receiver.

STOCKS AND SHARES

TUESDAY EVENING.

PRICES of Stock Exchange securities have started 1945 in good form. The gilt-edged group is noticeably firm, and this exercises a favourable influence over all the investment markets. Home Railway stocks are held steady by the near approach of dividend announcements. In the accompanying list of prices in the manufacturing and equipment section, a number of fresh advances have occurred this year. The satisfactory advance in the Cossor dividend, noted last week, has been a hardening factor in the radio section.

Electricity Supply

For several weeks past there have been no price movements worth mentioning in the group of Home electricity supply companies. Fluctuations have not exceeded more than 6d. a share where they have occurred amongst the ordinary shares, although in the preference list a few prices have moved up during the past month or so. The stolid front presented by the ordinary shares calls for attention as being noteworthy in view of the various factors, some favourable, others the reverse, that concern the industry as a whole. In pre-war days, rises in the price of coal and other costs would have been followed inevitably by dullness in the share prices. Added to these rising costs there has been, and still is, the risk of damage by enemy action. Yet none of these things exerts any influence over the stability of prices.

The Rises

International Combustion have risen 5s. to 6¾, a little demand finding no adequate supply available to meet it. Ever Ready shares are 1/16 higher at 43s. 9d. Tube Investments at 55s. 8d. are 3s. 9d. better. Mather & Platt have improved to 56s. 3d., General Electrics to 98s. 6d. Revo 10s. shares at 44s. 6d. gained the pence. S. Smith (England) rose to 86s. 6d.

Cable & Wireless stocks retain their last week's improvements and Globe Telegraph ordinary are 1s. 6d. higher at 42s. 6d. International "Tel. and Tel." continue to progress : at 24 the price shows a point rise. Brazilian Tractions, also a dollar stock, put on ¼, and are 26¾. The Calcutta Tramways excitement subsided. Of last week's 7s. fall, 1s. has been recovered, the price rallying to 62s. 6d.

Twenty Per Cent. Dividends

British Insulated and Callender's Cable keep together, neck and neck, rises of 1/16 taking the prices of both shares to 116s. 3d. Henley's, which are 5s. shares, have hardened to 27s. 9d., equivalent to 111s. for £1 shares. All three companies are paying 20 per cent. dividends. The yield on the first two is £3 8s. 9d. per cent.; Henley's return £3 12s. per cent. Ericsson Telephones 5s. shares receive 20 per cent. tax free. The shares are 1/16 higher at 55s., and at the latter figure give £1 16s. 6d. per cent. net, equivalent, of course, to £3 13s. per cent. gross, with tax at 10s. Murex is another company paying 20 per cent., the £1 shares at 5 1/16 yielding £3 19s., while Ransome & Marles at 87s. 6d. give £4 11s. 4d. on the present paid 20 per cent. dividend. Newman Industries, Switchgear & Cowans, Thorn Electric and Ward & Goldstone are amongst those that are now paying 20 per cent. dividends on their ordinary shares.

General Electric

The Stock Exchange Committee, appealed to, upheld the refusal of its Sub-Committee to the application for permission to deal in 2,000,000 new 4¼ per cent. "C" preference shares issued by the General Electric Company to pay off a loan contracted in the early days of the war. The 2,000,000 shares were taken by Morgan Grenfell, the bankers, at 20s. The firm was paid a commission of £30,000 for its services in the matter and it distributed a large proportion of the shares to various financial interests. The Stock Exchange Committee was asked to grant permission to deal in these 2,000,000 new shares, the price of which would have opened in the market on the basis of 21s., thereby offering the original purchasers a good profit on the deal.

Different Angles

The General Electric Company has 27,000 shareholders and apparently the Treasury took the view that to offer 2,000,000 shares amongst 27,000 shareholders would not only involve a great deal of work, but might divert money which otherwise would go towards the national war effort. The Stock Exchange Committee regarded the affair from a different angle, and, as already mentioned, declined to give the necessary leave to deal in the shares. There the matter rests at the present time. Out of the 2,000,000 shares 150,000 had been reserved as a kind of concession for assisting to make a market. These have been sold back at 20s. 6d. to the banking house.

Radio Group

The increase in the dividend on E. K. Cole shares to 20 per cent., following upon 15 per cent. in 1943 and 10 per cent. for 1942, was not unexpected, but the figures shown in the accounts were considered remarkably good. As a consequence, the price rose from 37s. 6d. to 40s., easing off a little from the best on a certain amount of selling that met the buying

(*Continued on page* 72)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Jan. 9	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Ordinary					
Bournemouth and Poole	12½	12½	62/6	..	4 0 0
British Power and Light	7	7	33/–	..	4 4 10
City of London	7	5½	30/–	..	3 13 4
Clyde Valley	8	8	42/–	..	3 16 0
County of London	8	8	43/–	..	3 14 5
Edmundsons	6	6	32/–	+1/–	3 15 0
Elec. Dis. Yorkshire	9	9	45/6	..	3 19 6
Elec. Fin. and Securities	12½	13½	60/6	..	4 9 0
Elec. Supply Corporation	10	10	50/6	..	3 18 6
Lancs. Light and Power	7½	7½	37/–	..	4 1 1
Llanelly Elec.	6	6	26/6	..	4 10 7
Lond. Assoc. Electric	3	4	26/–	..	3 1 6
London Electric	6	6	30/6	..	3 18 8
Metropolitan E.S.	8	8	43/–	..	3 14 5
Midland Counties	8	8	41/6	..	3 17 0
Mid. Elec. Power	9	9	44/–	..	4 1 10
Newcastle Elec.	7	7	32/–	..	4 7 6
North Eastern Elec.	7	7	34/6	..	4 1 2
Northampton	10	10	50/–	..	4 0 0
Northmet Power	7	7	41/–	..	3 8 4
Richmond Elec.	6	6	26/–	..	4 12 4
Scottish Power	8	8	40/6	..	3 19 0
Southern Areas	5	5	23/–	..	4 7 0
South London	7	7	30/–	..	4 13 4
West Devon	5	5	24/–	..	4 3 4
West Glos.	4½	3½	25/–	..	2 16 0
Yorkshire Elec.	8	8	43/–	..	3 14 5
Public Boards					
Central Electricity					
1955–75	5	5	115	..	4 7 0
1951–73	4½	4½	106	..	4 5 0
1963–93	3½	3½	104	..	3 7 4
1974–94	3½	3½	100½	..	3 4 8
London Elec. Trans.	2½	2½	98xd	..	2 11 0
London & Home Counties 1955–75	4½	4½	112	..	4 0 4
Lond. Pass. Trans. Bd.					
A	4½	4½	121½	..	3 14 1
B	5	5	122½	..	4 1 8
C	3	3½	69	..	4 14 2
West Midlands J.E.A. 1948–68	5	5	106½	..	4 14 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	7/–	..	—
Calcutta Elec.	6*	6*	46/6	..	2 11 9
Cawnpore Elec.	10	7	41/3	..	3 7 9
East African Power	7	7	35/–	..	4 0 0
Jerusalem Elec.	7	5	29/–	..	3 9 0
Kalgoorlie (10/–)	5	5	10/6	..	4 15 3
Madras Elec.	Nil	4	30/6	..	2 12 4
Montreal Power	1½	1½	25½	+½	—
Nigerian Elec.	8	10	37/–	..	5 8 1
Palestine Elec. "A"	5*	5*	38/6	..	2 12 0
Perak Hydro-elec.	6	7	12/6	..	—
Tokyo Elec. 6%	6	6	24	..	—
Victoria Falls Power	15	15	90/–xd	..	3 7 7
Whitehall Inv. Pref.	—	6	26/–	..	4 12 4

Company	Dividend Previous	Dividend Last	Middle Price Jan. 9	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord.	15	15	61/–	..	4 18 4
Assoc. Brit. Eng.	6	7	57/6	..	2 8 9
Assoc. Elec.:					
Ord.	10	10	58/–	..	3 9 0
Pref.	8	8	40/–	..	4 0 0
Automatic Tel. & El.	12½	12½	67/6	..	3 14 0
Babcock & Wilcox	11	11	54/–	+1/–	4 1 6
British Aluminium	10	10	46/–	..	4 7 0
British Insul. Ord.	20	20	5 11/16	+1/16	3 8 9
British Thermostat (5/–)	18½	18½	21/3	..	4 7 0
British Vac. Cleaner (5/–)	30	30	32/6	..	4 12 3
Brush Ord. (5/–)	8	9	11/–	..	4 1 9
Burco (5/–)	15	15	15/9	–9d.	4 15 3
Callender's	15	20	5 11/16	+1/16	3 8 9
Chloride Elec. Storage	15	15	85/–	..	3 10 7
Christy Bros.	12½	17½	80/–	..	4 7 6
Cole, E. K. (5/–)	15	20	38/9	+1/16	2 11 6
Consolidated Signal	24	27½	6¾	..	4 1 6
Cossor, A. C. (5/–)	7½*	10*	33/–	+6d.	1 10 4
Crabtree (10/–)	17½	17½	44/–	..	3 19 7
Crompton Parkinson Ord. (5/–)	20	22½	33/6	..	3 7 3
De La Rue	35	40	9½	..	4 2 0
E.M.I. (10/–)	6	8	37/–	+1/6	2 3 3
Elec. Construction	10	12½	61/3	..	4 1 8
Enfield Cable Ord.	12½	12½	64/–	..	3 18 2
English Electric	10	10	56/6	..	3 10 6
Ensign Lamps (5/–)	25	15	21/3	..	3 10 8
Ericsson Tel. (5/–)	22*	20*	55/–	+1/16	1 16 6
Ever Ready (5/–)	40	40	43/9	+1/16	4 11 4
Falk Stadelmann	7½	7½	34/6	..	4 7 0
Ferranti Pref.	7	7	31/9	..	4 8 2
G.E.C.:					
Pref.	6½	6½	34/–	..	3 16 4
Ord.	17½	17½	98/6	+6d.	3 11 0
General Cable (5/–)	15	15	17/–	..	4 8 3
Greenwood & Batley	15	15	48/9xd	+6d.	6 3 0
Hall Telephone (10/–)	12½	12½	31/6	..	3 19 4
Henley's (5/–)	20	20	27/9	+3d.	3 12 0
4½% Pref.	4½	4½	24/–	..	3 15 0
Hopkinsons	15	17½	73/9	..	4 12 9
India Rubber Pref.	5½	5½	23/–	..	4 14 9
Intl. Combustion	30	30	6¼	+¼	4 8 9
Johnson & Phillips	15	15	79/–	..	3 15 9
Lancashire Dynamo	22½	22½	100/–	..	4 10 0
Laurence, Scott (5/–)	12½	12½	14/–	..	4 9 3
London Elec. Wire	7½	7½	38/–	..	3 19 0
Mather & Platt	10	10	56/3	+1/16	3 11 2
Metal Industries (B)	8	8½	49/–	..	3 9 6
Met. Elec. Cable Pref.	5½	5½	21/3	..	5 3 6
Mid. Elec. Mfg.	25	25	7 1/16	..	3 9 10
Murex	20	20	5 1/16	..	3 19 0
Newman Ind. (2/–)	20	20	7/3	..	5 10 0
Philco (2/–)	—	—	15/–	..	—
Power Securities	6	6	29/6	..	4 1 4
Pye Deferred (5/–)	25	25	33/9	..	3 14 0
Ransome & Marles	20	20	87/6	..	4 11 4
Revo (10/–)	17½	17½	44/6	+6d.	3 18 7
Reyrolle	12½	12½	72/6	..	3 9 0

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Jan. 9	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing (*Continued*)					
Siemens Ord. ..	7½	7½	36/–	..	4 3 4
Strand Elec. (5/–)	10	12½	11/6	..	5 8 8
Switchgear & Cowans (5/–) ..	20	20	20/9	..	4 16 7
T.C.C. (10/–) ..	5	7½	25/–	..	3 0 0
T.C. & M. ..	10	10	56/–	..	3 11 6
TelephoneMfg.(5/–)	9	9	12/–	..	3 15 0
Thorn Elec. (5/–)	20	20	28/9	..	3 9 6
Tube Investments	20	22½	5⅝	+⅜	4 0 1
Vactric (5/–) ..	Nil	22½	17/6	..	6 8 6
Veritys (5/–) ..	7½	7½	9/–	..	4 3 4
WalsallConduits(4/–)	55	55	52/6	..	4 3 10
Ward & Goldstone (5/–)	20	20	30/–	..	3 6 8
WestinghouseBrake	12½	14	75/–	..	3 14 8
West, Allen (5/–)	7½	7½	8/9	..	4 5 9
Traction and Transport					
Anglo-Arg. Trans.:					
First Pref. (£5)	Nil	Nil	2/6	..	—
4% Inc. ..	Nil	Nil	6½	..	—
Brit. Elec. Traction:					
Def. Ord. ..	45	45	1200	..	3 15 0
Pref. Ord. ..	8	8	190	..	4 4 3
Bristol Trams ..	10	10	57/–	..	3 10 2
Brazil Traction ..	1⅔	2	26¼	+⅓	7 9 6
Calcutta Trams	6½	7½	62/6	+1/–	2 7 9
Cape Elec. Trams	5	6	26/–	..	+ 12 4
Lancs. Transport	10	10	47/6	..	4 4 3
Southern Rly.:					
5% Prefd. ..	5	5	78	..	6 8 2
5% Pref. ..	5	5	119	..	4 4 0
T. Tilling ..	10	10	62/–	..	3 4 6
West Riding ..	10	10	47/6	..	4 4 2
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	124½	+½	4 16 5
Def.	1½	1½	30	..	5 0 0
Anglo-Portuguese	8	8	29/6	..	5 8 6
Cable & Wireless:					
5½% Pref. ..	5½	5½	118	..	4 13 3
Ord.	4	4	85	..	4 14 2
CanadianMarconi	$1 Nil	4cts.	9/6	..	—
Globe Tel. & Tel.:					
Ord.	8¼*	5*	42/6	+1/6	2 7 1
Pref.	6	6	31/–	..	3 17 5
Great Northern Tel. (£10)	Nil	Nil	28	..	—
Inter. Tel. & Tel.	Nil	Nil	24	+1	—
Marconi-Marine..	7½	7½	35/6	..	4 4 6
Oriental Tel. Ord.	16	10	48/–	..	—
Telephone Props.	Nil	6	20/–	..	6 0 0
Tele. Rentals (5/–)	10	10	12/3xd	..	4 1 8

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 70)

movement. At 38s. 9d. the 20 per cent. dividend gives a return of £2 11s. 6d. per cent. on the money, clear evidence of the hopeful post-war prospects.

E.M.I. shares came into fresh demand and at 37s. are 1s. 6d. higher on the week. Broadcast Relay at 21s. 9d. and Ultra Electrics at 9s. 9d. have hardened. J. & F. Stone keep steady at 8s. 6d., and Scophony at 4s. 6d.

E. K. Cole

E.K. Cole was registered as a private company in 1926 and was made public four years later. It manufactures all classes of radio receivers and radiograms, also bakelite mouldings and test gear. It had a substantial interest in Scophony but disposed of this in 1943. It will be remembered that in the same year E. K. Cole acquired Ensign Lamps, Ltd. The E. K. Cole dividend record has been chequered. In 1939 and 1940, the ordinary shareholders went without a dividend, but in 1936 the company paid 30 per cent. out of earnings of 79 per cent. The price of the shares in the black days of 1940 fell to 2s. 6d.; the current quotation is practically the highest reached since the company was made public.

Watford Electric

Since the delayed issue of Watford Electric & Manufacturing Company's shares was made, a good deal of business has materialised in the shares. Both the ordinary and the preference have achieved a fair amount of popularity. The 6 per cent. preference shares of 10s. each, offered at 10s. 6d. to the shareholders in the proportion of one new preference for five old preference held, now stand at 12s. middle, giving at that price a yield of 5 per cent. on the money. Shares can be obtained in the market at 12s. 3d., affording £4 18s. per cent. and at the moment they can be bought free of stamp and fee. The ordinary shares, also offered in the proportion of one in five, at 4s. 1½d., are quoted at 2s. premium. These are, naturally the more speculative of the two.

Line upon Line

There are 4,000 Mid-Cheshire Electric ordinary on offer at 39s. 9d., yielding a few pence over 4 per cent. on the money. In the London group, Metropolitans at 43s. 6d. return £3 13s. 6d. and London Electric Supply at 31s. 3d. give £3 16s. 9d. Lines of 3,000 London Associated Electric at 26s., and ten thousand Scottish Power at 40s. 7½d., afford £3 1s. 6d. per cent. and £3 18s. 6d. per cent. respectively. All these yields are based, of course, upon the dividends last paid by the respective companies, and the return per cent. will be regarded as being modest enough. Nevertheless, investment continues to absorb them and probability points to the likelihood of there being still scope for expansion in the quotations.

NEW PATENTS

Electrical Specifications Recently Published

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

ARROW Electric Switches, Ltd.—" Slow-break electric switches." 10414/43. July 25th, 1942. (566217.)

British Thermostat Co., Ltd., and W. F. F. Martin-Hurst.—" Valves for controlling the flow of fluids." 9289. June 9th, 1943. (566211.)

British Thomson-Houston Co., Ltd. — " Electric discharge devices." 6140/43. April 21st, 1942. (566300.) " Electric circuit-interrupting devices." 9407/43. June 16th, 1942. (566310.)

British Thomson-Houston Co., Ltd., and L. C. Ludbrook.—" Electro-magnetic gauges." 11340. July 13th, 1943. (566227.)

British Thomson-Houston Co., Ltd., W. E. Gough, J. H. Pollard, S. A. Couling and R. H. Collingham.—" Electrical ignition apparatus for use on aircraft." 381. January 9th, 1942. (Addition to 545540.) (566283.)

R. Calvert, G. G. Gouriet and E. Davies.— " Electrical frequency-dividing, counting and time-base circuits." 10160. June 23rd, 1943. (566215.)

J. Davis & Son (Derby), Ltd., and C. Dawson. —" Electric switch mechanisms more especially for use in controlling shot-firing in mines." 11649. July 17th, 1943. (566229.)

Dorman & Smith, Ltd., and T. Atherton.— " High-rupturing capacity electric fuses." Cognate applications 6911/43 and 7682/43. May 1st, 1943. (566303.)

Ferranti, Ltd., M. K. Taylor and I. N. Vaughan-Jones. — " Super-regenerative receivers." 8740. June 1st, 1943. (566209.)

A. S. Green, T. Astley and R. Birchenough.— " Coupling and static electrical earth bonding device for pipes." 16843. October 14th, 1943. (566279.)

Igranic Electric Co., Ltd.—" Drives for valves and the like." 10518/43. June 29th, 1942. (566260.)

J. E. Rhys-Jones and Plessey Co., Ltd.— " Radio aerial systems particularly of the direction-finding type." 14372. October 14th, 1942. (566286.)

Kirkstall Forge, Ltd., and F. R. Cowell.— " Transmission gearing for trolley-buses." 5547. April 7th, 1943. (566331.)

Kodak, Ltd. — " Electric lamp sockets." 8549/43. June 22nd, 1942. (566250.)

Landis & Gyr Soc. Anon.—" Alternating current power switches." 15054/42. November 13th, 1941. (566192.) " Coin-inlet mechanism for use on prepayment apparatus operating with coins of different values." 17808/42. December 16th, 1941. (Addition to 480552.) (566194.)

Linde Air Products Co.—" Electric welding systems using fusible electrodes." 6748/43. May 14th, 1942. (566204.)

J. L. P. MacNair and G. E. Gardam.— " Electrodeposition of chromium." 10564. January 8th, 1943. (Divided out of 15071/41.) (566218.)

K. Manheimer.—" Electric lighting fittings." 8398. May 26th, 1943. (566207.)

Marconi's Wireless Telegraph Co., Ltd.— " Radio transmission systems." 10310/43. June 26th, 1942. (566259.)

Nalder Bros. & Thompson, Ltd., and J. C. Redman.—" Electrical measuring instruments." 11706. July 19th, 1943. (566230.)

N. Pensabene. — " Dynamo-electric machines." 8910. June 3rd, 1943. (566210.)

Philco Radio & Television Corporation.— " Apparatus for receiving frequency-modulated waves." 9543/43. June 13th, 1942. (566255.)

A. Phillips, Ltd., and C. E. M. Shakeshaft.— " Prepayment meter mechanism." 1355. January 27th, 1943. (566196.)

Pyrotenax, Ltd., and F. W. Tomlinson.— " Insulated electric conductors." 9752. June 17th, 1943. (566316.)

Reavell & Co., Ltd., and T. T. Mayers.— " Pneumatically operated switches more particularly switches for stopping and starting electric motors driving air compressors." 10873. July 5th, 1943. (566261.)

Revo Electric Co., Ltd., and F. H. Reeves.— " Electric-lamp fittings." 8546. May 28th, 1943. (566208.)

P. F. Roberts.—" Inductances and transformers containing laminated cores by the use of which efficiency is increased." 10756. July 2nd, 1943. (566221.)

S. Rothschild and Cathodeon, Ltd.—" Means for the indication of infra-red radiation." 13505. June 31st, 1943. (566278.)

K. F. Rushton.—" Holders for electric light bulbs." 7624. May 13th, 1943. (566244.)

Santon, Ltd., and R. J. Trevelyan.—" Method for making soldered joints." 12104. July 26th, 1943. (566265.)

Standard Telephones & Cables, Ltd.— " Telephone cord connector." 7262/43. July 7th, 1942. (566205.) " Method of and means for attaching a lead-out conductor to an electrode of an electric vacuum tube." 11163/43. August 27th, 1942. (566225.)

J. Warne and F. Garside.—" Primary electrical batteries." 5455. April 6th, 1943. (566241.) " Electric torches, flash-lamps and the like." 5456. April 6th, 1943. (566242.)

Westinghouse Electric International Co.— " Electric circuit interrupters." 13612/42. September 26th, 1941. (566191.)

Radio on Railways

TESTS of a two-way radio system have been carried out on the Canadian National Railways by the Canadian Marconi Co. A 50-W transmitter of the frequency modulated type is used, operating on 36·6 Mc/s. Two steam locomotives, a Diesel and an electric have been equipped with the necessary apparatus for communication with the chief train controller in the signal control tower at Montreal. A range of 20 miles is possible, but for the purpose of the tests only about half this is required.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

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

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

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

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

Orders Placed

Glasgow.—Electricity Committee. Accepted. Meters.—Aron Electricity Meter; Metropolitan-Vickers Electrical Co.; Measurement: and Sangamo Weston.

Hull.—Electricity Committee. Accepted. 30,000-kW turbine (£162,853).—General Electric Co. Stacks and ducts (£287,204. revised).—Clarke, Chapman & Co. Piping (£36,455).—Aiton & Co.

Manchester.—Electricity Committee. Accepted. Supervisory control equipment.—Standard Telephones & Cables. Battery and charging equipment.—Britannia Batteries. Weldless steel lamp columns and fittings (annual contract).—Bromford Tube Co.; Stewarts & Lloyds. Auxiliary steam pipes.—Babcock & Wilcox.

Warrington.—Electricity Committee. Accepted. Reinforced concrete chimney (£11,235).—Simon Carves. Interconnector cabling (£1,958), plus laying at time rates.—British Insulated Cables. 50-ton electric crane (£4,425).—Wharton Crane & Hoist Co. Cables for twelve months.—British Insulated Cables.

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.

Ancoats.—Workshop. Sandford Street: Jones & Dalrymple, architects, 178. Oxford Road, Chorlton-upon-Medlock. Manchester.

Reinstatement of works after fire. Woodward Place; Halliday & Agate, 14. John Dalton Street, Manchester, 2.

Bolton.—Works additions, Thomas Street; James Lever & Sons, Ltd.

Bournemouth.—Additions, 83-5, Gladstone Road: Cleveland Industries, Ltd.

Additions, 36, Commercial Road: W. Timpson, Ltd.

Cheltenham.—Works additions, Portland Street: M. E. Stace & Co., Ltd.

Dumfries.—Extensions at Dumfries and Galloway Joint Sanatorium (£4,150); medical superintendent.

Essex.—Canteen additions, technical college, Chelmsford (£3,221); county architect.

Heaton Chapel.—Offices and stores: Wellington Tyre Co., Warwick House, Warwick Road.

Hull.—Housing development, Sutton; Fisher & Hollingsworth, architects.

Hulme.—Factory. Melbourne Street and Bradshaw Street; D. Howick, 1, Brazennose Street, Manchester, 2.

Keighley.—Civic Centre at College Street and Hanover Street; R. C. Gibson, borough engineer.

Langley Moor (Co. Durham).—Factory for Woodhouse & Smith, hosiers, Nottingham.

Maidstone.—Workshops, College Avenue for Catchment Board (£2,608); E. W. Tyler & Co., Ltd.

Mansfield.—Substation, Rock Valley; Barringer, Wallis & Manners, Ltd.

Miles Platting.—Rebuilding workshop, New Street, after fire; E. L. Doyle, architect, 26, Hollins Lane, Marple Bridge, Marple.

Oldham.—Works additions, Daniel Street; Meredith & Drew, Ltd., biscuit manufacturers, Potato Crisp Dept.

Preston.—School, Ribbleton estate; J. E. Foster, borough surveyor.

Rochdale.—Additions to Lark Mills; John Bright & Bro., Ltd., cotton spinners, Fieldhouse Mills.

Sheffield.—Office, showrooms and warehouse, Leppings Lane; J. C. & M. Wortley.

South Shields.—Schemes for building new fever hospital, extension of maternity hospital and provision of an out-patients' department and reconstruction of kitchen at the general hospital; N. G. Richardson, borough engineer, Town Hall, South Shields.

Stockton-on-Tees.—Additions to malleable steel works; South Durham Steel & Iron Co.

Stretford.—Works additions, Ayres Road; Switchgear & Cowans, Ltd.

Works additions, Frazer Road; Wood Straw Co., Ltd.

Works additions, Ashburton Road; Massey Harris, Ltd.

Laboratory, Frazer Road; Sterling Varnish Co., Ltd.

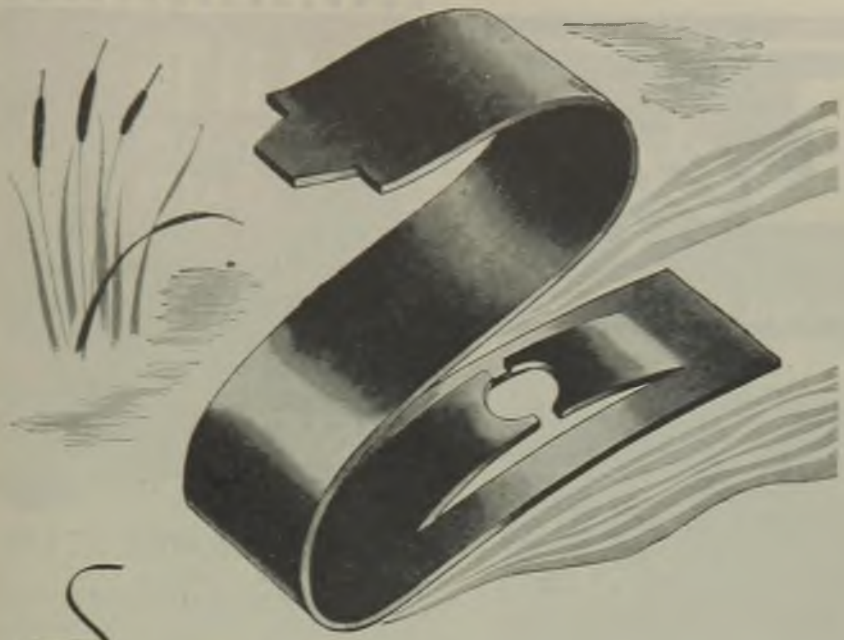
Swansea.—Factory additions, Landore; Welsh Boxes, Ltd.

Warrington.—Extensions to Town Hall, Bank Park; J. Y. Hughes, borough surveyor.

West Hartlepool.—Two additional central kitchens; borough engineer.

York.—Training college, hostel, principal's house, gymnasium, Heslington; governors of St. John's Training College, Lord Mayor's Walk, York.

Works additions, Wiggington Road; Rowntree & Co., Ltd.



Swan song

They say that when the swan sings it is about to die. Our swan (which the artist has tricked up out of a Spire fixing) heralds the demise of the millions of nuts and washers that it replaces. Spire fixings take many forms. They do the job of a nut and washer, but they do it with more efficiency and less effort on the part of the operator. Many Spire fixings are integral with the component that is to be fixed so that no nut or washer at all is needed. The Spire 'idea' is not restricted to 'nut and bolt' assemblies. Whenever there is a fixing, clamping, holding job to do there is a chance that Spire could help you. So if you will tell us your immediate assembly problem — we shall gladly design yet another. It may not be as elegant as the Swan but it will do a job of work reducing your assembly time and saving material and cost for you.

That's FIXED That!

Here's a little chap in action. Reference No. NU 531. Its uses are legion. Wherever there is blind assembly work, wherever your operatives are fumbling with nuts and washers the NU 531 will save time and cost and a lot of bad temper. Clip it into position and it stays 'put' until you are ready to tighten up the screw. No washer needed of course.

Spire

★ A BETTER way of fixing

Simmonds Aerocessories Limited · Great West Road, London. A Company of the Simmonds Group

CLASSIFIED ADVERTISEMENTS

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

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

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

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

Original testimonials should not be sent with applications for employment.

OFFICIAL NOTICES TENDERS, ETC.

GELLYGAER URBAN DISTRICT COUNCIL

TENDERS are invited for the supply and delivery of:

(a) Indoor and Outdoor Transformers.
(b) Kiosk complete with switchgear and accessories.
(c) E.H.T. and L.T. Cable.
(d) Overhead Line Equipment.
(e) Wood Poles.

Specification and tender form may be obtained from the Electrical Engineer and Manager, Electricity Offices, Hanbury Road, Bargoed, Glam.

Tenders, in plain sealed envelopes (which must not bear any mark or name indicating the sender), bearing the words "Tender for ——," must reach me not later than 10 a.m. on Saturday, the 3rd day of February, 1945.

The Council does not bind itself to accept the lowest or any tender.

BERNARD M. MURPHY.
Clerk of the Council.

Council Offices,
Hengoed, Glam.
1st January, 1945. 1220

SITUATIONS VACANT

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

COUNTY BOROUGH OF EASTBOURNE

Electricity Department

Chief Clerk and Administrative Assistant

APPLICATIONS are invited for the position of Chief Clerk and Administrative Assistant with the above Undertaking.

Applicants must have had a sound commercial training and extensive experience in the administrative work of an Electricity Undertaking, including modern methods of costing, preparation of accounts, framing of tariffs, etc., and the control of clerical staff.

The salary will be £450 per annum, plus war bonus (at present £60 per annum).

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

Form of application may be obtained from the undersigned, and this should be completed in candidates' own handwriting and returned in a plain sealed envelope endorsed "Chief Clerk and Administrative Assistant," not later than Monday, 5th February next, to the undermentioned address.

N. BOYDELL, M.I.E.E., A.M.I.Mech.E.,
Borough Electrical Engineer and Manager.

St. Winifred's,
Fairfield Road,
Eastbourne.
January, 1945. 1244

SHEFFIELD CORPORATION ELECTRICITY DEPARTMENT

Temporary Appointment of Contracts Engineer and Clerk of Works

APPLICATIONS are invited for the position of Contracts Engineer and Clerk of Works. Whilst the vacancy at present advertised is a temporary one, opportunities will be occurring for the holder, if satisfactory, to fill a future vacancy on the permanent staff.

Applicants must have had a thorough mechanical engineering training, preferably including experience in a manufacturing engineering works, and possess a degree or equivalent technical qualifications admitting to Corporate Membership of the Institution of Mechanical and/or Electrical Engineers.

The successful candidate will be required to give general assistance with the extensions at the generating stations and supervise the erection of the plant, also to carry out such additional duties as may be assigned to him.

The salary will be in accordance with Class M, Grade 7, of the National Joint Board Scale, Supplemental Schedule B, which is at present £618, and the successful candidate will be required to pass a medical examination.

Form of application may be obtained from the undersigned. Canvassing or any communication with a member of the Council, either directly or indirectly, is prohibited, and will be a disqualification.

The latest date for receipt of application is Monday, 29th January, 1945.

JOHN R. STRUTHERS,
General Manager and Engineer.

Commercial Street,
Sheffield, 1.
2nd January, 1945. 1231

ROYAL TECHNICAL COLLEGE, SALFORD

(Principal: J. E. Richardson, Ph.D., B.Eng., M.I.E.E., A.M.I.Mech.E.)

APPLICATIONS are invited for the post of full-time Lecturer in Electrical Engineering, to commence duties as soon as possible after Easter, 1945. Applicants must have had industrial experience and be capable of teaching Design of Electrical Machinery up to the Higher National and London University Final B.Sc. degree standard, together with at least one other advanced electrical subject.

Salary in accordance with the Burnham Technical Scale, plus war bonus, with allowance for approved industrial experience.

Application forms and further particulars may be obtained from the Principal, Royal Technical College, Peel Park, Salford 5, Lancashire, to whom applications should be returned not later than 22nd January, 1945.

H. H. TOMSON,
Clerk to the Governors.
1182

ASSISTANT Storekeepers (2), exempt or discharged military service, with knowledge electrical/radio apparatus, required for American company's King's Cross premises. Salary £4—£4 10s. p.w. according experience. Apply, giving age, experience.—Box 1225, c/o The Electrical Review.

AFTER restrictions on the engagement of labour are removed a well-established firm of electrical power switchgear and domestic appliance manufacturers in the London area desire to engage men for the following permanent positions: (a) Draughtsman to take charge of small drawing office; (b) Draughtsman for development of new electrical equipment; (c) Works Engineer with knowledge of tool design and production, and able to supervise plant maintenance. Applicants should write as soon as possible, giving fullest details of previous experience, employers and salaries earned. This information will be dealt with in strictest confidence. Only men of initiative and with sound experience need apply to—Box 1215, c/o The Electrical Review.

APPLICATIONS are invited for the position of Shift Charge Engineer at a large North-West industrial power station working in conjunction with the "Grid." Candidates must have had a good practical and technical training in electrical and mechanical engineering, and experience in the operation of water tube boiler and turbo-alternator plants. Applications, stating age and giving full particulars of experience and training, accompanied by not more than three testimonials, to be sent to—Box 1201, c/o The Electrical Review.

APPLICATIONS are invited for the post of Assistant Substation Attendant. Applicants must have experience in the control of high and low tension switchboards, and in the operation of rotary convertor plant. Conditions of service and rates of pay in accordance with D.J.I.C. No. 11 Area—present rate £4 17s. 6d. per week. Applications, stating age, details of experience and enclosing copies of two testimonials, to be addressed to the undersigned not later than 22nd January, 1945.—F. Swarbrick, Engineer and Manager, Hove Corporation Electricity Department, Hove Street, Hove, 3, Sussex. 1240

CONTROL Engineer required to operate modern E.H.T. board and D.C. switchboard at generating station in Home Counties, N.J.I.C. rate 2s. 4½d. per hour. State experience, age, married or single, to—Box 1216, c/o The Electrical Review.

ENGINEER and Manager wanted by a firm of contractors for branch establishment in the Midland area. Applicant must have had considerable contracting experience, and be able to do own estimating and preparation of working drawings. Commencing salary £500. Write, stating age, experience, etc.—Box 1223, c/o The Electrical Review.

LECTURER in Radio, to assist in the training of Naval Radio Mechanics. The candidate must have had a good education in electricity or physics and have a satisfactory knowledge of radio theory and practice. Salary £350 p.a.—Electrical Department, Robert Gordon's Technical College, Aberdeen. 1187

OUTSIDE Technical Representative required. Should have established personal contacts with radio designers. Experience in design or manufacturing department of radio manufacturers desirable. Salary about £600 p.a. Age 30-45 years.—Box 1226, c/o The Electrical Review.

REPRESENTATIVES required by wholesalers for London area. Only men with live connections and commission basis. Superannuation scheme in force.—Box 1227, c/o The Electrical Review.

REQUIRED for engineering works engaged on Government work, Cricklewood area. Shorthand-Typist or Ediphone Typist. Please reply, stating experience and salary required, to—A. T., c/o Streets, 110, Old Broad Street, E.C.2. 1249

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

SUBSTATION Engineer, Borough of Barking. Applicants must be Corporate Members of the I.E.E. or hold an equivalent qualification and must have had technical and practical experience of all work connected with rotary, rectifier and static substations. The selected applicant will be responsible for the design of substations, design of all equipment, protective and supervisory systems, preparation of estimates and forms of tender, responsible for equipping, operating and maintaining all substations, also responsible for substation and fitting staff. Salary £471 p.a., in accordance with Class F, Grade 6, of the N.J.B. Schedule. The appointment will be subject to the Local Government Superannuation Act, 1937, after six months' probationary service and a satisfactory medical report. Applicants should write, quoting D.1028XA, to the Ministry of Labour and National Service, Central Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 22nd January, 1945. 1233

SENIOR Storekeeper required by electrical wholesale distributors, London area, with considerable experience and a sound knowledge of all materials usually stocked. Permanent and progressive position for suitable applicant. State fully in confidence details of positions previously held, and present employment, age, and salary required.—Box B.H.D., 1229, c/o The Electrical Review.

STORES Assistant with knowledge of electrical accessories required by London wholesaler. Apply by letter.—Messrs. Bennett & Fountain Ltd., 122, Great Titchfield Street, W.1. 1230

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

TECHNICAL Commissions in H.M. Forces. Vacancies for Engineers and Tyre Specialists as indicated below exist in the Corps of Royal Engineers and Royal Electrical and Mechanical Engineers for general service. Applications will be received from candidates up to 45 years of age who are fit for such service. Candidates need not be in possession of a university degree or other professional qualifications, although this is desirable, but they should possess technical qualifications at least up to the standard of Higher National Certificate. (1) Electrical and Mechanical Engineers (Ref. No. C.2007A): Considerable practical experience is essential and candidates are expected to be familiar with the maintenance of medium or heavy types of standard equipment. Applications will be considered from candidates experienced in any branch of electrical, mechanical or refrigerating engineering, but greater emphasis will be laid on the candidate's aptitude to handle labour and improvise rather than on experience of precision work under factory conditions. A general engineering apprenticeship, followed by practical experience in one of the following branches, is desirable: Erection and maintenance of cold storage plants, general machine shops, large prime movers of all types, power distribution, etc. (2) Mechanical Engineers for Port Maintenance and Inland Waterways, Transport Workshops, Royal Engineers (Ref. No. C.2008A): A general mechanical engineering apprenticeship in heavy industries is essential, together with experience of cranes and ropeways and erection and maintenance of heavy oil or gas engines. (3) Tyre Repair Specialists for R.E.M.E. (Ref. No. C.2009A): Experience in the installation, maintenance and operating of modern tyre repairing machinery is desirable. Candidates must be capable of inspecting and conditioning tyres and tubes and have a thorough knowledge of tyre repairing, tyre capping and re-treading. The final selection of candidates will be made as a result of an interview by a War Office Selection Board, who may recommend accepted candidates either for a direct commission or for commissioning after a period of satisfactory service in the ranks. Applicants should write, quoting the appropriate reference number, to the Ministry of Labour and National Service, Central (T. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 15th February, 1945. 1222

THE services of a really capable creative Designer required by a medium-sized firm with factories in London and South Midlands, engaged in the marine, agricultural and amusement park equipment fields, for position vacant immediately after removal of present restriction of employment. Write in confidence, full details of past experience, salaries, etc.—Box 1250, c/o The Electrical Review.

TRAVELLER wanted immediately for London firm of engineers' agents. Knowledge of springs, stampings, spinnings, etc., an asset. Particulars of qualifications, experience, age and salary required, to—L. H. Reid & Co., Abford House, Victoria, S.W.1. 1219

TYPIST Book-keeper required for electrical contractor's office. Permanent position. Write full particulars and sal. expected.—W. H. Smith, A.I.E.E., 172, Kennington Park Road, S.E.11. 6608

WORKS Manager required in London by firm of electrical measuring instrument manufacturers. Must be fully conversant with production control, time study, individual and mass production methods. Permanent position with good prospects. Write, giving full particulars of past experience and salary required—Box 1241, c/o The Electrical Review.

APPOINTMENTS FILLED

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

SITUATIONS WANTED

ELECTRICAL AND MECHANICAL ENGINEERING

BUYER requires change to progressive firm, age 40, keen enthusiastic worker, conversant with large purchases.—Box 6640, c/o The Electrical Review.

ADVERTISER (45), desiring change, requires situation as Salesman, Asst. Buyer, Order Clerk, etc. Many years' electrical trade experience.—Box 6620, c/o The Electrical Review.

A.M.I.E.E., A.M.I.Mech.E., seeks interesting spare time work, Central or West London area.—Box 6605, c/o The Electrical Review.

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

AS Department or Technical Manager in electrical mfg. firm, experience in design, manufacture, sales, B.Sc., A.M.I.E.E., London district.—Box 6616, c/o The Electrical Review.

B.Sc., A.M.I.E.E., with wide technical and practical experience of elect. distribution systems, specification and purchase of H.T. switchgear, age, 32, exempt, seeks progressive post.—Box 6624, c/o The Electrical Review.

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

ELECTRICAL and Mechanical Engineer desires to contact small manufacturer with view to producing his designs (domestic apparatus), which should have large demand in post-war period.—Box 6602, c/o The Electrical Review.

ELECTRICAL Engineer, A.M.I.E.E., desires post as Works Engineer, 25 years' experience, maintenance, construction, electrical and mechanical, age 44, exempt. —Box 6603, c/o The Electrical Review.

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

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

ELECTRICAL/Mechanical Engineer, sound commercial background, experienced on rural and similar development, H.T. and L.T. distribution, electrical installation and factory maintenance, desires position with scope in post-war period. Preferably with rural supply authority where initiative and experience will be utilised and appreciated.—Box 6601, c/o The Electrical Review.

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

FOREMAN, 20 yrs.' experience radio receivers, transmitters, D.F. equipment, amplifiers, ground communication equipment, desires change, view promotion.—Box 6628, c/o The Electrical Review.

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

VACUUM and Electronics research Controlling position required. Salary £750.—Box 6626, c/o The Electrical Review.

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

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Four	25,000 lbs. evaporation.	175 lbs.	W.P.
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One	15,000 lbs. ,,	175 lbs.	,,
One	12,000 lbs. ,,	175 lbs.	,,
One	12,000 lbs. ,,	200 lbs.	,,
One	12,000 lbs. ,,	160 lbs.	,,
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We Install complete, including brickwork. Economisers, Pumps, Piping Valves, Generating Sets and Motors in stock. Please send us your enquiries; we can give immediate delivery.

BURFORD, TAYLOR & CO. LTD.,
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FOR sale. One 7-panel metalclad Switchboard, suitable for use on a 6,600-volt, 3-phase, 50-cycle system, comprising 6 300-amp. Oil Circuit Breaker Units, B.C. 100 mVA. and one Metering Equipment Unit, made by Switchgear & Cowans in 1935.

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1221

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INDUSTRIAL INFRA-RED APPARATUS FOR PAINT DRYING.
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GUARANTEED HEAT GENERATORS.
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M.E.C. APPARATUS, DULL EMITTER SYSTEM.
59

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Delivery from 2-3 days.

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Day and night service. MACaulay 4555.
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A large stock of surplus Carbon Rods, Ebonite, Fibre, A.I.D. Turnbuckles, etc., also Searchlights (sale or hire), Mirrors, Lenses, also Winches of our well-known self-sustaining types. Hundreds of thousands supplied during the last 40 years to Govt. depts., corporations and innumerable traders.—London Electric Firm, Croydon. 42

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

A.C.-driven Plating Dynamo, 1,000 amps., 16 volt, 570 r.p.m., direct coupl. on bedplate, reconditioned.—The Electroplant Co., Wembley, Middx. 1234

A.C. Motors, 1/50th h.p. to 3 h.p., from stock, for essential work only.—The Johnson Engineering Co., 5, Spencer Street, Leamington Spa. 57

AERIAL Cables, all sizes quoted for; good deliveries against Government contract numbers.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6630

ALTERNATING petrol/paraffin Sets, 400/3/50, direct coupled on bed. First-class order. 25 kVA. 35 kVA. 50 kVA. 70 kVA. Fully tested, for quick delivery.—The Electroplant Co., Wembley, Middx. 1235

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B.T.H. Turbine Generating Set, 625 kVA, 400-3-50. Turbine of the mixed pressure type. High pressure steam, 115/116 lbs. per sq. inch. Jet condenser by Mirrlees Watson. Alternator type ABT, 625 kVA, .8 p.f. Complete with switchboard.—Berry Hill, Plant Division, New Haden Colliery, Cheadle, Staffs. Phone 2181. 1247

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TRANSFORMERS, single and three-phase. All types up to 10 kVA.—Woden Transformer Co. (Phone, Bilston 41959), Moxley Road, Bilston, Staffs. 12

T.R.S. Cables and Flexibles, Welding Cables, supplied to M.O.S. requirements.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 6639

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50-volt Lighting Set complete and in working order. Alpha Petter Engine, just overhauled. Offers to—Banks, 2, Vernon Avenue, Woodford Green. 6618

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300-h.p. Slipring Motor by Mather & Platt, wound for 500/550-3-50 and speed at 1,470 r.p.m. Complete with starter. Motor and starter, FLP-Buxton certified, first-class condition, never been used.—Berry Hill, Plant Division, New Haden Colliery, Cheadle, Staffs. Phone 2181. 1248

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1,000-kW Turbo-Alternator Set, made by Metropolitan-Vickers in 1920, 3-phase, 50 period, 400 volts. Steam pressure 200 lbs.; jet condenser. Apply Patons & Baldwins Ltd., Halifax, Yorkshire. 1156

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CONSULT us for all types of A.C./D.C. Windings. We are the trade rewinders of both repair and repetition armature and stator windings, etc.—Hodson (Electrical Engineers), 75a, George St., Croydon. Phone, Croydon 1508. 6621

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REPAIRS. Clockwork Controllers, Time Switches. Clocks and every kind of clockwork appliance used in connection with electricity repaired quickly by skilled staff. Inquiries welcomed. Representative will call in London area if required.—J. W. & R. E. Hughes, 58, Victoria Street, London, S.W.1. Phone, Victoria 0134. 6417

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WELL-known firm of electrical manufacturers situated in Eire wishes to tie up with a British firm of electrical manufacturers of appliances and component parts, for the purpose of manufacturing their goods in Eire.—Box 1245, c/o The Electrical Review.

AGENCIES

A well-known manufacturer of Electrical Appliances requires first-class Representatives to cover Scotland, Lancashire, Yorkshire, South Coast and Midlands. State age, experience and salary required.—Box No. P.123, c/o 19-21, Corporation Street, Birmingham, 2. 1232

AGENCIES required for London, South of England, for Cables, Switchgear, Conduit and Domestic Appliances. Advertiser has first-class connection among supply undertakings, wholesalers and contractors.—Box 6615, c/o The Electrical Review.

AGENCIES required for London, South of England, for the following: (1) Domestic electrical appliances; (2) Brass electrical accessories, switch plugs, etc.; (3) Conduit. Advertisers have clientele with every wholesaler in the territory mentioned. Immediate turnover can be guaranteed. Either commission or buying basis. Post-war arrangements considered.—Box 64, c/o The Electrical Review.

AGENCIES required, South of England, including the London area: (a) Cables; (b) Small Switchgear; (c) Transformers; or any lines suitable for distribution for wholesalers' business.—Box 40, c/o The Electrical Review.

EIRE. Agency firm open to represent manufacturers on sole selling rights, immediate or post-war. Progressive organisation established. Replies to—Box 1148, c/o The Electrical Review.

EXPORT Trade. British firm about to open branch in Paris is anxious to contact other manufacturers with a view to representing them in France. Further details from—Box 1212, c/o The Electrical Review.

MANUFACTURERS' Agents, covering the whole of Great Britain and Colonies, are desirous of contacting manufacturers with a view to sole selling rights (either commission or buying), post-war arrangements considered. —Box 23, c/o The Electrical Review.

TO Manufacturers of Electrical Appliances. A well-established connection is available for your post-war sales in Yorkshire. Advertiser, manufacturers' agent, with personal connection amongst wholesalers, supply cos., etc., would be glad to discuss post-war arrangement. —Box 6625, c/o The Electrical Review.

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BATTERY Chargers Modernised. Your old Charger made like new by specialists. Conversion from valve to metal rectification. Send for interesting leaflet "Q.D." on this service.—Runbaken Electrical Products, Manchester, 1. 45

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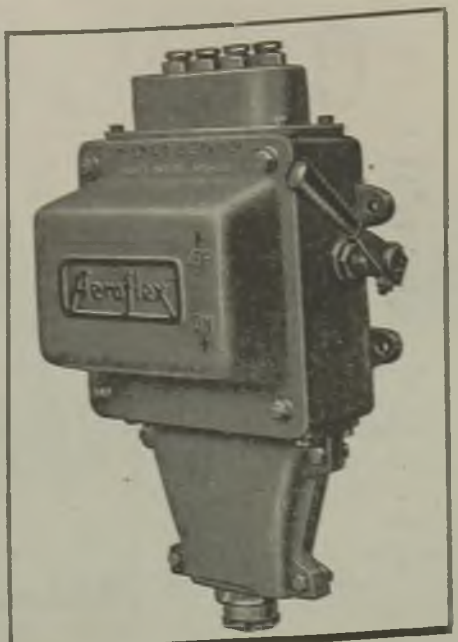

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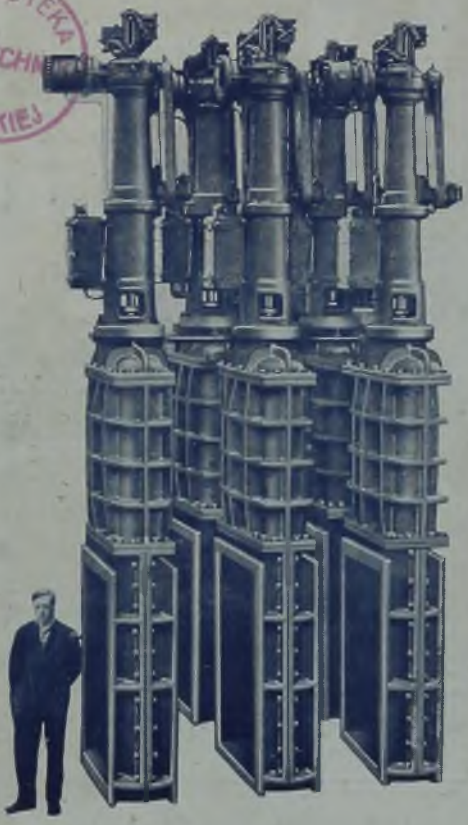

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