

58 44

ELECTRICAL REVIEW

FOUNDED
1872

Vol. CXXXV. No. 3492

AUGUST 18, 1941

9d. WEEKLY

COMPACT



CORRECT



A.S.C.M. Steel Conduit is manufactured only by

ALMA & CRANMORE TUBE CO. LTD.
BARLOW, H. J. & CO. LTD.
ELECTRICAL CONDUITS LTD.
GENERAL ELECTRIC CO. LTD.

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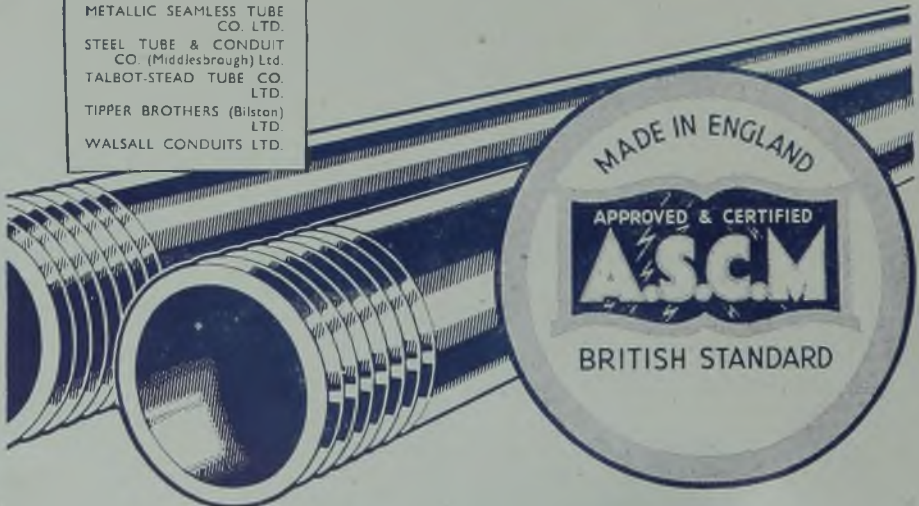
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Perfecta Tube Co. Ltd.
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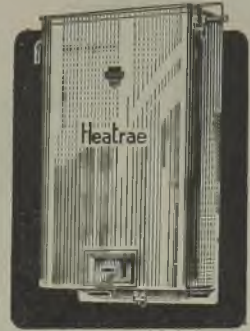
In the intimate "oneness" between horse and rider lies the whole art of taking fences neatly and without spills.

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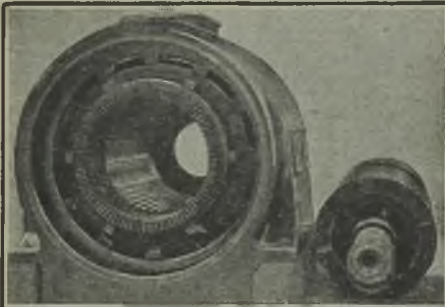
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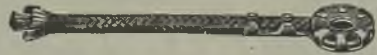
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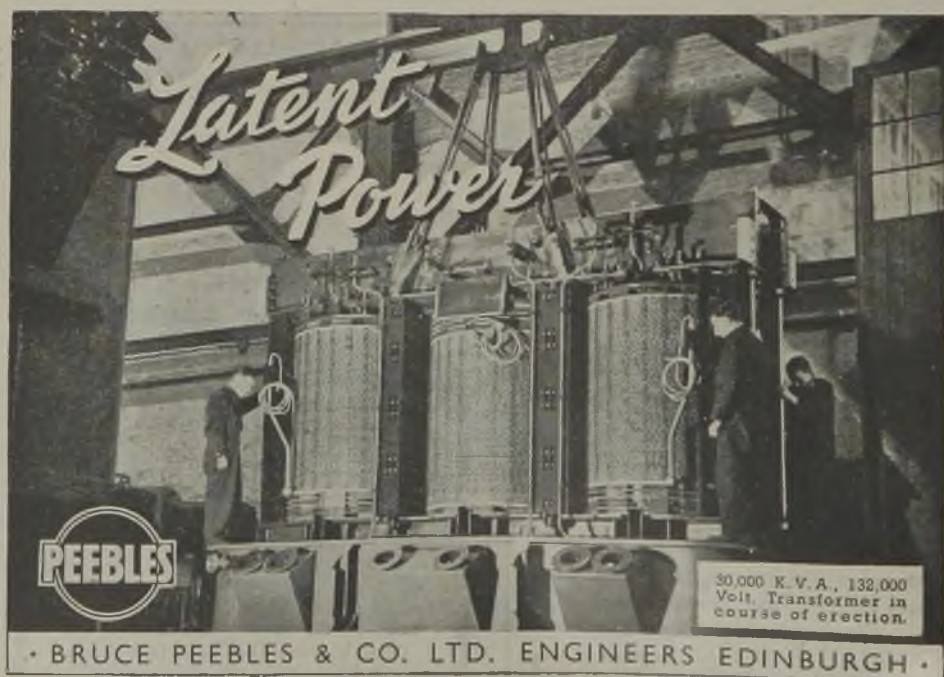


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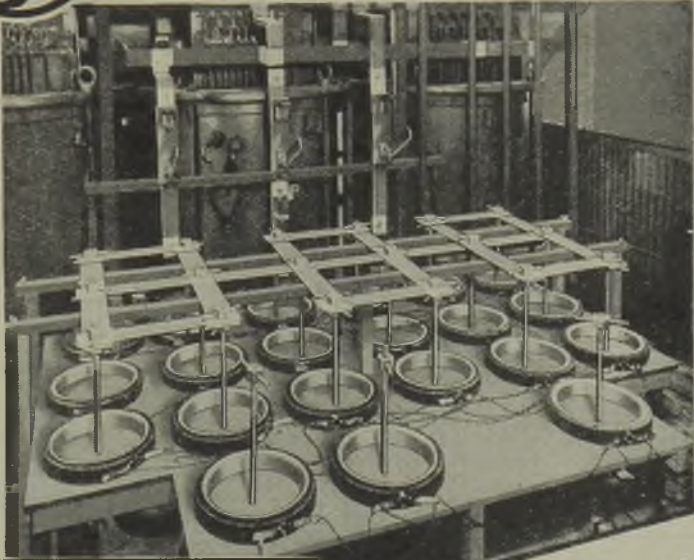
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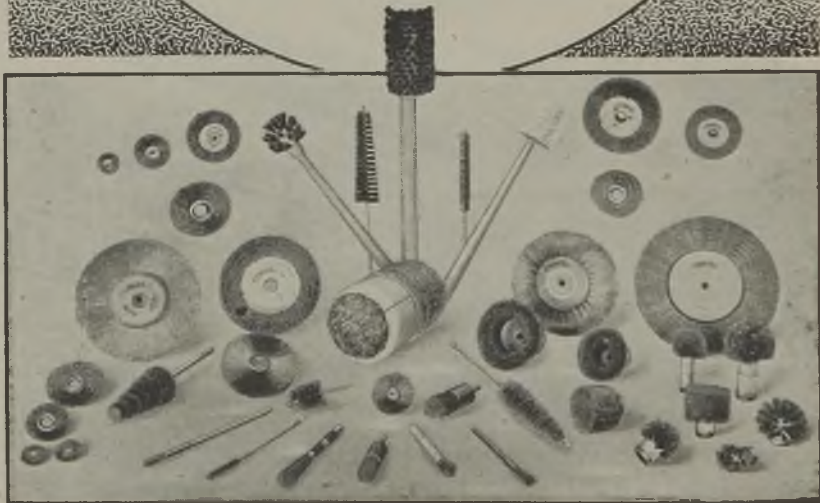


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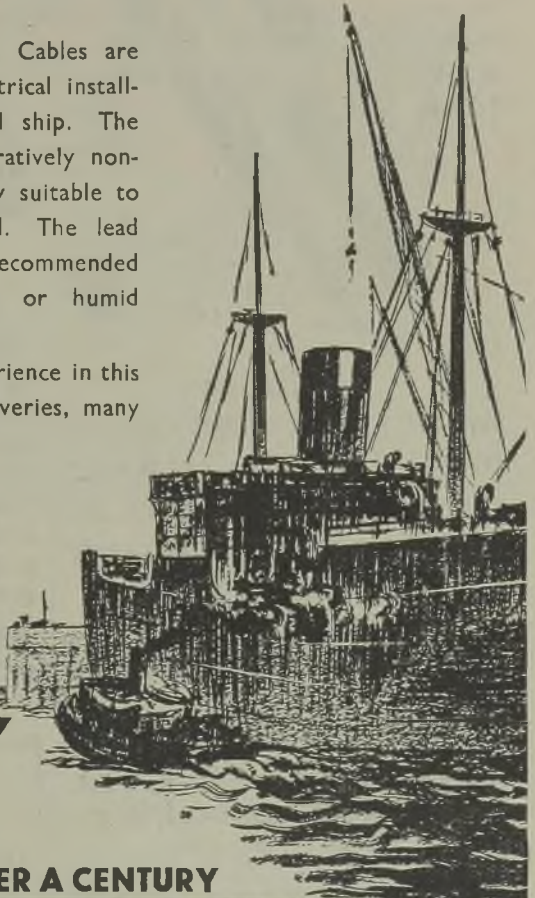
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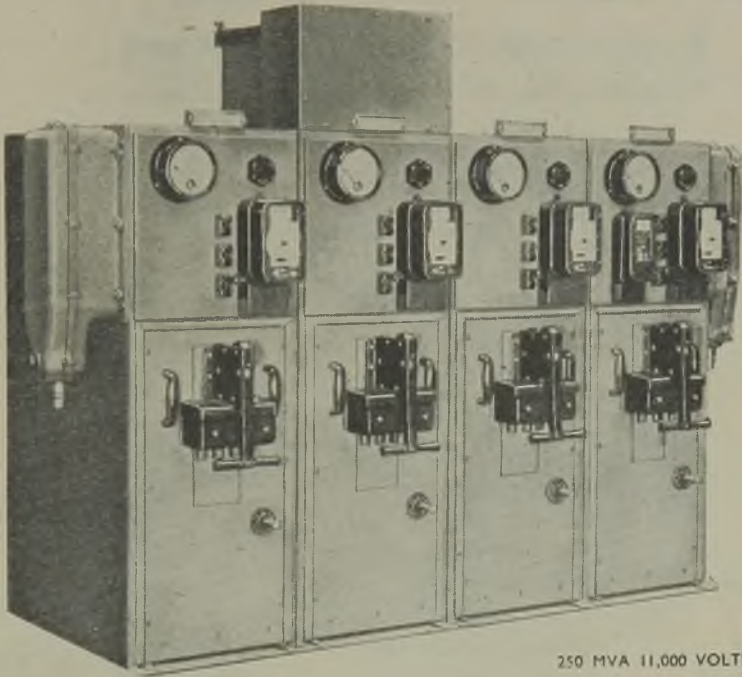


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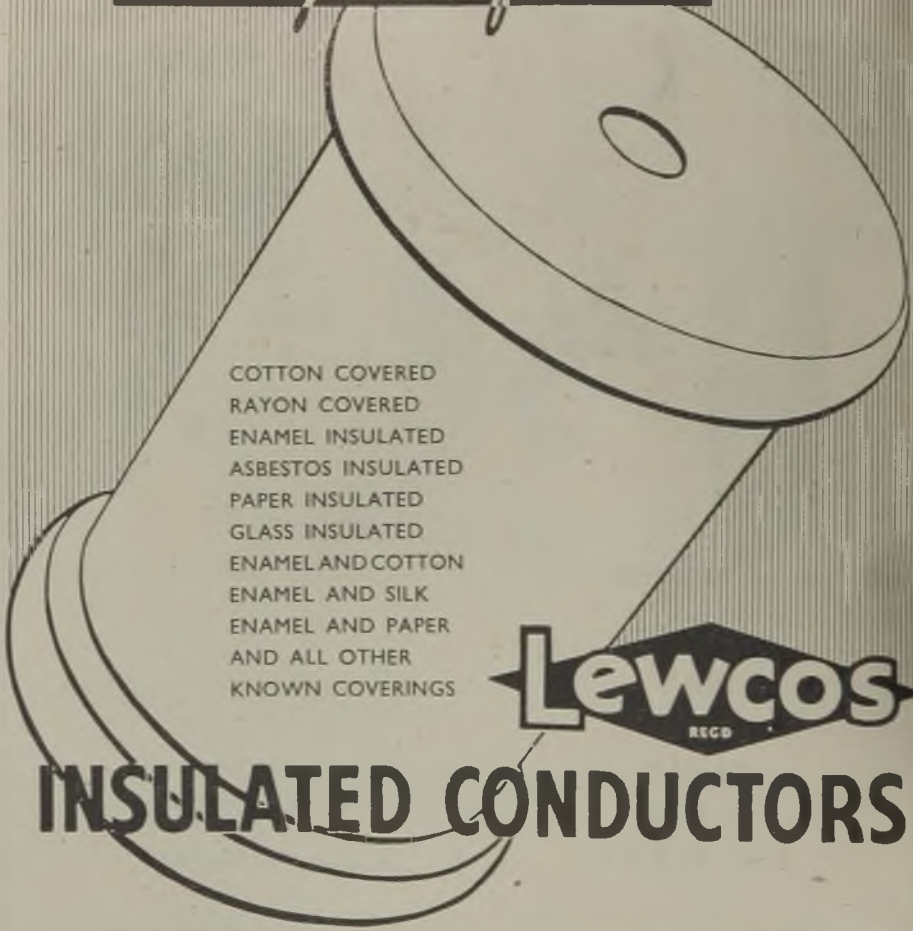
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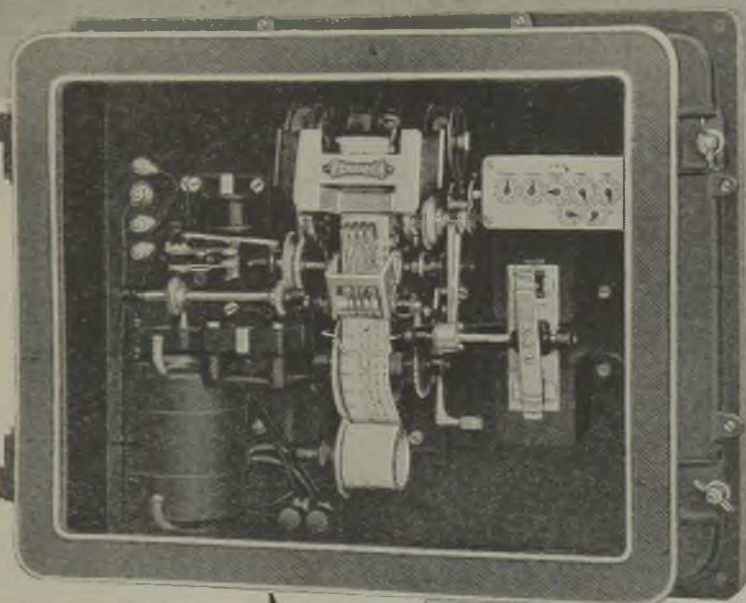
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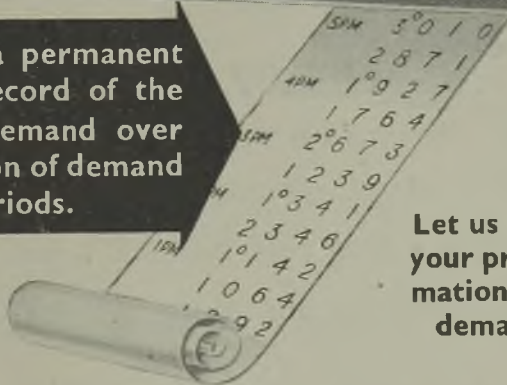
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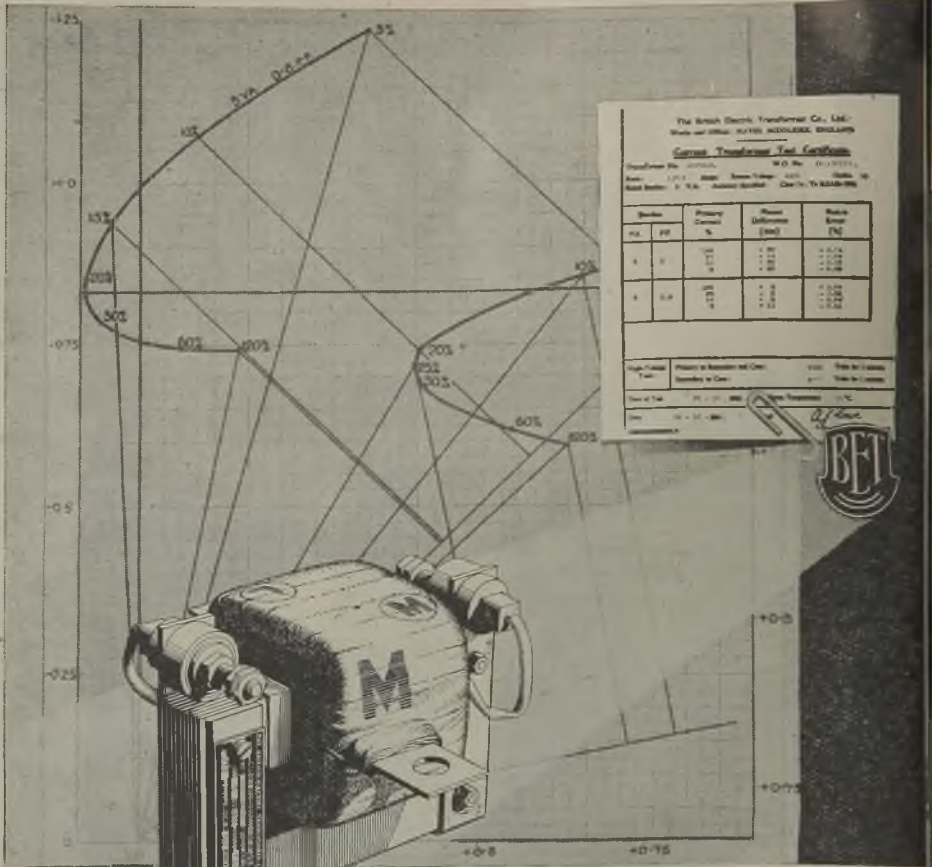


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Electrical Review, August 18, 1944

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No steel authorisation required.

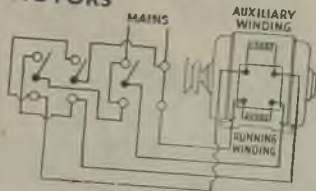


Motor Maintenance Points & Problems

Keep this page, it may prove of service to your Maintenance Engineers

REVERSING SINGLE-PHASE MOTORS

In the case of single-phase motors, it is necessary to reverse the starting winding relative to the running winding, consequently any links between the starting and the running winding terminals should be removed. A triple-pole change-over switch is again used, one pole ensuring a break in the electric supply. A wiring diagram for this is shown.



DISMANTLING A BROOK MOTOR

If a motor is situated in a dusty position it should be dismantled occasionally. This should be done by an experienced maintenance man or electrical engineer, and the windings blown free of dust. A coat of insulating varnish on the windings is also an

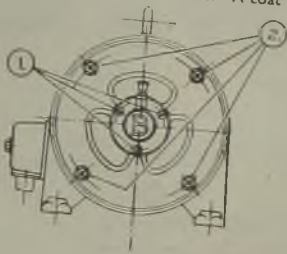


Fig. 1

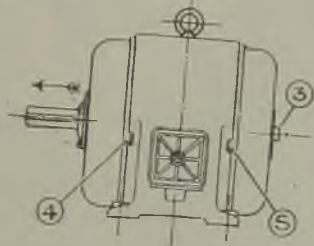
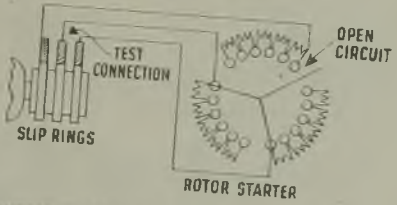


Fig. 2

advantage. To dismantle the motor—Remove screws (1) and rear end cap, remove four holding pins (2) and withdraw the retaining pins. Tap at point (3) with a wood lever gently. Lift out rotor in direction of arrow, noting that the rotor bars do not fall on the winding when the rotor is nearly withdrawn. Remove rear end similarly by inserting driver at point (5).

OPEN CIRCUITS ON SLIP RING MOTORS

A convenient test for tracing open circuits or faulty contacts on a rotor is to bridge the brush holders with a short conductor when the motor is running with the starter in the full "on" position. Such a test can also reveal any fault in the starter, for if this is not working properly there will be a perceptible improvement in the running of the motor when the brush gear is shorted. Any flashing across the brush holders would definitely show either an open circuit or a faulty rotor.

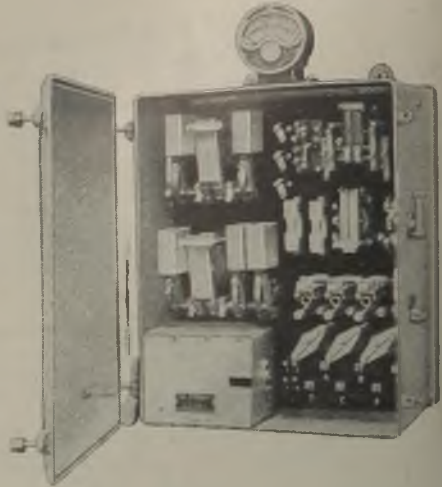


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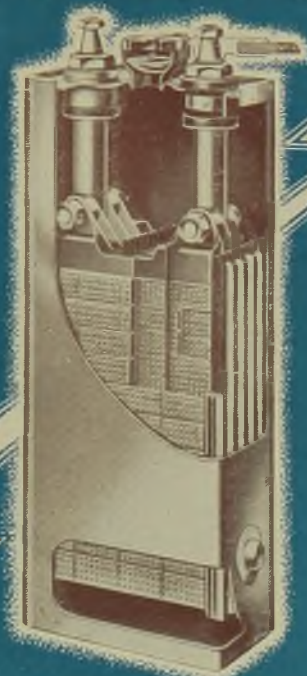
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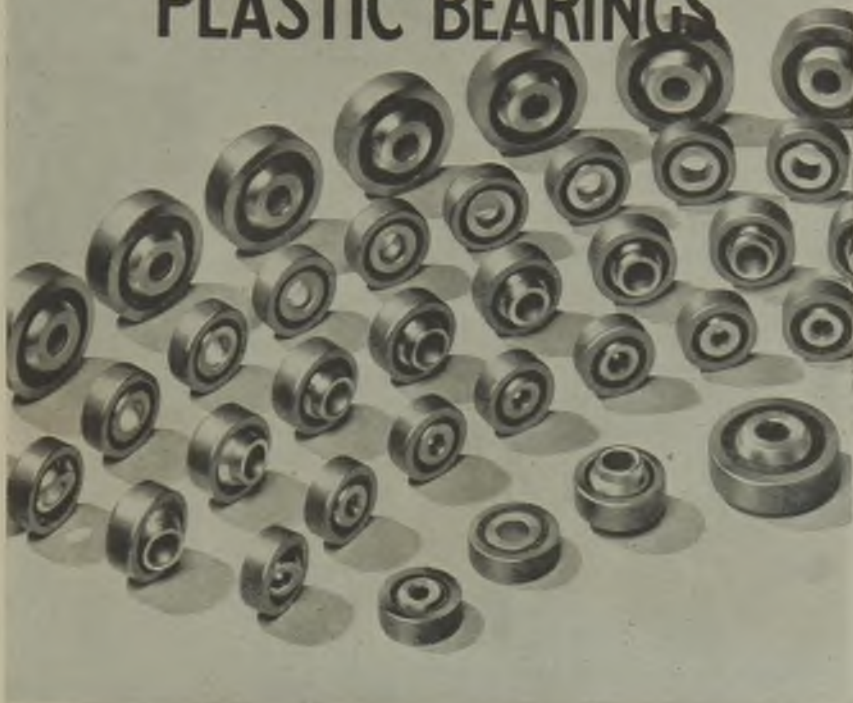
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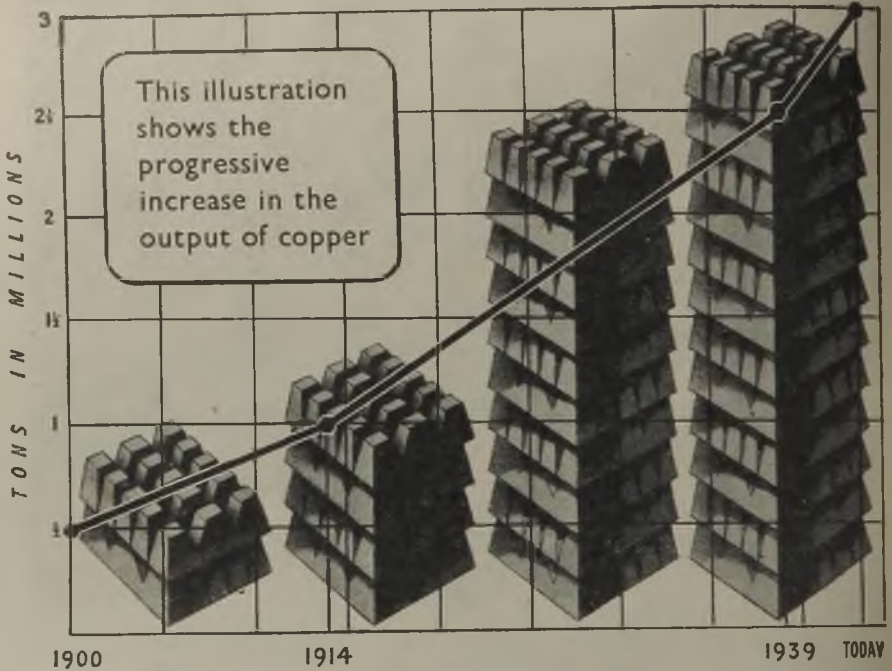
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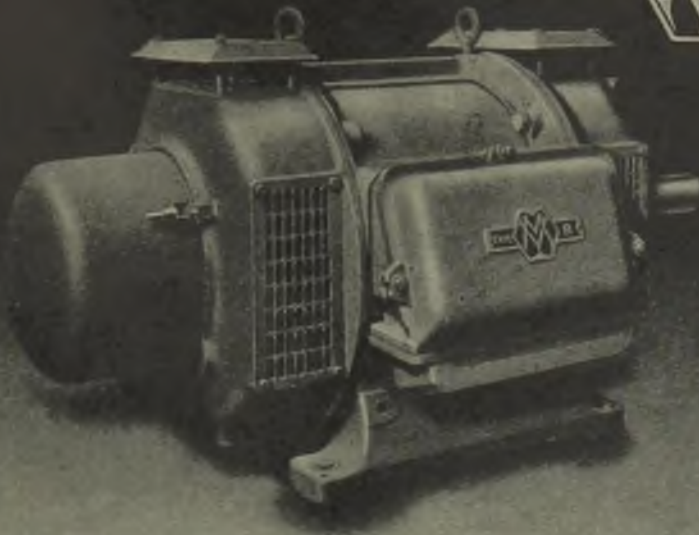
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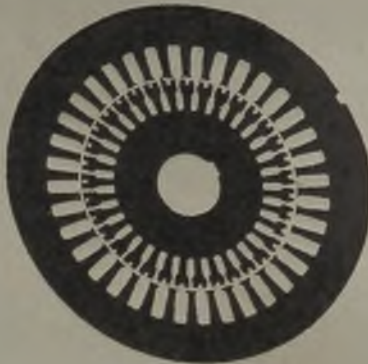
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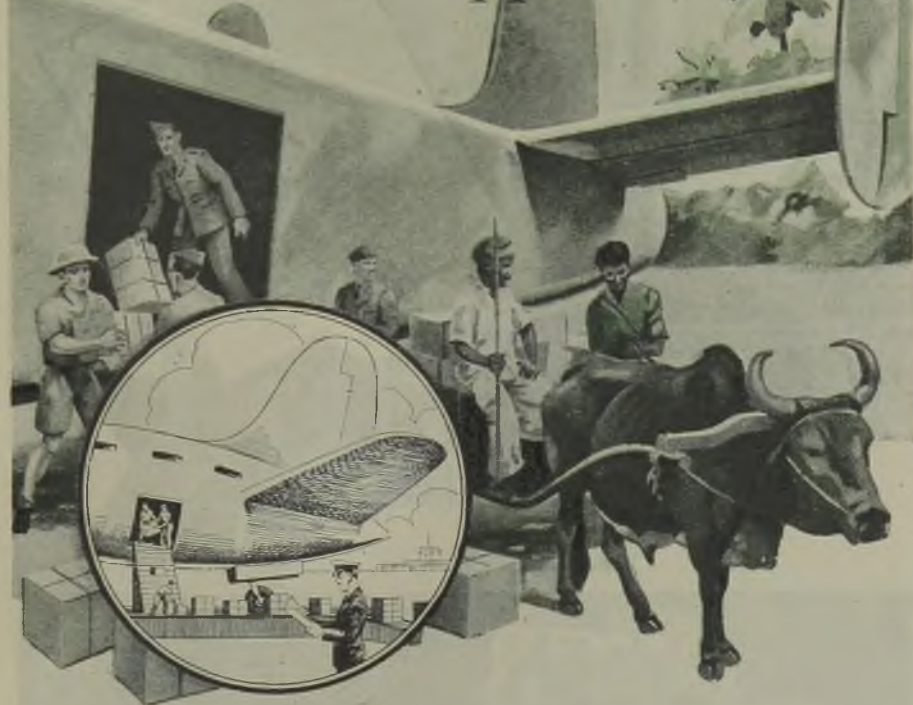


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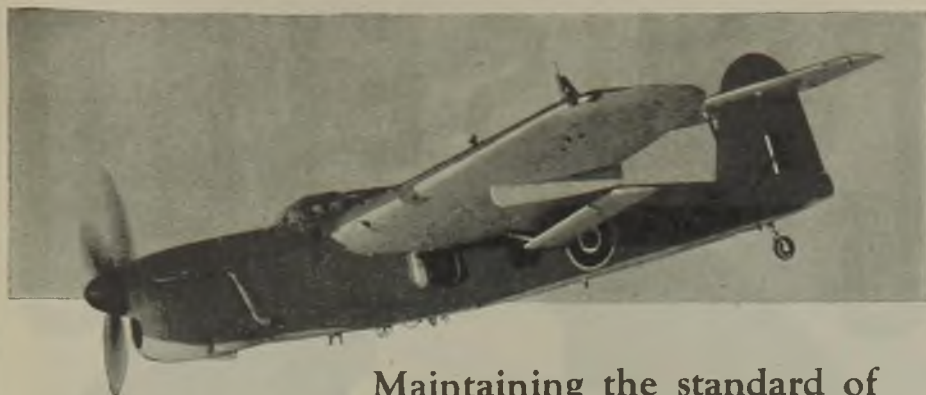
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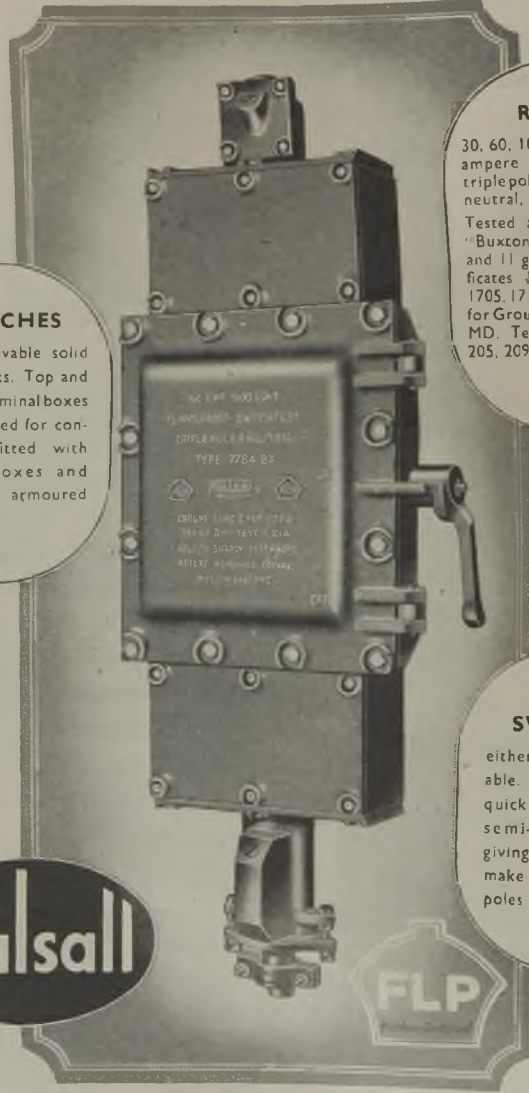
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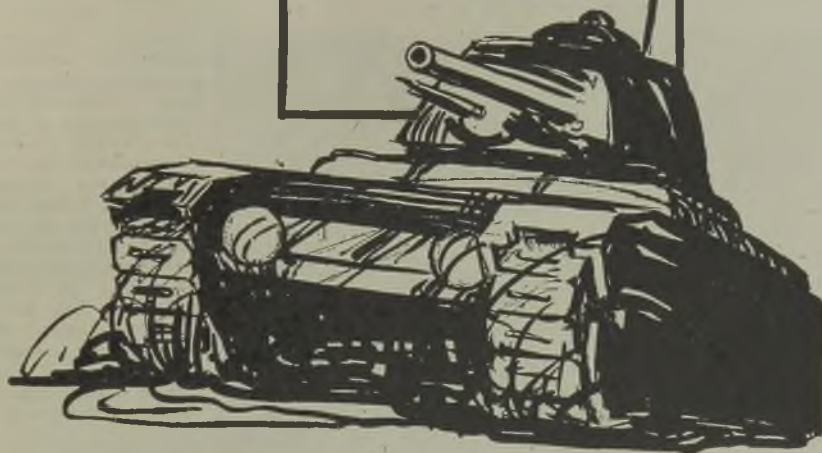
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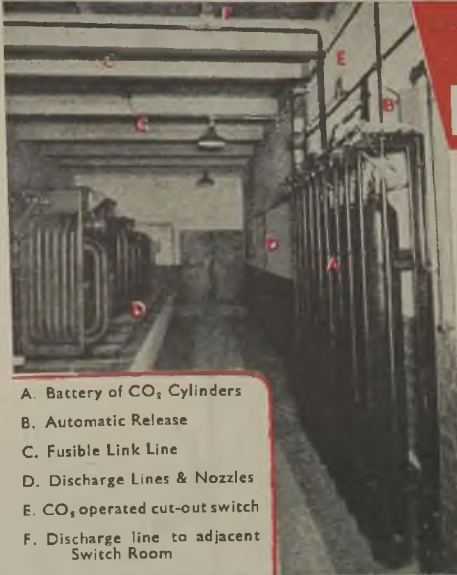
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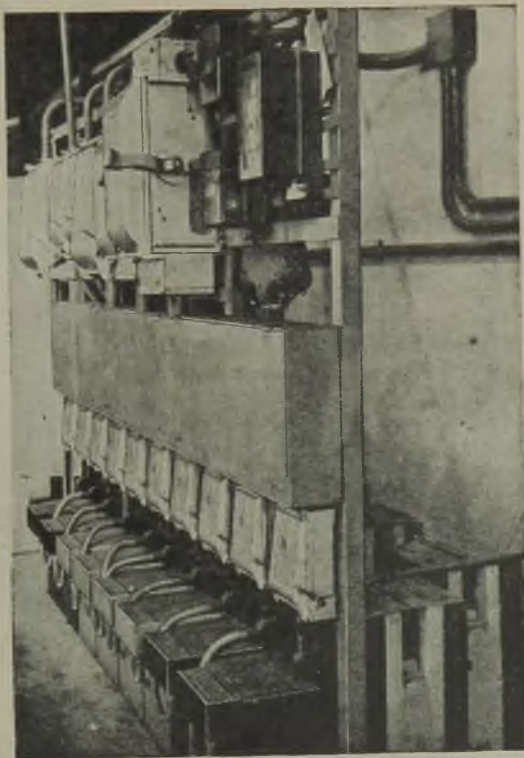
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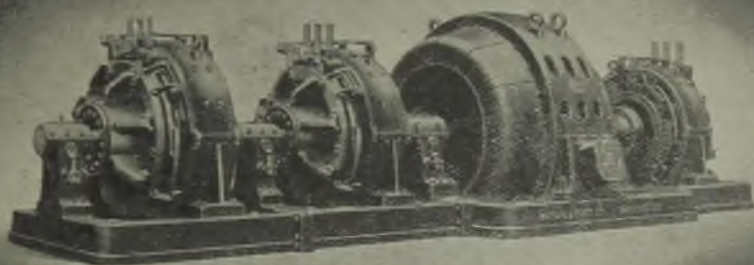
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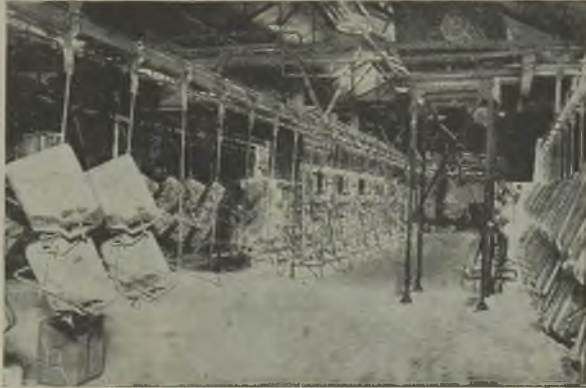
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ELECTRICAL REVIEW

August 18, 1944

Managing Editor :
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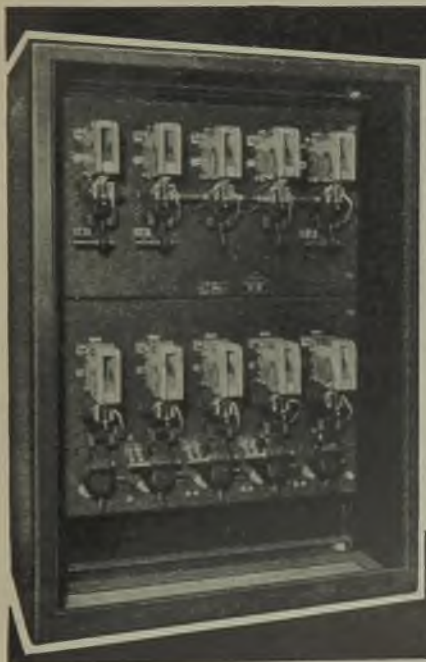
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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872



Vol. CXXXV. No. 3482.

AUGUST 18, 1944

9d. WEEKLY

Low-Cost Installations

Engineering Design in Post-War Buildings

ADEQUATE engineering is as necessary to good building as are adequate architecture and workmanship; engineering design cannot be adapted to accommodation arbitrarily allocated as being the least useful for other purposes. On these sound premises the Institution of Mechanical Engineers, as reported in the *Electrical Review* of July 28th, has submitted a report to the Ministry of Works which presents an outline of good practice in connection with mechanical installations in post-war buildings.

Lifts and Laundries

As might be expected, many of the report's implications are of electrical interest. There is, for instance, the view that lifts for passengers and light luggage, of standard speeds and sizes and with usual electrical interlocks, can be provided within the economic rents payable by occupants of industrial workers' flats of more than three, or possibly only three, storeys. Arrangements for communal laundering in new buildings of this type with reasonable privacy and the use of up-to-date and quiet-running plant are shown to be feasible, the final ironing being done at leisure in the flat itself. The best means of providing hot water, it is held, depends upon local circumstances and storage heaters would possess advantages in many cases.

Central heating is regarded as unlikely by itself to satisfy the tenants of such flats. Provision should therefore be made for local space heating to enable varying individual requirements to be met. For background warming wall-panel systems,

in which water is circulated at low pressure at a mean temperature of 90 deg., appear to be favoured, if properly installed. Considerable economy can be effected by controlling the temperature of the boiler flow pipes by means of thermostats in accordance with external weather conditions, to which electrical methods lend themselves well.

Although the scope for air conditioning in offices may be limited, as regards the immediate future, a good case is made on many grounds for its adoption in stores, restaurants and kitchens. Success will depend largely upon the provision of suitable automatic controls and on the space allowed for the equipment. Recent developments in refrigerating plant, tending to reduce its cost, and in heat-insulating materials are influences in the direction of more extended use. The high reliability and good performance of small refrigerators is considered to make them very much more suitable for domestic use than cubicles supplied with liquid refrigeration from a central source. Experience in the United States with the latter system, which in initial cost and maintenance compares badly with individual refrigerators, has not been happy.

Architect as Co-ordinator

These few examples from the report illustrate the large number of widely varying specialised electrical applications that will have to be allowed for in the design of buildings, provided they can be installed economically. At present, the report points out, too many installations

fall short of what should be readily attainable standards of service, safety and true economy, which is attributable to defective relations between the numerous branches of engineering and building. Co-ordination of work from the earliest stages should be the responsibility of a single person and he should, it is held, be the architect. Yet however well organised this part of the work, the lowest overall annual costs throughout the life of the building and full satisfaction to users are unlikely to be reached unless the engineering supervision of installations in operation as well as during construction is in the hands of those having attested technical qualifications.

WE are gratified to learn that the articles and reports on rural electrical development which have appeared in the *Electrical Review* have caught the attention of the United States Rural Electrification Administration. It is also very useful to have some information regarding the R.E.A.'s experiences, for it is a very experienced body with some years of service to its credit. In his letter published in this issue Mr. Allyn A. Walters, of the R.E.A., stresses the necessity for reducing line construction costs to the minimum consistent with satisfactory operation. He says that at the time the United States entered the war the average construction costs had been halved, the figure being about \$750 (£188) per mile, enabling the less remunerative areas to be supplied without subsidy. Apparently fixed charges or contributions to the cost of lines are not commonly demanded. The rates are based on usage only, but Mr. Walters does not give kWh charges which no doubt vary considerably according to the circumstances of each area.

REMARKING that conditions in the United States and in this country seem to be closely parallel, Mr. Walters refers to one or two applications. The R.E.A. has been advocating for some time the use of appliances of the type of the "Essex" hammer mill but so far there seems not to have been such acceptance of the idea there as in the Wessex Company's area. Successful experimental hay dryers have been operated in the United States and these dryers are now beginning to receive serious consideration there.

Unheated air is used, although heating has been tried and may be found economically feasible. It is found that there is a great improvement in the nutritional value of hay so dried.

IT seems likely that I.E.E. Offer to Cambridge University will accept the generous offer of the Institution of Electrical Engineers to endow for a limited period (probably five years) a professorship of electrical engineering at the University. Although this will be a departure from precedent (as perpetual endowment is the rule) the University authorities appear to be willing to make the necessary provision for the continuance of the professorship if external aid is not forthcoming. We are sure that the electrical profession and industry will see that no financial difficulties interfere with the operation of this very excellent plan.

IN the course of a lecture to the Institution of Civil Engineers of Ireland earlier this year Mr. O'Riordan, chief engineer (civil works) of the Electricity Supply Board, referred to the much-delayed Liffey Scheme as being "in partial operation." Other accounts have appeared to conflict with this statement, but the position is cleared up by the Board's annual report which has just been received. This states that the Golden Falls station, which utilises 25 per cent. of the total head of about 200 ft., was commissioned on December 10th, 1943, but the main Poulaphouca station is still held up for lack of certain parts of the mechanical and electrical equipment. To operate the Golden Falls station it has been necessary to by-pass the main station by allowing water to run down the old river channel. As it is not desirable to reduce the level of the main reservoir while using only 25 per cent. of the head, the operation of the station has been intermittent.

IN a provocative article *All or Nothing* in this issue Mr. F. W. Purse (who can always be relied upon to disturb the doves) expands a theme which he has already put forward in our Correspondence columns—that "freedom of choice" of domestic services is all wrong. Quite obviously to make arrangements for the use of coal, gas and electricity in a house is

unnecessarily adding to its cost, but we rather doubt whether the "authorities" will be convinced that provision for electrical service is enough, desirable though this may be from the industry's point of view. Mr. Purse is very fair, though; if people want gas let them have it, he says, but they must have gas alone. It is hard to imagine (and we are inclined to the belief that Mr. Purse's tongue is in his cheek) that anybody wants gas lighting nowadays or will be willing to put up with the inconveniences of gas irons and battery-operated radio sets if they can be avoided.

Freedom in Operation SUPPORT for Mr. Purse's contention that electricity (or gas) can only be supplied at the minimum price if it is given a clear field comes from Scotland. The Fife County Council is equipping a number of school feeding centres and the Fife Electric Power Co., asked to quote terms for a supply, put forward very favourable rates which, however, were dependent upon the exclusion of gas, except as an emergency stand-by. The Council has accepted the offer and in consequence gas undertakings in the area have sent in a protest to the Ministry of Fuel and Power. Here, actually, "freedom of choice" has been exercised by a consumer but because this consumer happens to be a public body the gas interests evidently feel entitled to question its freedom.

Post-war Domestic Apparatus JUST back from another transatlantic tour, Miss Caroline Haslett, director of the Electrical Association for Women, has given us some interesting impressions of post-war plans there with regard to domestic electrical appliances. While America is more advanced in such apparatus as the "Deepfreeze" refrigerator—she ate a steak that was eight months old!—Miss Haslett considers that Great Britain is perhaps more advanced in its plans for providing electrical equipment for the home after the war and should advance side by side with our allies across the Atlantic in technical development. All the same we agree with her that facilities should be given at this stage of the war to manufacturers to prepare their post-war models. The building of small numbers of experimental houses is being allowed all over the

country and surely it is necessary to ensure that suitable equipment is available to go into them. The amount of material and labour involved would be insignificant.

Electrical Ironmongers IN his annual report the chairman of the Electrical Section of the National Federation of Ironmongers (Mr. L. H. Pearson) complains that the margin upon electrical appliances allowed to retailers is too narrow to pay for proper display, staff and service and he urges that it should be increased. Mr. Pearson may possibly be right but his case is not strengthened by his comparison between electrical contractor-retailers and electrical ironmongers. He says that the former can rely upon their installation work to help carry the overhead charges, whereas the retailer, pure and simple, has no such stand-by. It is thereby implied that electrical ironmongers devote most of their attention to their electrical trade when, actually, so far as our own observation goes, this side of an ironmonger's business is usually but a small part of the whole.

Gas Turbines and Producers SINCE products of combustion have to be circulated in gas turbines of the open-cycle type, only high-grade oil was considered as a fuel in the article which appeared in our issue of June 23rd. The use of coal through the medium of gas producers is discussed in *Power* (May, 1944), where it is contended that the leanness of the gas should not decrease efficiency as a result of the greater amount to be compressed. As turbine-inlet temperatures are limited to about 1,200 deg. F. for metallurgical reasons, rich gas is diluted with many times its weight of air. Producer gas of 130 BThU per cu. ft. contains about 50 per cent. of nitrogen and this would effect a compensatory reduction in the quantity of excess air to be dealt with by the compressor.

Machine Age A DRAWING in a recent issue of the bulletin issued by the Manitoba Power Commission indicates a very high degree of dependence upon electricity in that Province. It shows a farmer at the door of a cowshed gazing upon the havoc caused by a snowstorm and saying, "The wires are down. Anybody around here know how to milk a cow?"

Electro-Farming—II

Some Recent Developments at Aylesbury

THE feeding of animals is another matter of close concern to any farmer. At the Round Hill Farm Estate we saw a new development in grass drying for winter fodder which is believed to represent a considerable advance on the rotary type of dryer, particularly from the labour-saving viewpoint.

Freshly cut grass is emptied on to a conveyor at the feeding end of the machine in which is incorporated a leveller by which the grass is evenly fed to an elevator which carries

veyor are driven by a 2-HP, 1,420-RPM motor, with chain transmission on to a crank shaft from which the arms operate.

At the top of the elevator the grass falls on to an endless chain wire conveyor at the top of and inside the horizontal rectangular drying chamber (about 20 ft. long, 3 ft. deep and 5 ft. wide) by which the grass is carried to the other end of the chamber where it falls on to a similar conveyor at the bottom of the drying chamber which brings the grass back to the starting end. These two drying-

chamber conveyors are driven by a 1-HP, 1,400-RPM motor through chain and variable-speed transmission on to the two conveyor end drums, so that the conveyor speeds provide for a 20-min. to a 9-min.



A new development in grass drying for winter fodder which is believed to represent a considerable advance on the rotary type of dryer. Above: Furnace housing and dryer showing conveyor-drives. Below: Elevator to the dryer and dried grass cooling fan. Right: Chaff cutter, grinder and fan fed by conveyor from the drying cabinet



the food up to the drying chamber. The elevator has nine longitudinal arms with downward projecting spikes, and the arms operate with a semi-rotary and reciprocating motion. The elevator and the initial con-

veyor cycle, according to the weather conditions and the type of grass.

While the grass is on these two conveyors it is dried by means of hot gases which pass through the chamber from a coke semi-producer furnace incorporated in a brick structure running at right angles to the drying chamber and conveyors already referred to. The gases are passed into the drying chamber, through a brick compartment forming the base of the steel drying chamber, by means of a fan in a flue projecting from the furnace. This fan is driven by a 7½-HP, 1,425-RPM motor via 3 to 1 ratio V-belt

transmission. The flames and gases rise from the furnace through sliding brick doors into a flue chamber, and on their way to the drying chamber pass a spark trap. Coke is fed into the side of the furnace, and inside, during combustion, progressively down a

even-ratio V-belt transmission to the fan shaft. The conveyor is driven by a 1-HP, 1,400-RPM motor which has a temporary four-stage chain transmission scheme pending the arrival of a reduction gear box with an overall reduction ratio of 190 to 1.

At the end of this conveyor the dried and cooled grass falls into a chaff cutter from which it is drawn by a fan through a grinder and blown as powder into a cyclone separator which passes the useful material into collecting sacks for storage at an estimated output for the whole plant of 4 cwt. per hour. The chaff cutter, the fan and grinder are all group-driven by a 20-HP motor. The whole plant, which was not completely installed at the time of our visit, is a product of the Templewood Engineering Co., Ltd.

At the demonstration farm of the Bucks County Council at Stoke Mandeville we saw an interesting group drive for a chaff-cutting machine, a grinding and crushing machine and an oil-cake breaker. They are all served from a 12½-HP, 1,440-

RPM motor mounted in a trough-girder cradle suspended from the roof girder and the wall. A 5 to 1 belt-transmission scheme serves a countershaft, from which there are secondary drives to the individual machines. The chaff cutter has a chain feed in a wooden trough to the revolving knives at the head, the crusher incorporates steel crushing rollers and tooth grinding wheels, and in the oil-cake breaker the cake passes through intermeshed cog wheels.

We have often wondered why the Continental type "universal" motor has not



Among the many chick-rearing installations is one with seven stacks of rearers in a room about 60 ft. long and 20 ft. wide ; note general heating arrangements on left

series of steps to keep it in flame and prevent the development of smoke. Combustion air is admitted through adjustable louvres which are automatically hydraulically operated under thermostatic control.

The dried grass from the bottom conveyor at the feeding end of the machine falls on to another conveyor in a trough which takes it to the cutting and grinding equipment. While on this conveyor the grass is cooled by a fan which draws air through it and at the same time extracts dust from it. This fan is driven by a 2-HP, 1,420-RPM motor with



The modern grain dryer is one of the finest examples of electric service to agriculture ; supply point on left

been widely adopted in this country, and we still do after having seen one adapted to an ordinary mincing machine for the preparation of fodder. The unit incorporates a $\frac{1}{4}$ -HP motor geared down to about 100 RPM, and a reversing switch, and the whole is mounted on an adjustable tripod.

The electrical industry offers valuable service to the poultry farmers, especially by way of egg incubation and chick rearing. At Mr. Reynolds' chicken farm at Long Crendon the most interesting incubator is probably the "Petersime" which has a capacity of 16,000 eggs. The incubator takes the form of a wooden cabinet measuring about 8 ft. long, 5 ft. wide and 7 ft. high, and we should say at least two-thirds of this space at the top is taken up by a large horizontal revolving drum which contains 84 trays which hold a total of 13,000 eggs. The drum is turned by hand periodically so that, so far as the eggs are concerned, the action of the hen is simulated.

The eggs in the drum are reached by four hinged side-opening doors. At the bottom is a hatching compartment fitted with sliding trays with a total capacity of 3,000 eggs. Access to the trays in this section is by three drop-down doors. At the top of the cabinet inside, *i.e.*,

it desirable to fit the two extra banks for boosting in very cold weather spells. A bell alarm is operated if the temperature falls below an unsafe point, and each thermostatically controlled section is equipped with a neon pilot light for "on" and "off" indications. Around the horizontal drum a specially constructed fan revolves to ensure an even distribution of heat. This fan is driven by a $\frac{1}{4}$ -HP motor.

Among the many chick-rearing installations is one with seven stacks of rearing in a room about 60 ft. long and 20 ft. wide. Each stack has two units in tier formation and each of these holds 125 chicks. Each unit has a warm chamber at one end for which the warmth is supplied merely by a 40-W lamp. The chicks are free to run to and from the open chamber at will.

Difficulties have arisen in connection with this installation during very cold weather with regard to the general temperature of the room, and in consequence the consumers' department of the supply undertaking is carrying out an interesting experiment. At each side of the room, just above floor level,



There is a continuous call for timber on the farm, so that a big aid is the portable cross-cut saw; supply unit is seen in pole-mounted cupboard

secured to the ceiling, there are six banks of spiral element radiant heaters, with a total loading of about 4 kW, and these are thermostatically controlled for the maintenance of an incubation temperature of about 100 deg. F.

Originally the equipment was fitted with four banks of heaters only, with a total loading of about 2 kW, but the owner found

a length of 6-in. greenhouse piping has been installed with an inclination of about 2 ft. above floor level at one end. To the upper end is fitted a small feed-water tank, while the lower end of the pipe is equipped with a Hotpoint 3-kW thermostatically controlled immersion heater, with a thermostat setting of 160 deg. F. It is hoped that normal convection throughout the pipe will afford the required heating boost to the general room temperature.

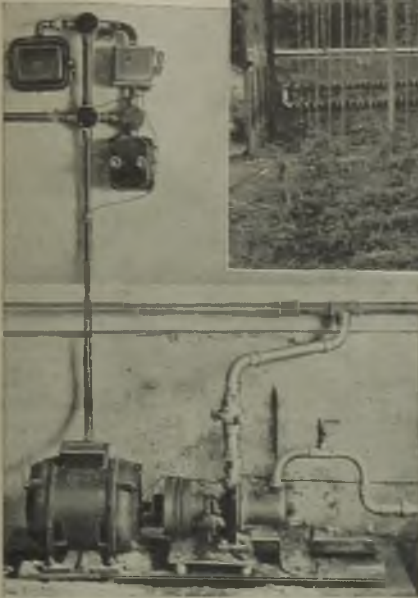
There can be no greater contribution to the general efficiency of farms without a public water supply than that afforded by the clean, unobtrusive and trouble-free electrically driven pump, of which there is a

model to suit every requirement. For instance, a 550-gal. per hour single-throw pump which meets the whole of the water requirements at Ilmer House Farm from a bore-hole in which water was touched at 146 ft. is driven by a $\frac{3}{4}$ -HP, 940-RPM motor via a 5 to 1 V-belt transmission,

centre line. The motor end of the saw is mounted in a tubular cradle for easy handling. The motor is supplied at 400 V, three-phase, by means of a trailing cable from a Walsall



Bare elements are operated at low-voltage in this greenhouse heating scheme, so that it is permissible to use water freely



There can be no greater contribution to the general efficiency of farms than that afforded by the clean, unobtrusive and trouble-free electrically driven pump; shallow-well turbine pump (right)

and a shallow-well supply for a small farm at Quainton is afforded by a Monopump directly coupled to a $\frac{3}{4}$ -HP motor.

Fence repairs, gate-post replacements, out-house maintenance and fuel requirements all call for a continuous supply of timber on the farm, and a very big aid in this connection is a modern portable log-saw such as that we saw in use by a consumer at Chinnor. This portable cross-cut saw operates on the continuous-chain principle, the saw teeth being incorporated in the links of the chain, which travels about two end-drums and between a sheet-metal guide and housing. The effective saw length is about 4 ft. The 8-HP, 2,850-RPM three-phase motor is inclined from the vertical at one end, and transmission is by worm gearing on to the end drum. The motor is controlled by means of a star-delta starter flange-bolted directly on to the motor frame at about the

combined gland-type screw-in plug and socket unit and switch box housed in a pole-mounted weather-proof cupboard. The saw is a product of Mawdsleys, Ltd.

The modern grain dryer such as the Turner installation which we saw at Prune Farm at Grendon Underwood is one of the finest examples of electrical service to agriculture. From the engineering point of view the system of elevators and screens and the fans are an example of modern group driving on a par with that to be seen in any up-to-date factory. The wheat is tipped into a concrete hopper at the front of the installation from which it passes into a pit. From this it is conveyed by a bucket elevator to a pre-cleaner which removes the rough foreign matter. The wheat is then chute-fed to another bucket elevator to the top of the drying chamber, about 25 ft. high and 10 ft. by 2 ft. in section, through which it falls against the current of hot air to a trough at the bottom. A third bucket elevator then takes the wheat to a "Eureka" separator which, like the pre-cleaner, operates on the agitated-sieve principle and separates the wheat into seeds, middlings and tails, the dirt and dust from the separator being blown into bag filters.

Hot air, which is drawn through the annular spacing of the specially constructed circular coke furnace at the back of the installation, is passed into a dryer at one side near the top by means of one fan and drawn out from the same side at the bottom by another fan. The air supply is regulated by dampers and the operating temperature is about 150 deg. C. The group-driving motor

for all the components is a 16-HP enclosed surface-cooled Bull equipment.

A closely allied development is greenhouse heating on the low-temperature principle which we saw on the premises of a horticultural consumer at Haddenham. Bare elements are operated at low voltage, so that it is permissible to use water freely in the greenhouse without fear of danger from or damage to the elements. The elements consist of crinkled galvanised strip, about 2 in. wide, screwed directly to battens on the wall.

The greenhouse dimensions are about 35 ft. by 20 ft. and it is equipped with two heating circuits supplied from two 1½-kW 230/12-V transformers centrally placed on each side of the greenhouse. Each transformer supplies

one double run, out and return, of strip along the half-side and half-end of the building. This results in a single run of about 50 ft. and an effective element length, due to the crinkles, of about 70 ft.

In this article we have made no attempt to cover the general uses of electricity on the farm, but have confined ourselves to some of the recent and not generally known developments. Otherwise we should have had a good deal to say about the standard domestic equipment in the farmhouse. There is, however, one use which is worth a word. At the Ilmer House Farm the use of an electric washing machine for dealing with the farm hands' white smocks in the weekly wash has proved a boon beyond all expectations.

Freedom of Choice

Coal, Gas or Electricity?

THE slogan "Freedom of Choice" is being given great publicity by the gas industry and hammered into various Government Departments, particularly the Ministry of Fuel and Power, to a degree that the "vested interest" aspect sticks out a mile, and doubtless in the hope that some policy of appeasement will be adopted. Munich is too fresh in our memory as to the disastrous results of such a policy. Indeed, if rumour is correct, this policy appears to be contagious and has infected some persons intimately connected with our own industry who are alleged, in an unofficial capacity and jointly with coal and gas personages, to have made representations to the Minister of Fuel and Power that "freedom of choice" should be maintained. It is difficult to believe that we have such reactionaries in our camp, but it is certainly a very disturbing thought.

There is no doubt that the gas industry, finding that it could not stem the progress of electricity supply under normal conditions, has sought other means of doing so, and, as stated in the report of the British Gas Federation, "consistently advocated the creation of the Ministry of Fuel and Power." Having, by reason of war conditions, secured this end, they are now playing on it to the maximum extent with "freedom of choice" as their slogan. Why should the fuel industry be chosen for this privileged treatment? In every walk of life we are subject to restrictions in one form or another, apart from those attributable to war conditions, and if "freedom of choice" to satisfy the whims and fancies of a few is permitted,

then all other restrictions should be swept away. Let us examine the intentions of the gas industry in the matter.

In its report to the Ministry of Works, the Committee convened by the Institution of Gas Engineers states:—"It is important that every new building should be suitably provided, at the time of its construction, with gas installation pipes and points for the installation of gas appliances. This recommendation is in accord with the principle of freedom of choice of fuels by the tenant . . . and the provision of a complete installation of gas pipes and points, in addition to facilities for the use of electricity and solid fuel, appears to be a reasonable standard of equipment in house construction."

Further, in the report of the British Gas Federation on the Planning of the Gas Industry, it is stated:—"It is important that every new building should be suitably provided at the time of its construction with gas installation pipes and points for the installation of gas appliances"; also:—"It is presumed that the authorities, in the planning and erection of the houses, will definitely allow the occupants reasonable freedom of choice as to the fuels they desire to use for various purposes."

It should be noted from these extracts that emphasis is laid upon the necessity for a gas installation and whilst ostensibly recognition is given to the use of solid fuel by the provision of flues, etc., it is only another way of making the position secure for gas, as gas cannot be used without adequate ventilation and making a virtue of a necessity.

By Fredk. W. Purse,
M.I.E.E., M.I.Mech.E.

See what the Committee of Gas Engineers says in its before-mentioned report to the Ministry of Works:—

"A ventilated, incombustible compartment of adequate size for the housing of meters should be provided by the building authority."

"Cooking Appliances: The site should be convenient for use, well lighted, free from draughts, and in such a position that adequate ventilation may be provided for the removal of vapours."

"Refrigerators: A suitable space should be provided for the installation of a gas-operated refrigerator, if required, so as to give a clear ventilated air space above and around the cabinet, whether of the independent or built-in type."

"The following types of gas water-heating appliances should be connected to flues: (a) Rapid (or "instantaneous") water-heating type, used for the heating of water for a bath or other purpose requiring a similar volume of hot water. (b) Storage (or "circulator") type, having gas burners generating 15,000 BThU (gross) per hour or more. (c) Central heating type. (d) Wash boilers, washing machines or similar appliances, having gas burners generating more than 20,000 BThU (gross) per hour. (e) Any appliance fitted in a bathroom for heating water for a bath, having gas burners generating more than 500 BThU (gross) per hour per 35 cu. ft. of room space. Every such bathroom should be provided with adequate means of ventilation to the outside of the room."

"It is recommended that special provision be made in kitchens for adequate ventilation to ensure the necessary air changes for the removal of odours, due to cooking, washing, etc., and so to prevent their permeating the house."

Coal Industry Unaffected

It must be apparent from the foregoing how firmly the gas industry is endeavouring to dig itself in, and in more senses than one.

"Freedom of choice" does not really concern the coal industry since it has never applied in their case; only in rare cases is it found that there are fireplaces in every room, and the more modern houses, and particularly flats, have either no fireplaces or only one in the living room. If solid fuel is not used directly in domestic premises, it is used indirectly in the form of electricity or gas, so that the coal industry cannot possibly claim any loss of business by the absence of freedom of choice.

For the Minister of Fuel and Power to suggest, as he did in a speech on March 19th, 1943, that "we should have to build thousands of houses and they must be equipped in any form of service—gas,

electricity or solid fuel," is the height of absurdity—fancy every new house equipped with a coal range and fireplace in every room, with the accompanying flues, chimneys and coal storage accommodation, not overlooking the additional transport of solid fuel to every house. There are many forms of domestic service which cannot be provided by solid fuel, but they all can be performed by electricity, so why introduce the former at all? It, therefore, really comes to a question of electricity *versus* gas.

As already stated, electricity can provide *all* domestic services of lighting, heating, cooking, etc., and at a reasonably competitive price. As it is imperative that the cost of new houses must be cut to the minimum, why add to the cost by providing a complete gas equipment? Let us take a hypothetical example of a new estate being laid out, on the lines already foreshadowed, providing for 1,000 houses. I estimate that the additional cost of equipping every house with gas piping (excluding appliances and fittings), fireplaces, flues, solid fuel storage, street mains and service connections would be of the order of £100,000 or £100 per house. The saving in loan charges on such an expenditure would more than cover the fixed charge on electricity domestic tariffs, and leave a margin for providing additional amenities in the house if these were required, but in any case the saving I have indicated would far outweigh any supposed disadvantage from lack of freedom of choice.

Not in Public Interest

What the public do not realise is that this freedom of choice really does not serve their own interests, and if two services have to be provided, then they have to bear the additional cost, and not only the initial capital cost, but the subsequent running costs. Indeed, the British Gas Federation is much alive to this point, as in its report of October, 1943, it says:—"If gas were to be displaced by electricity on a substantial scale in this field, it would—on the reduced average consumption per consumer—result in average gas costs rising, whilst the ability to offer lower prices for additional supplies of gas would tend to disappear." By substituting electricity for gas in this quotation, it states precisely the position of the electricity supply industry; in other words, the charges for electricity can only be reduced to a minimum by securing the maximum revenue per consumer.

Here again, by inference, the gas industry recognises this essential feature when the British Gas Federation states in its report that "the operation of a national fuel policy will result in a greatly increased gas consumption per consumer." A national fuel policy which permits a continuation of multiple services cannot result in the lowest

charge to the consumer. The minimum cost to the consumer can never be secured if full provision has to be made in each house for alternative fuels. It would be as logical, under the pretence of "freedom of choice," to insist that every post-war motor car should be equipped for the use of both petrol and gas. The effect on the price of motor cars needs no emphasis. A strong case could be made for this double equipment of motor cars by the gas interests on the grounds that it would enable motorists to make use of home products, avoiding the use of imported petrol, and the argument can also be applied that a substantial use of gas for this purpose would tend to reduce its price.

I appreciate that my proposal will not be too popular, particularly with the company interests of our industry, as the margin of profit would not satisfy them, and they will defend their attitude by raising the bogey of peak load. This has, in fact, been seized upon by the gas industry. These "peak" merchants discourage the all-electric idea, preferring to sell a smaller number of units at a higher price; they overlook the point that excessive peaks are caused by consumers relying on the convenience and flexibility of electricity, and only using the supply spasmodically for heating purposes irrespective of the cost, and neglecting the steady day-to-day use for *all* purposes which the all-electric house would provide. There is ample evidence to demonstrate that "all-electric" can be both attractive to the consumer and remunerative to the undertaker, so why not go all out for it?

I also know I shall be considered a heretic in propounding this doctrine, and it will be said that I am proposing to put the gas

industry out of business, but in fact the reverse is the position. My proposals are only in reference to the houses that are to be built in future; this will leave the gas industry normally undisturbed with regard to its existing business, and such expansion (particularly industrial) as it can secure of its present system. It will, in fact, be saved a good deal of unremunerative expenditure, and should therefore be better off by the application of restriction in choice.

I would go further in regard to my suggestion of restriction in choice, and say that to satisfy the demands of that section of the public, which emphatically insists upon using gas, the Government should say: "Choose between all gas or all electricity," and allocate to the gas industry the exclusive right to supply even up to fifty per cent. of the new houses, and relieve the electricity industry of its obligation to supply electricity as well. It is the desire of both industries to supply as cheaply as possible to their consumers, but this will be impossible if gas mains and electric cables are to be laid in every new road, and every house has to be fully piped for gas, with adequate ventilation for fumes, and fully wired for electricity, with all the subsequent dual attendance and maintenance.

This "freedom of choice" is as crazy as all the other slogans, such as "Ninepence for Fourpence" and "Homes for Heroes," which have been slung about in the past. Let us face the facts and realise that the cost of dual (or triple) services is both unnecessary and unjustifiable, and that "freedom of choice" is not in the interest of either the consumer or the industries concerned.

Electrolytic Descaling

CLEANING steel by electrolytic pickling in molten caustic soda is claimed to produce a highly satisfactory surface for subsequent plating, galvanising, tinning, vitreous enamelling and painting. Processing in this way cleans the surface more uniformly, causes steel to become mildly resistant to rusting, avoids the harmful absorption of hydrogen and minimises loss of metal, while involving relatively small consumption of chemicals.

An investigation to determine the optimum time, temperature, current density and similar data for such treatment is described in a paper by Mr. N. L. Evans, of I.C.I. (Alkali) Ltd., issued by the Iron and Steel Institute. The author discusses the bearing of certain electrical conditions on the design of pickling plant, including precautions necessary for its safe operation.

According to British Patent No. 442,859/1936 the operating temperature should be 850 deg. F. and the immersion time from 10 to 15 seconds at a density of 100 A per sq. ft. of material to be cleaned, which is made the cathode, with nickel or iron anodes. The power required is

stated to be from 5 to 20 kWh per ton of metal cleaned, the maintenance of good electrical contacts appearing to be an important factor in preventing the occurrence of brown stain on the treated steel.

The tanks for containing the molten caustic soda should be constructed of mild steel plate about 1 in. thick with joints electrically welded on both sides. The most satisfactory way of heating the tanks is probably by means of electric immersion elements suspended along the sides of the tanks so that they can readily be taken out.

The consumption of caustic soda is said to be 15 lb. per ton of wire cleaned, the bethanising process having been extensively used in Great Britain for the production of galvanised steel wire. More recently it has been employed on a fairly large scale for descaling steel sheet, not as a preliminary to electro-galvanising, but as a final treatment to minimise rusting for an appreciable period, in contrast to the rapid rusting which follows pickling in acid. Rylands Bros., Ltd., are operating the process and J. Sankey & Sons, Ltd., are using it experimentally.

Industrial Lighting—I

Factors to be Considered in Planning an Installation

THE lighting of factories presents problems that are diversified in many ways.

The designer's dream is soon dispelled by the cost accountant's sober reality, while the wartime need to make the most of available materials imposes a closer restraint than might be justified by economic considerations alone.

It is most difficult to determine the levels and qualities of illumination desirable in

By **E. D. Iliff**,
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or more of which are within the visual range. The intensity of emission at those particular wavebands also varies considerably. The lamp which emits most energy at visible frequencies is the most efficient source of light, so a correction factor has to be applied to values of intensity of emission (Table I) to take into account the responsiveness of the human eye.

Visual acuity (ability to see clearly) is influenced by a variety of factors that may be summed up in the single word "contrast," which is created mainly by difference in intensity and colour of reflected light. The importance of colour depends on the nature of the work, and visual acuity is enhanced by colour differences only if they are marked.

Every object will reflect light of every wavelength to some extent; its apparent colour and tone depend first on the composition of the light falling upon it, secondly on its ability to reflect light of those wavelengths and, thirdly on the sensitivity of the eyes of the observer to the reflected light. Even to a colour-blind person objects seen in the light of the blue-green mercury vapour lamp will probably be lighter or darker than in daylight, or in yellow sodium light, and differences in tone will determine their visibility. The prejudices in favour of daylight and tungsten lamps are therefore often misplaced.

The manufacturing concern of which the author is chief electrical engineer claims to be by far the largest individual user of sodium lamps in this country and its discharge lamp installations must be among the biggest. The present installations include some 1,100 sodium lamps, 200 mercury lamps and 320 fluorescent tubes, in addition to tungsten lamps, and a further 250 sodium points and 200 mercury points are planned.

each section of a works, because management and operatives can seldom offer conclusive evidence of their respective requirements.

The advent of the discharge lamp, while extending the scope of the illuminating engineer, has still further complicated the problems that face him, for light is a manifestation of radiated energy of an intensity that is not uniform.

The human eye is sensitive only to the comparatively narrow waveband between about 4×10^{-5} cm. and 7×10^{-5} cm., visual response being indicated by a curve (Fig. 1) which peaks at about 5.56×10^{-5} cm. Now emission from an incandescent tungsten filament is greatest at a wavelength of 9×10^{-5} cm. so that more light of longer wavelength is available for reflection, thus emphasising colours at the red end of the spectrum. But gas-discharge spectra are not continuous, consisting of narrow wavebands of energy, one

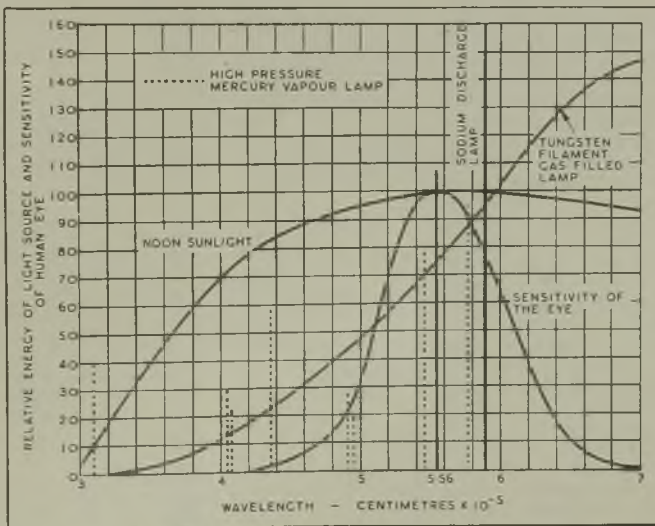


Fig. 1.—Visual response to energy distribution

The most suitable light for any particular type of work is best determined by experiment. A monochromatic light, such as sodium, has special advantages for the detection of surface irregularities, particularly in the case

Table I.—RELATIVE ENERGY, UTILISATION, AND EFFICIENCY OF LIGHT

Source	Per cent. visible	Per cent. visual utilisation	Per cent. efficiency relative to white light
White light of uniform intensity throughout the visual range	100	35	100.0
Monochromatic light of wavelength corresponding to highest sensitivity of human eye	100	100	280.0
Sunlight	40	40	45.0
Incandescent filament lamp	14	23	9.0
High pressure mercury vapour lamp	9	58	14.5
Sodium discharge lamp	11	76	20.0

of articles of a homogeneous nature, or at least of uniform colours. The reason is that there are no colour differences to distract attention, and the contrasts of shade are produced mainly by the nature of the surface under inspection. Light comprising only a few bands of different wavelengths may also help to emphasise contrasts in colour, the use of mercury vapour lamps for coal-picking being a well-known example.

The sensitivity of the eyes of the observer will vary very considerably, not only from person to person, but also in the same person under different conditions. Physical or mental fatigue may reduce vision to a very marked degree, and defects in lighting will therefore be cumulative in effect. The level of illumination provided by the very best installations is of the order of 30-50 ft.-candles, while 10 ft.-candles for general assembly work would be considered good, in this country at least (comparison with the great American aircraft assembly plants is perhaps unfair). Those intensities should be compared with the 100 ft.-candles which is typical of conditions in the daytime in a building well provided

with windows and roof lights. It is hardly surprising, therefore, that eye-strain is common among those who work continuously in artificial light.

To provide the requisite level of illumination is not the only problem, for it is most important to eliminate glare, direct or reflected, from the light source. The surface brightness, or intrinsic brilliance, of all electric lamps in common use (Table II), shows opal-finish tungsten lamps and the fluorescent tube to great advantage. This factor is of great importance in avoiding either direct or reflected glare, and even at great mounting heights a low surface brightness is desirable. Discharge lamps are generally superior in this respect to tungsten filament lamps with clear glass bulbs, and the surface brightness of the sodium lamp is less than a quarter of that of any other discharge lamp, except the fluorescent tube. In the case of filament lamps it is probably true to say that there are few locations where an opal, sprayed, or pearl-finish lamp would not be well worth the slight extra cost. When clear lamps are used a diffusing glass should almost always be provided.

Efficiencies and Costs

Including the losses in the control gear, approximate averages expressed in initial lumens per watt (Table III) show that the higher-rated sodium lamps are the most efficient by a comfortable margin, with the 400-W h.p.m.v. lamp leading all the remaining discharge lamps, comparable incandescent lamps being of much lower efficiency.

Table II.—SURFACE BRIGHTNESS OF LAMPS

Class	Nominal rating, watts	Description	Surface brightness Candles per sq. cm.		
Sodium discharge	45 & 60	Clear U-tube enclosed in clear vacuum jacket	9		
	85 & 140				
High pressure mercury vapour	80 & 125	Pearl shaped pearl bulb	60		
	250 & 400	Clear tube	150		
Fluorescent h.p.m.v.	80	Pearl shaped bulb	38		
	125	" " "	40		
	400	Pearl tube	50		
	400	Isothermal tube	50		
Fluorescent tube	80	Pearl tube 5 ft. long, bayonet cap at each end	0.5		
Incandescent tungsten filament	15	Vacuum single coil	Clear	Pearl	Opal
	40	Gasfilled coiled coil	388	—	—
	40	" " single coil	485	—	—
	60	" " "	469	5.7	.95
	75	" " "	563	6.7	1.1
	100	" " "	605	10.6	1.7
	150	" " "	658	13.9	2.2
	200	" " "	781	16.1	2.3
	300	" " "	862	22.9	3.0
	500	" " "	1,015	32.0	4.0
	1,000	" " "	1,225	—	—
	1,500	" " "	1,350	—	—

For a given total lumen output, the purchase cost of fluorescent tube equipment is the highest, followed in order by sodium and high pressure mercury, with tungsten easily the cheapest.

The cost of wiring, etc., is least in the case of sodium, and follows the overall efficiency (Table III), provided that the power factor of the discharge lamp circuits is corrected by condensers suitably connected. A useful approximation for purposes of comparison of wiring costs may be obtained by taking the reciprocal of the efficiency figure multiplied by the working power factor.

As regards maintenance, a comparison of

Table III.—LAMP EFFICIENCIES

Class	Nominal rating, watts	Output Lumens	Approx. average efficiency Lumens/watt
Sodium discharge	45	2,500	27.3
	60	3,900	47.6
	85	6,100	57.0
	140	10,000	59.8
High pressure mercury vapour	80	3,040	34.2
	125	5,000	36.5
	250	9,000	33.1
	400	18,000	42.1
Fluorescent h.p.m.v.	80	3,040	34.2
	125	5,000	36.5
	400	14,800	34.6
	400	15,200	(tubular) 35.6 (isothermal)
Fluorescent tube	80	2,800	31.1
Incandescent tungsten filament, gasfilled	150	2,030	13.5
	200	2,900	14.5
	300	4,720	15.7
	500	8,470	16.9
	750	13,610	18.1
	1,000	19,100	19.1
1,500	30,300	20.2	

lamp replacement costs may be made by arriving at a figure of cost per lumen output per hour, taking the E.L.M.A. figures of average life. The result shows tungsten lamps to be easily cheapest, with high pressure mercury slightly less than sodium discharge, while the fluorescent tube is the most costly. These figures are, however, based on purchase price only and take no account of handling costs, which are roughly inversely proportional to the lamp life and partially offset, or may even outweigh, the purchase cost of replacement lamps. It should also be noted that the useful life of discharge lamps is generally far longer than is claimed by the makers.

The comparative costs of electricity consumed follow from the efficiency figures (Table III).

Before leaving economic comparisons, it is worth while considering how the costs are likely to vary with conditions of service. Depreciation of reflectors, control gear, etc., will probably not be proportionate to the

actual number of burning hours. Though the useful life of the equipment will be shortened by continuous burning, the main factors influencing depreciation are the general conditions in which the equipment is employed and the maintenance attention devoted to it.

It is likely that the frequent replacement of lamps necessitated by continuous burning would tend to improve the maintenance of the equipment as a whole. There is more to go wrong with discharge units than with tungsten equipment, and the high temperatures associated with h.p.m.v. and tungsten lamps tend to render reconditioning or replacement of reflectors more frequently necessary, and feed cables are more likely to perish than is the case with fluorescent tubes and sodium lamps. Discharge lamps seem to give longer service when burning continuously than when used intermittently.

A further article will deal with examples of actual installations and the results obtained from them.

Electrical Computer

METHODS of calculating the variable heat flow in, and cooling of, steel ingots in moulds are described in a paper (No. 15/1944) issued by the Alloy Steels Research Committee of the Iron and Steel Institute, with the object of suggesting means of improving the uniformity of heating in industrial furnaces and of controlled quenching.

In addition to numerical computation two machines have been used for solving differential algebraic equations of a wide range of types. One of them is the motor-driven analyser of "Metrovick" construction at Manchester University, which is composed of eight integrators for mechanical evaluation. The other calculating machine employed is an electrical computer, which was specially built for the purpose in collaboration with the Metropolitan-Vickers Electrical Co., Ltd., and operated in the Research Department of Hadfields, Ltd., Sheffield. Its design was suggested by the similarity in form of heat-flow equations and those for the voltage distribution in an electrical "ladder network" consisting of a series of resistance-capacity loops.

The computer is in three main parts; first there is the electrical circuit itself, with the aid of which mathematical equations are solved in the form of time variations of the voltages at different points of the circuit. Secondly there are one or more input potentiometers for applying time-varying voltages (corresponding to the time variations of temperature of the surfaces of the material being studied) to the computer circuit at one or more points. Thirdly there is an output quadrant electrometer for recording the solution.

Agreement between calculation and practice has been surprisingly good and the results have confirmed in a striking manner a number of important conclusions that had been come to from theoretical work. The experiments were carried out on a works scale and should interest not only the steel industry, but also all investigators of heating processes.

CORRESPONDENCE

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

Rural Electrification in America

THE several discussions of rural electrification in your June 2nd issue were interesting to me. It occurs to me that your editorial on "Rural Supply: Costs and Benefits" omits mention of a factor in rural electrification which the Rural Electrification Administration has found highly important; the capital investment in the lines must be at the minimum consistent with adequate and continuous service. No factor has contributed so much to the extension of rural power lines in the United States as the reduction in average construction costs from about \$1,500 a mile to about \$750 a mile at the time we entered the war. Progressive reduction in the cost of service facilities means, of course, that areas of lower revenue can receive service without subsidy. We have found that our horizons thus widen steadily.

A fixed charge varying with the floor area of farm outbuildings, mentioned in the article discussing the results in the Wessex area, is not now common. Contributions by farmers to the cost of the line and even line rental charges, in cases where the farms are reasonably close to the primary line, are demanded only rarely. The normal farm rates charged by R.E.A. borrowers are based on usage only, and other rural suppliers have been following their lead.

The discussion of the "Essex" hammer mill is especially interesting, because we have been recommending such relatively low-powered, automatic installations for a considerable period. So far as I know, they have not yet attained in any large area of this country the popular acceptance which the Wessex figures indicate.

Hay dryers of the type your writer mentioned are just beginning to receive serious consideration in this country. A number of more or less experimental installations have proved highly successful, and materials for the wide installation of such equipment are being made available by our War Production Board. In these installations fans force air through ducts so that it is blown through the drying grass. The air usually is not heated, although experiments indicate that heating might be economically feasible. In the experimental installations, hay so dried is about twice as valuable from a nutritional standpoint as hay dried in the field.

We, like the Wessex Company, are finding that our pre-war educational activities are now beginning to bear fruit. The average

kilowatt-hour use per farm connected to R.E.A.-financed lines has more than doubled in five years in many areas; many of our borrowers report average use substantially above our estimates of the point at which it would level off—and the increases continue.

Reading about Mr. Hoadley's address to the Town and Country Planning Association makes me believe that your various rural electrification plans and those which many people in this country are making are substantially parallel. The points discussed and the questions asked—as well as the answers—were just about what they have been in recent meetings which I have attended.

St. Louis, Mo., U.S.A. ALLYN A. WALTERS,
Chief, Information Division,
Rural Electrification Administration.

Plugs and Sockets

THE ring main and its socket-outlet equipment is so complex a subject that every article dealing with it raises new difficulties. Almost nowhere is there any agreement except upon the desirability of the scheme. Quite naturally the core of the discussion is the desirability or otherwise of interfering with the socket standards which were arrived at so recently and with so much heartbreaking consideration.

If this is at all a just assessment of the controversy, are the terms of it in conflict? Can we have a ring main and can we use on it the existing standard sockets? Obviously not. If we are to adopt the ring main, therefore, we must break into the standard socket specification. And why not? The "standard" in this case is an arbitrary limitation applied for the sake of uniformity to articles whose function and size had already been determined by empirical methods. Any alteration in function demands an adjustment of the standard.

The most practical approach to the problem is to consider its desirability and cost. The standard is quite secondary. The desirability does not appear to be in question; the cost is a matter between the contractor and his customer. If (or should I say "when?") I am permitted by wiring regulations to install a ring main with such materials as are at my disposal, I shall discuss with my customer, whether he is an individual or an authority, the relative desirability and cost of a "tree" or a "ring" system. It will be very nice for him and for me if we can be sure in advance that the socket equipment installed complies with a standard. But lack of such certainty will not prevent him or me, if we

wish, from providing ourselves with desirable facilities for the use of electricity.

Since the standard socket and plug (unfused) of the "tree" system (which is arbitrary for marginal current ratings), belongs to that system, it must not be interchangeable with the "ring main" socket and plug (fused). Therefore, an *unrated* socket and plug (fused), of suitable design, of which examples already exist, must be standardised for the job. I use the word *unrated* advisedly since to rate such a socket is a confusion of thought.

After all, a standard is a mere vehicle for securing uniformity. In planning this little bit of the future let us not put the cart before the horse.

Swindon.

W. IBBERSON JONES,
(Teesdale & Jones, N.R.E.I.C.)

IN his letter in your issue of August 4th, Mr. L. Newton Davey bases his arguments on a number of false assumptions regarding our proposals for a 3-kW domestic standard fused plug and socket. He says (1) that cost has not been considered; (2) that the working contractor has not been consulted; (3) that one can determine beforehand where an unknown tenant will want his electric fire, so that one can use 2-A plugs everywhere else; by inference: (4) that it is not a good thing for the consumer to be able to connect an electric fire to any socket in any room; (5) that an unswitched socket is better than one with a switch; (6) that to use mixed 15-A and 2-A B.S. 546 plugs and sockets is cheaper than using 3-kW D.S. plugs and sockets throughout; and (7) that B.S. 546 having given a lot of trouble through allowing for too many sizes, it is not advisable to replace the range by one size only.

I cannot trespass on your space with a lengthy dissertation on all these fallacies, but with your permission I will deal with one or two.

First of all, a considerable increase in the number of plug points necessitates local funding if the cost of wiring is not to be multiplied in proportion to the increase in the number of plug points. This means that not one of the existing B.S. 546 socket outlets is suitable if electricity is to be made more freely available.

The cost of the 3-kW D.S. plug and socket, including its h.r.c. fuse, will be a great deal less than that of a 15-A B.S. 546 type without a fuse, and no greater than that of a good make of 5-A size, also without fuse. If the cost of wiring is taken into account the 3-kW D.S. will probably cost even less than the 2-A B.S. 546 size with a fuse added somewhere (its overall size is not much greater than that of the present 2-A size).

During the lengthy period of its development we took full advantage of the criticisms

and suggestions of contractors, supply authorities, users and manufacturers of domestic appliances, and to the best of our knowledge have satisfied them on all points. The cost of development, jigs and tools, stocks, etc., for large-scale production is much too great for any experienced manufacturer to overlook this elementary precaution, and I would like to take this opportunity of thanking our friends for their help.

Mr. Davey is worried about people using the wrong size of fuse. It should not be forgotten, however, that the existing practice as regards domestic fusing is largely governed by the vagaries of "perm" and shingle and the wartime shortage of hairpins. Surely a plug provided with an efficient h.r.c. fuse which cannot be replaced by a piece of wire is an improvement on this. Furthermore, most domestic appliances cannot easily be overloaded and faults are nearly always short-circuits. Our h.r.c. fuses open the circuit in 0.0006 second on a heavy short-circuit, *i.e.*, incomparably faster than anything in general domestic use at present.

Interchangeability of the 3-kW D.S. plug (or any acceptable alternative) with old plugs in old installations would be highly undesirable for such obvious reasons that I will not set them out. It would not be politic to hamper the electrical development of all future housing for the sake of the small percentage of existing peripatetic householders moving from a house with two or three sockets to one with about a dozen, or *vice versa*.

FOR DORMAN & SMITH, LIMITED,
London, E.C.4. R. AMBERTON,
Director.

Administrative Training

MEN on service, and their relatives on the home front, may well be reassured by the widespread response which has come from British industry to my offer in the *Electrical Review* of April 28th to share with other organisations the experience to date of the Dunlop post-war training plan.

The enormous interest aroused by the plan is a welcome recognition of the debt we owe to our men in the Forces. More than a hundred inquiries have come to me, at least two-thirds of them from such industries as the coal, iron, steel, textile, rubber, motor, engineering, gas, oil, electrical, flour, cable, plastics, hosiery, linoleum, needle, pharmaceutical, film, and boot and shoe industries: not to mention one of the big chain stores.

Our industrial organisations are indeed preparing to take up the challenge, as Lord Woolton declared to the House of Lords they would, to rebuild a land worthy of its men. It will be good for the men themselves to know that preparations to receive them back into civil life are already well forward.

Meanwhile, from the long-term point of view, training of both staff and operative personnel, such as cannot be given elsewhere, has already begun, so opening up the way of advancement to the individual and increasing the efficiency of industry. It would be difficult to rate too highly for the strenuous years of peace the cumulative value of this aspect of our work. Pursued in every industry it will do much to secure Britain's place in the markets of the world.

Erdington, Birmingham.
C. D. LAW,
Chief Staff Training and Appointments Officer.
Dunlop Rubber Co., Ltd.

Power Station Sites

YOUR summarised report in the August 11th issue is interesting as showing how opinions can be expressed by people without qualifications to form them, much as, at one time, daily papers were wont to air the opinions of film actresses on theological subjects. Durham County farmers it appears "agree that the site chosen is the only possible one." This is as illuminating as a

generating station engineer's opinion would be on the yield of milk from Jersey cows. The further statement that country dwellers are "entitled" to the same amenities as town dwellers is a product of the gasbag type of politician, who is over-busy promising everything, except hard work, to everybody.

The Durham miners, whose concentrated attention on digging coal would be appreciated, approve the scheme as "providing a good supply of electricity." In these days of the grid, what has that got to do with a particular site? More muddled thinking is provided by local councils. The whole proceedings give unfortunate support to Hitler's dictum that democracy is inefficient.

The site of a power station should be settled by electrical engineers, who alone have the technical qualifications, and whose high level of education will also ensure consideration of what is culturally right and fitting. Moreover if they feel it desirable, they can always consult others professionally qualified, such as artists or architects.

Banstead.

WILLIAM C. KENNETT.

Mobile Power Plants

Supplying Liberated Countries

IN a recent issue we mentioned the mobile power units which were being produced for use in liberated territory by the American Westinghouse Co. We have now received photographs and brief details of similar units constructed by the General Electric Co. of

who participated in the battle of Stalingrad, described the use of these mobile generating stations. They were run close to the lines to supply repair plants for tanks, trucks and other equipment as well as for the rehabilitation of recovered communities. The saving in taking



Generating and power sections of a 3,000-kW ten-car train power unit

America and the American Car & Foundry Co. which have been used in regained Russian areas and in Italy.

The U.S.S.R. has received more than forty of the units, which consist of a train of ten cars that can be rushed to a designated point and within eight hours after arrival deliver some 3,000 kW for lighting, power, hospitals, sanitation and rehabilitation work. These trains are self-contained and include sleeping quarters for the crew and a maintenance shop.

In a recent interview in the United States, Capt. B. G. Prischeenko, of the Red Army,

the power plant near to the lines instead of conveying damaged equipment back to repair shops some distance from the front is evident.

Fused Plugs

In the comments last week on the report by the Electricity Installations Study Committee we said that a very great majority of the supply authorities replying to the Committee's questionnaire favoured fused *pins*, rather than fused sockets. We should have said fused *plugs*.

PERSONAL and SOCIAL

News of Men and Women of the Industry

I.E.E. Scholarships.—The Council of the Institution of Electrical Engineers has awarded the following scholarships for 1944.—*Duddell* (annual value £150 for three years).—*Mr. F. Beach* (Pontypridd County School).—*Manville* (annual value £150 for three years).—*Mr. D. J. Taylor* (Deacon's School, Peterborough).—*Thorowgood* (£10 per annum for two years).—*Mr. R. A. Bennett* (Southern Railway Co.); (£30 for one year).—*Mr. A. Cardini* (L.N.E.R.). Awards of the Salomans and David Hughes Scholarships are to be announced later. It has again been decided not to award the Ferranti Scholarship or to make grants from the War Thanksgiving Education and Research Fund.

Mr. H. W. Blades, M.I.E.E., who has been mains engineer to the City of Birmingham Electric Supply Department for some years, retired on superannuation on July 31st. Mr. Blades has been in the service of the Department for thirty-eight years, and to mark the occasion of his retirement a presentation was recently made to him by the staff and employees.

The Lytham St. Annes Town Council has granted an increase in the basic salary of the borough electrical engineer, **Mr. J. C. Fairchild**, of £100 a year and increases to a number of officials in the Electricity Department.

Mr. T. S. Parkinson, A.M.I.E.E., has been appointed deputy borough electrical engineer of St. Helens where for the past twelve years he has been mains superintendent. Before going to St. Helens he held responsible positions in the Electricity Departments of Barrow, Salford and Blackburn. Mr. Parkinson is on the Committee of the Mersey and North Wales Centre of the Institution of Electrical Engineers. He is also chairman of the St. Helens Corporation Gas and Electricity Recreation Club.



Mr. T. S. Parkinson

Mr. J. Mills, power station superintendent at St. Helens since July last year, has now been appointed technical assistant to the borough electrical engineer and manager. Mr. Mills received his training with the Lancashire Electric Power Company and later joined its staff, serving for nine years as assistant in the test department. He then joined the staff of the Bradford Electricity Department and after serving in various capacities for thirteen years, finally held the position of generating engineer before going to St. Helens. He is an associate of the Manchester College of Technology, an associate member of the Institution of Electrical Engineers, and a member of the Institute of Fuel.

We regret to hear that **Sir Alexander Roger**, chairman of the Automatic Telephone & Electric Co., Ltd., British Insulated Cables,

Ltd., and other companies, has been confined to bed for the past three or four weeks and will be unable to attend to correspondence or undertake any engagements for some time.

Mr. E. Fawcett has just retired from the position of chief engineer of the Testing Department of the North-Eastern Electric Supply Co. after forty-one years' service with the company.

Farewell gifts of books and a "notable and beautiful" piece of machinery for his workshop (Mr. Fawcett's own description) were made to him recently by Lt.-Col. S. E. Monkhouse (managing director) and his colleagues.

Mr. Fawcett was born at Louth, Lincolnshire, in 1879 and attended the King Edward VI School in that town, later going to the City and Guilds of London College, South Kensington; he is a F.C.G.I. Before going to Newcastle he spent two years in the Testing Department of the Croydon Corporation undertaking. From small beginnings the "Nesco" Testing Department came to have a staff of over a hundred, three test rooms and a "turnover" of 100,000 meters a year.

Mr. Fawcett has also been active in other directions. He was chairman of the Meter and Instrument (now the Measurements) Section of the I.E.E. in 1930-31, and he was actively associated with the Electricity Commissioners in developing machinery for the administration of the Electricity Supply (Meters) Act. More recently he has taken an active part in the proposed standardisation of consumers' meter and service arrangements; he opened a discussion on the subject at a meeting of the Measurements Section in March last. He has served on a number of B.S.I. and E.R.A. committees, mostly as chairman.

Mr. Fawcett intends to continue his London committee work and any correspondence can be addressed to him at Riding Mill, Northumberland.

Mr. H. J. T. Ellingham, Ph.D., A.R.C.S., A.M.I.Chem.E., F.I.C., of the Imperial College of Science and Technology, South Kensington, has been appointed secretary of the Royal Institute of Chemistry. Dr. Ellingham is a well-known authority on electro-chemical subjects and was president of the Electro-depositors' Technical Society from 1940 to 1942.

By a printer's error the name of **Mr. A. R. Walter**, who is retiring from the position of acting city electrical engineer of Chichester, was incorrectly given as A. R. Walker last week.

Lieut. F. Jackson, of Preston, recently reported missing in Normandy, is now officially stated to be a prisoner in Germany. He was on the staff of the Siemens Lamp Works, Preston, as laboratory technician in civil life.



Mr. E. Fawcett

Obituary

Major G. R. Leeson.—We extend our deepest sympathy to Alderman H. Leeson, A.M.I.E.E., chairman of the North West Midlands Joint Electricity Authority, whose son Major G. R. Leeson was killed in Normandy on August 4th.

Mr. A. D. Berkeley.—We regret to report the death, in Birmingham on August 13th, of Mr. Arthur David Berkeley, M.I.E.E., for many years chairman of the Micanite & Insulators Co., Ltd., and a director of Associated Insulation Products, Ltd. Educated at St. Paul's School, he later served an apprenticeship with Cromptons of Chelmsford and was one of the pioneers of the electrical insulation industry in this country.



The late
Mr. A. D. Berkeley

During a visit to the Chicago Fair in 1893 Mr. Berkeley found that the manufacture of micanite had just been commenced in the United States and immediately grasped the possibilities of this new development. In the year 1894 with his brother, the late Mr. Edward Berkeley, he undertook the introduction and distribution of micanite products in Europe. They were subsequently joined in this venture by the late Mr. M. Mohr and soon after it was decided to manufacture micanite in England and a manufacturing company was formed in 1901. As the business grew, and other materials were developed, various premises were in turn utilised until in 1906 the company changed its name to its present title, the Micanite & Insulators Co. In 1908 a larger factory was erected at Walthamstow on the site of the present main works. Numerous additions have been effected from time to time and other premises acquired.

Mr. Berkeley also devoted his attention to the various associations concerned with the welfare of the electrical industry. He was a member of the Council of the British Electrical and Allied Manufacturers' Association and was recently elected a vice-president; he remained an active member until his death. He took particular interest in the work of the E.R.A., being a member of Council and chairman of the Finance Committee for many years. He also took a prominent part in the work of the National Union of Manufacturers; he was elected deputy-chairman of the Administrative Committee in 1919 and a vice-president in 1923.

Mr. Berkeley continued, in spite of his many administrative responsibilities, to take a personal interest in the development of the business. He became very well known during his long career and the industry has lost one of its prominent leaders.

Mr. J. H. Turner, M.Inst.C.E.E., who was chief engineer at Kemsley Paper Mills, Sittingbourne, for eleven years and prior to that electrical engineer at the mills, has died suddenly at the age of fifty-seven. He served with a number of private electrical and engineering firms including Siemens Brothers & Co., Ltd. During the last war he was a captain in the Royal Engineers.

Damages for Agent

LORD Patrick issued his decision in the Court of Session, Edinburgh, on August 11th, in an action brought by Mr. Richard Dobson, Glasgow, against the Hobart Manufacturing Co., Ltd., claiming £15,000 damages for alleged breach of contract in terminating the plaintiff's appointment as district sales agent. Plaintiff was until 1942 the sales agent for the Scottish district of the company, which manufactures many types of machines for the preparation of food. The machines were largely manufactured in America and France and imported into this country, but to a certain extent they were manufactured in this country. On the outbreak of war the company was prohibited from importing machines from the United States. In 1940 France fell, and thereafter the company could import no more machines from that country. Respondents claimed to be entitled to terminate their agreement with the plaintiff.

Lord Patrick found for the plaintiff and awarded him £3,500 damages. His Lordship said it was plain from the evidence that the company did not regard the plaintiff's failure to produce the contractual amount of business in 1941 as being due to any failure on his part. The company knew that it was due to causes quite beyond his control. It had been proved that if the company had been able to supply the machines, the plaintiff would have exceeded the contractual requirements. His Lordship was satisfied that the respondents had not proved that the plaintiff was in breach of contract justifying them in rescinding the contract.

Relaxation of Rubber Control

A NUMBER of restrictions upon the handling of waste and reclaimed rubber are relaxed by the Control of Rubber (No. 23) Order, 1944 (S.R. & O. 1944 No. 886, Stationery Office, 3d.). The principal features of the Order are the abolition of restrictions upon the acquisition and disposal of waste and reclaimed rubber and of restrictions on its use and consumption, except in the case of the higher grades specified in the No. 21 Order. The restrictions on the burning and destruction of waste rubber are abolished and waste ebonite, gutta percha and balata, rubber crumb and rubber shred are no longer controlled by Ministry of Supply Order.

The Order continues the control of prices for waste and reclaimed rubber and the control of charges for producing reclaimed rubber. Certain new classes are distinguished in the price schedules.

I.E.E. Students

THE Committee of the North Midland Students' Section has circulated a list of questions to its members in order to ascertain the subjects in which they are mainly interested; the most convenient times for meetings; and the kinds of works and other establishments which they prefer to visit.

The Council of the Institution of Electrical Engineers has granted permission to the committee of the Western Centre for the formation of a Students' Section embracing the Bridgend, Maesteg, Ebbw Vale and Newport areas.

Large Welding Manipulator

Handling Parts up to Twenty-seven Tons

FABRICATION by welding becomes more economical when manipulators are utilised for elevating, turning and tilting the "work" into positions suitable for downhand deposition. Such devices save handling time and working floor space; they assist the rate-fixing department to judge more closely processing time and electrode consumption, and they can be "loaded" with work by the progress department in much the same way as machine tools.

A new electrically-operated manipulator has recently been completed by Cooke & Ferguson, Ltd., Manchester, especially for marine engine parts weighing up to 27 tons. It represents a new principle of design that will enable similar models capable of lifting up to 50 tons to be readily constructed. Incidentally the manipulator itself could not have been built otherwise than by the employment of welded fabrication.

The work is clamped with T-bolts, inserted into slots, to a circular table top 2 in. thick and 16 ft. in diameter. It has a gapped centre to increase accessibility and allow projecting parts to be placed inside, so lowering the centre of gravity, even below the clamping level. The table top is bolted to a fabricated ring, in the periphery of which is a V-shaped double track that is part of the supporting arrangement of the revolving table. On the underside of the latter (Fig. 1) is a stainless steel pin-rack for the engagement of a gear-box driven by motors.

The whole clamping table is supported by three sets of rollers spaced in a circle around the V-shaped tracks. Each set comprises two groups of three rollers, each group being mounted in a housing which is capable of universal movement about two intersecting axes. The housings are at the opposite ends of a beam, which is also capable of universal movement, so that the loads are uniformly distributed.

The maximum eccentricity for the centre of gravity of a 10-ton load is 48 in. from the table centre. The speed of the table top is 1 RPM. The self-locking gear-box is fitted into a recess of the tilting body and is driven by a 50-HP motor, provided with an electro-mechanical brake to allow accurate adjustment of the jobs to be welded. Both the high-speed and low-speed shafts of the gear-box are entirely supported by ball and roller bearings.

The fabricated tilting body fulfils various

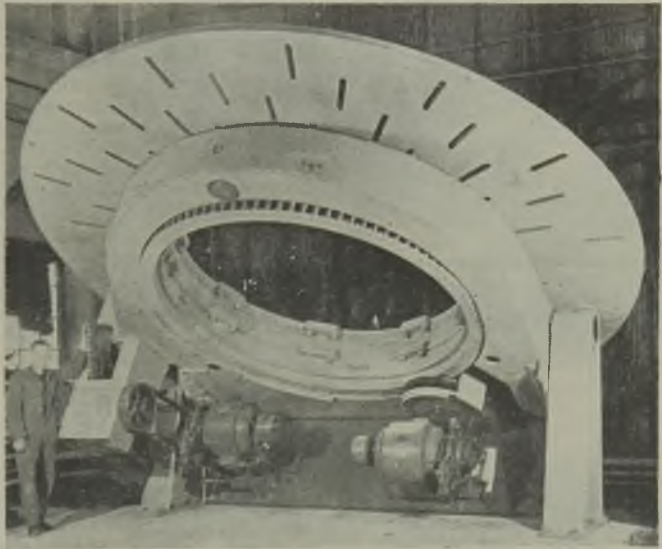


Fig. 1.—Welding manipulator, showing clamping table with rotating and tilting motors

functions; it supports the rollers, provides the tilting trunnions, and permits the counterballast tank (which also contains both the driving motors) to be bolted to the back of the body. In addition to the recess for the revolving drive gear-box, the body provides the projection upon which the tilting arm is fitted.

For the rated capacity of 10 tons the height for the centre of gravity of a load can be 72 in. above the faceplate. The time necessary to tilt the body through the maximum angle of 90 deg. is one minute. The fabricated tilting arm contains the self-locking reduction gears. This tilting arm, or gear-box, is driven by a 30-HP motor, also having an electro-mechanical brake.

The action of the tilting arm is to climb up the stationary worm wheel segment mounted on one standard, or leg of the manipulator. Although the revolving table

of which is to improve the characteristics of the whole machine. The manipulator has been placed on the edge of a 14 ft. deep pit, making it possible to handle workpieces up to 44 ft. in length.

Both drives for rotating the table and tilting the body have push-button operated starters (Fig. 2) for their slip-ring motors, which will run in the required direction only while the appropriate push-button is held depressed; upon releasing the button the motor will be stopped by the electro-mechanical brakes. For the tilting drive shunt limit switches have been mounted on one leg of the manipulator. All the bearings are connected by pipes with nipples and can be pressure fed by a grease gun.

The capacity range of the machine is from 10 to 27 tons; any job within this range can be handled provided the work to be welded is positioned in accordance with a load (gravity) diagram furnished by the makers. The time saved by the use of the manipulator has been proved by experience to vary from 25 to 33½ per cent. of the total of the welding and handling time issued to the operators on structures weighing 10 tons. It is anticipated that when the fabricated workpiece

approaches the 20-ton mark savings of 35 to 40 per cent. of the total welding and handling time will be recorded.

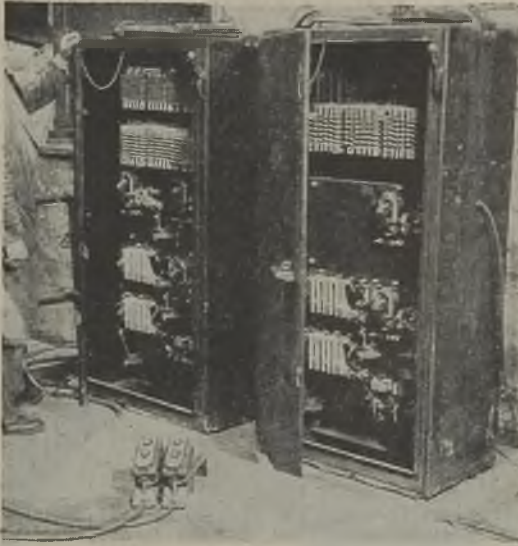


Fig. 2.—Push-button control panels for 30- and 50-HP motors

has a radius of 8 ft. the height of the legs is less than 6 ft. due to the choice of an eccentric tilting axis, the primary intention

Grain Drying

Conference and Demonstration at Norwich

THE drying of grain is an essential prerequisite for its proper storage. The grain commands a higher price when it is offered with a moisture content less than a certain limit. Consequently it may pay the farmer to use extra drying appliances to deal with the greater quantities gathered by combine harvesters.

The Farm Crop Grain Dryers' Association is an active body which disseminates information and gives technical advice to farmers and others concerned with this problem. There are a number of agricultural engineering firms which have developed grain dryers of different types, but none of them has been completely electrical. All of them derive their heat from coal, wood, coke, etc., coke being the most popular. Electrical power has, of course, been frequently used for the various power drives, fan operation, etc. The Bedford electricity undertaking recently arranged with one of its consumers to convert an existing coke-fired grain dryer to all-electric operation, but it was not until this summer that the subject of all-electric grain dryers had been discussed at a national gathering.

This year's annual conference of the Farm Crop Grain Dryers' Association was held at the offices of the Norwich Corporation Electricity Department by invitation of Mr. J. A. Sumner,

city electrical engineer. The Norfolk W.A.E.C. co-operated wholeheartedly in this function and shows and demonstrations were given by all the leading makers of grain dryers. The Electricity Department itself staged a demonstration and found that its new agricultural showroom, recently described in the *Electrical Review*, attracted very great interest. The conference itself was spread over three full days and one evening session as well, and was attended by about 600 people from all the grain producing areas of the country.

The sessions were devoted to the use of combine harvesters, the storage and marketing of grain, and the drying of grain. On the last subject there was a considerable and most animated discussion, occupying most of one afternoon. The interest did not stop at the sessional discussion, for at a "Brains Trust," having Donald McCulloch as question master, the subject was revived and Mr. Sumner was called upon to assist the trust in dealing with the technical points involved.

Following this very successful conference, a number of undertakings in East Anglia are negotiating for the installation of all-electric new or converted grain dryers and inquiries are being received at Norwich from all quarters.

COMMERCE and INDUSTRY

Ironmongers and Discounts. Women's Wages Raised.

"Monopoly" in Fifeshire

MUNICIPAL gas undertakings in Fife have forwarded to the Ministry of Fuel and Power a report of the circumstances in which the County Council has given electricity almost a complete monopoly of the servicing of the school feeding centres in the county. It is complained that although these undertakings are among the largest contributors of local and county rates, they were not invited by the County Council to tender a competitive quotation.

At a recent meeting of the County Council a communication was read from the Fife Electric Power Co. pointing out that, in order to make possible certain concessions as to charges, it would be necessary to exclude gas entirely from the kitchens, but later the company agreed to gas being used as a standby and subject to other conditions as to charges. Dunfermline Corporation Gas Committee at its last meeting declared that the conditions imposed by the Fife Electric Power Co. had all the appearance of being in restraint of the legitimate trading of the gas undertakings. In the Dunfermline area three school feeding centres were to be set up, and the Committee expressed disappointment that it should have been prevented from quoting for public business by the granting to the Fife Electric Power Co. of a monopoly by the County Council.

War Damage Claims

New regulations governing applications for compensation for war damage are promulgated in the War Damage (Notification and Claims) Regulations, 1944, superseding those made in 1941. These regulations (S.R. & O. 1944 No. 816, Stationery Office, 2d.) specify the procedure for notifying the War Damage Commission of damage sustained and for making claims for cost of works and temporary works payments and value payments.

An accompanying Order, the War Damage (General) Regulations, 1944 (S.R. & O. 1944 No. 818, price 1d.) defines a number of terms employed, e.g., "market value," "normal use" and "equivalent replacement" and provides that the Commission may make immediate value payments when it is satisfied that this course is necessary or expedient to meet the building requirements of persons engaged in work of public importance. It also deals with the valuation of salvaged articles for the pur-

pose of assessing war damage claims. This Order supersedes three previous Orders dealing with these subjects.

Farming Exhibition at Truro

Nearly 1,400 visitors, mostly farmers and their families, visited an exhibition held for a week recently at Truro by the Cornwall Electric Power Co., in conjunction with the Cornwall



Part of the Cornwall Electric Power Company's exhibition at Truro

War Agricultural Executive Committee. Special group visits were also made by a Women's Land Army unit, an A.T.S. unit, and students of Truro School and Kent College. Separate sections of the display covered the home, dairy, workshop, barn, water pumping, poultry and horticulture, and typical examples of the latest types of electrically operated appliances were demonstrated. A special feature was a model depicting how electricity is brought to a small hamlet.

At the opening of the exhibition Mr. A. C. Owen, general manager of the Power Company, outlined the progress made in the development of the undertaking's 1,156 sq. mile area with its scattered population of only 225 per sq. mile. He said that electricity was now available in 289 towns, villages and hamlets, or over 78 per cent. of the 77,000 premises in the area, and there were now 1,245 farms taking supplies.

Electrical Ironmongers

A summary is given in the *Ironmonger* of a report presented by Mr. L. H. Pearson, chairman of the Electrical Section of the National Federation of Ironmongers at the Federation's annual meeting last month. In this Mr. Pearson contended that the existing margin upon the sale of electrical appliances was inadequate and should be not less than 50 per cent. The effect of an inadequate return was obscured by the

fact that the larger buyers received substantial extra discounts, giving them a total margin which was usually reasonable. The result of this would be to "freeze" the number of outlets at its present level and prevent the expansion of electrical retailing on a sound commercial basis through suitable private-enterprise outlets.

Mr. Pearson expressed the opinion that there was a considerable difference between electrical contracting and retailing. Only a small proportion of the contractor's sales were subject to the retail distributor's margin; on the remainder he had his installation charges which carried their due share of overheads and profits. While many contractors had excellent retail premises a large number did not maintain such good premises and did not therefore incur the costs which were unavoidable if the goods were to be attractively shown to the public. Contractors were usually content to send their clients to the nearest manufacturer's or wholesaler's showroom, whereas the retailer was expected to be satisfied with a similar margin and bear the cost of the additional overheads—showroom, specialised staff, capital outlay and service staff—as well as bearing the cost of repairs during the guarantee period. Reference was also made to the operation of electricity supply authorities' showrooms which were not mainly concerned with making a profit if electricity was sold.

E.I.B.A. Annual Meeting

The annual general meeting of the Electrical Industries Benevolent Association will be held at 2, Savoy Hill, Strand, W.C.2, by courtesy of the British Electrical Development Association, at 11 a.m. on Thursday, September 21st. The annual report to be presented at the meeting will show that, in spite of the severe difficulties of the present times, and the many extra tasks which E.I.B.A. has had to shoulder, it has continued its work and laid further foundations for the future.

Women Engineering Workers' Wages

At last week's conference between representatives of the Engineering and Allied Employers' Federation and of the trade unions concerned an agreement was reached which will give increased wages to women employed in the engineering industry.

Details were not given but it is believed that, following suggestions by the National Arbitration Tribunal, the time rate (including bonuses) will be raised to 56s. a week (6s. increase) and the minimum piece rate to 61s. 2d. (7s. 11d. increase). Piece rates are to yield at least 27½ per cent. more than the basis rates, instead of 25 per cent. The basis rate will be raised from 25s. to 37s. by transferring 12s. of the national bonus to the basis rate and the balance of the bonus (10s.) will be increased by the addition of 4s.

Reinstatement in Employment

It has been decided by the Minister of Labour and National Service that the Reinstatement in Civil Employment Act, 1944, shall come into operation as from August 1st. At the same time the Minister has made the Reinstatement in Civil Employment (Procedure) Regulations (S.R. & O. 1944 No. 880, Stationery Office, 2d.). These set out the methods to be followed by men or women leaving the Forces or Civil Defence services who wish to return to their

former employment and contains forms of application to employers, to Reinstatement Committees (which adjudicate when the applicants' rights under the Act are not granted), and to umpires for leave to appeal from the Committees' decisions.

Procedure is laid down for Reinstatement Committees and for appeals to the umpire.

Proposed Trade Union Amalgamation

The August *Monthly Journal* of the Amalgamated Engineering Union reports that a further conference was held last month with representatives of seven unions to discuss the proposed amalgamation of the trade unions in the engineering industry. The representative of the Electrical Trades Union was absent owing to indisposition. Proposals with respect to contributions and benefits were discussed in detail and it was agreed that a further meeting should be held at Rugby on September 15th, when consideration would be given to the organisational side of the proposed amalgamation plans.

Instrument Conference

A joint conference on instruments for automatically controlling and recording chemical and similar processes is to be held in London on September 22nd and 23rd. Its object is to promote more interchange of experience and so encourage collaboration between physicists and chemical engineers. The conference will be open to all interested in the subject, free of charge, whether members of the organising bodies or not. Further particulars are obtainable from the Institution of Chemical Engineers, 56, Victoria Street, London, S.W.1.

Rubber Conference

An announcement by the Ministry of Supply states that "exploratory" conversations have been completed by the officials of the United Kingdom, United States and Netherlands Governments who met in London recently to examine post-war rubber problems. The conversations ranged over the whole field of rubber production—natural and synthetic—and a large measure of agreement was reached on the broad outlines of the position and on the nature of the problems involved. The conversations are to be resumed shortly.

Electricity from Ironworks

At a recent meeting of the Barrow-in-Furness Corporation Electricity Committee the town clerk submitted a letter from the Ministry of Fuel and Power enclosing an Order providing that the Corporation should take from the Millom & Askam Hematite Iron Co. a supply of electricity to the extent of not less than one million kWh a month. In the event of the price not being agreed between the company and the Corporation, this would be fixed by an arbitrator appointed by agreement between the company and the Corporation, or failing such agreement, appointed by the president of the Institute of Chartered Accountants. The town clerk also submitted a letter from the Ministry enclosing a letter from the company asking for an arbitrator to be appointed by the president of the Institute of Chartered Accountants and suggesting that the arbitration should be held at Seascale.

Having heard a report from the borough

electrical engineer on the matter the Committee decided to inform the Ministry that it took strong exception to the specification in the Order of the number of kWh to be taken and also to the appointment of an arbitrator by the president of the Institute of Chartered Accountants. It suggested that the arbitrator should be appointed by the president of the Institution of Electrical Engineers or the Institution of Mechanical Engineers. The whole of the facts are being placed before the Central Electricity Board.

Colour and Stereoscopic Television

A demonstration was given this week of the "Telechrome." Mr. J. L. Baird's invention which eliminates the revolving discs and lenses previously necessary for colour and stereoscopic television and produces pictures directly on the screen of the cathode-ray tube. The "Telechrome" differs from the black and white cathode ray tube in having two cathode ray beams and a transparent double-sided screen, the front of which is coloured blue-green and the back red. One cathode ray beam produces a blue-green picture on the front surface, the other a red picture on the back surface, the two blending to give a picture in natural colour. For stereoscopic viewing coloured glasses are used. Stereo television without the use of glasses has been demonstrated by Mr. Baird but this is still at too early a stage to be practically applied.

Consumer Sent to Prison

Salford magistrates last week sent to prison for two months a man accused of fraudulently consuming electricity. Temporary wiring indicated that at least two electric fires and a water heater had been operated without the current registering. The offences had been going on for about two years. The loss to the electricity undertaking was estimated at £22.

Trade Announcements

British Mechanical Productions, Ltd., Leatherhead, has acquired a controlling interest in the General Accessories Co., Ltd., Bristol. The arrangements provide for the continued directorship of Mr. S. Harper-Bill (Administration) and Mr. P. A. Johnson (Works) and for the resignation of Messrs. Child and Pratt. The board will be strengthened by the following appointments:—Brig.-Gen. R. F. Legge, C.B.E., D.S.O., chairman of British Mechanical Productions, Ltd., and general manager of the British Power & Light Corporation, Ltd.; Mr. L. D. Bennett, chairman and managing director, Philco Radio & Television Corporation of Great Britain, Ltd.; Capt. C. R. Cook, managing director of British Mechanical Productions, Ltd., and governing director of the Pitter Gauge & Precision Tool Co., Ltd. (to be executive director of the G.A.C.); and Mr. F. C. Fuke (late of J. H. Tucker & Co.), general manager of British Mechanical Productions, Ltd. (to be director (sales) of the G.A.C.). Mr. E. H. Marten-Smith, A.C.A., becomes secretary of the company.

Under the new arrangements the company will be autonomous and will have the full manufacturing support of British Mechanical Productions, Ltd. It will take over and be responsible for all sales of "Clix" accessories and improve designs where necessary. It intends to conform with the Electrical Fair

Trading Policy and to issue as soon as possible a wartime catalogue to be followed by a full permanent catalogue.

Bruce Peebles & Co., Ltd., have moved their London office to 4 Carlos Place, London, W.1 (telephone, Mayfair 3326/7/8).

Change of Name

In order to indicate more accurately the scope of its business the name of Tool Distributors, Ltd., 119, West Street, Bedminster, Bristol, has been changed to Tool & Electrical Distributors, Ltd. The company has opened a wholesale electrical department and would like to receive manufacturers' catalogues and terms.

Trade Publications

Pultra, Ltd., 24, Gravel Lane, Salford, Manchester, 3.—Illustrated catalogue (C.A. 4) dealing with "Micro" lathes, now including details of the capstan and some other models not mentioned in the first edition; also catalogue sheets (C.A. 5.1) headstocks, (C.A. 5.2) lathe beds and tailstocks, and (C.A. 5.3) compound slide rests for parallel and taper turning.

Copies of these can be obtained from the firms concerned by bona fide trade applicants.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month from August 9th:—

NEWMAN. No. B625,095, Class 7. Electric motors (not for land vehicles).—Newman Industries, Ltd., Yate, Bristol.

CCC (design). No. 621,335, Class 9. Containers and lids for batteries or accumulators; panels for electrical instruments and apparatus.—Cellulose Compositions Co., Ltd., 160, Cambridge Road, Trumpington, near Cambridge.

SPRINGBOK (design). No. 628,473, Class 9. Electric switches, and electric flat irons.—Roland Gidley and Hilda May Gidley, trading as Springbok Engineering Products, Moor Edge, Crossgate Moor, Durham.

PHOTECTOR No. 629,182, Class 9. Photoelectric cells; fittings therefor and parts thereof not included in other classes.—Westinghouse Brake & Signal Co., Ltd., 82, York Way, Kings Cross, London, N.1.

INFORMATION DEPARTMENT

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

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

Messrs. A. K. Waugh makers of "CP" heater elements, present address required.

LITTLE GIANT and LONG TIM lighting plants.

ELECTRICITY SUPPLY

Liverpool's "Moon" Lighting. Big Loss on Glasgow Transport.

Barrow-in-Furness.—NEW SUBSTATION.—The Electricity Committee is to seek sanction to borrow £2,870 for a new substation to serve the Harrel Lane area.

FRINGE ORDER.—Application is being made for a Fringe Order authorising the Committee to afford supply to premises and farms at Swarthmoor in the Ulverston U.D.C. area.

Glasgow.—UNDERGROUND CABLES.—The Clyde Valley Electrical Power Co. has been granted permission by Glasgow Corporation Highways and Town Planning Committee to lay underground h.v. cables on ground adjoining the main outfall sewer at North Elgin Street, Clydebank.

PLAN FOR BRIGHTER STREET LIGHTING.—Proposals for improved street lighting have been submitted to the Ministry of Home Security by the Corporation Lighting Department. It provides for a ten-fold increase. The 15-W lamps used in the present "starlighting" will be retained, but with an alteration in the shading arrangements.

Huddersfield.—OWNERSHIP POLICY.—Having considered the position of the electricity supply industry in relation to post-war planning the Electricity Committee recommended that the Corporation should undertake to give complete support to all municipal, and co-operate with all company, selected-station owners who wished to retain control of their stations. Further, that the Corporation should press for the amendment of the constitution of the I.M.E.A. so that representation should be on the basis of output, and that failing the constitution being so amended the Corporation should consider resignation from membership of the Association. These recommendations were approved by the General Purposes Committee, which resolved that copies should be sent to all municipal and company selected station owners.

At a subsequent meeting of the Town Council the recommendations were opposed by the Labour Party, for whom Mr. J. Ross Davies moved an amendment that the Corporation should undertake to support Clause 14 of the I.M.E.A. "Brown" Memorandum, believing this to be an essential step towards national ownership of electricity supply. Opposing the amendment, Mr. G. B. Jones said that no facts had been put forward to show that there was any justification for combining all the electricity generating stations. The amendment was defeated by 43 votes to 12.

Liverpool.—MODIFIED STREET LIGHTING.—The improved street lighting, recently sanctioned by the Ministry of Home Security, was brought into operation on Saturday last. The scheme covers three miles of main streets in the centre of the city, and the maximum intensity of illumination at street level is 0.02 ft.-candle, which is one-hundred times the intensity of "starlighting." The mounting height of the lamps (25-W) is 28 ft., and the spacing averages 35 yd. Existing fittings have been adapted for the purpose by incorporating a saucer shaped baffle under the lamp. The lip of this baffle is higher on the side next to the

buildings so as to prevent direct radiation on to reflecting surfaces above ground level.

Switching is carried out from a central point as follows, each group of lamps being controlled by a contactor:—The main switch energises the first group of lamps and also the closing coil of the contactor for the second group. This contactor then closes and energises the second group of lamps together with the closing coil of the contactor for the third group, and so on until the whole area is illuminated. For switching off the reverse process is used. The control point is continuously manned and is a class "O" priority station for receipt of air raid warnings. In most cases the existing "starlighting" has been retained so that the streets will not be plunged into utter darkness in the event of an air raid warning. The quality of the new lighting might be described as equal to that of good moonlight. Two factors which weighed with the Ministry of Home Security in granting permission for the lighting were the geographical position of Liverpool in relation to enemy air bases, and the fact that no new material was being employed in the execution of the scheme.

Stroud.—PREPARATIONS FOR STREET LIGHTING.—Detailed schemes and estimates for post-war street lighting are to be obtained by the Urban District Council from the gas and electricity companies.

TRANSPORT

Ceylon.—TRANSFER OF COLOMBO TRAMWAYS.—The Colombo correspondent of *The Times* reported on August 10th that the Colombo tramways were to be run as from last Monday by the Municipal Council. The Colombo Electric Tramways & Lighting Co. Ltd., was to receive a payment of 3,633,433 rupees, which was the amount awarded by the umpire in the arbitration proceedings, and in addition all profits until the completion of the purchase. The bulk of the shares of the company are held by the United Planters Co. of Ceylon, Ltd.

Glasgow.—SERIOUS DEFICIT.—The Corporation Transport Department concluded the past financial year with a deficit of £145,000, and estimates show that during the coming year this may be increased to about £500,000. The deficiency is almost wholly due to the increases made in wages and salaries and the greater costs of material. The Committee is to appoint a sub-committee to consider the position, and to deal with the question of increasing fares and any steps which may be taken to achieve economy.

London.—BAKERLOO SECTION TEMPORARILY CLOSED.—The section of the Bakerloo Line between the Piccadilly Circus and the Elephant and Castle stations is temporarily closed to enable important maintenance work to be carried out in connection with the under-river tunnels and track. The line will be re-opened on August 25th. Alternative routes are available and in addition a special service of buses is being operated between Jermyn Street and the Elephant and Castle.

Organisations of the Industry—IX

Association of Supervising Electrical Engineers

WHEN the Association of Supervising Electrical Engineers was formed thirty years ago its activities were limited to educational and social matters. The first world war curtailed its work, and by the year 1920 its fortunes were at a low ebb, but certain stalwarts were so confident that there was a future for the Association that they engaged a full-time secretary. The fact that there was no money, or very little, in the "kitty" did not daunt them, and the deck, so to speak, was fully cleared for action.

It was realised at that period that supervising electrical engineers constituted a body of men whose knowledge and experience would contribute considerably to the progress of the industry, and that if their views were to be made available a central organisation through which those views could be presented was necessary. On this basis the Association began to progress and, as practical and technical engineers whose pride in their craft was of personal importance, the views of the membership were invited on many matters.

The Association is now the recognised authority for supervising electrical engineers due to the scope of its membership, which is employed in most industries. Included in its ranks are chief engineers and foremen of industrial and commercial concerns; managers, supervisors and foremen in the electrical contracting industry and the distribution and installation departments of supply authorities; chief maintenance engineers and foremen of large business establishments, departmental stores, hospitals, works and factories; commercial engineers (a designation recognised as the result of A.S.E.E. activity in 1924-7); consumers' engineers; engineering staff of consulting engineers; and eligible grades employed by the various Government Departments and industrial establishments.

To foster apprenticeship in the industry has been one of the Association's objects since the days of its formation and in 1928

it published a suggested scheme of apprenticeship for the electrical industry on a national basis under the control of a Central Apprenticeship Board, and providing for indentures between the parents or guardians and the Board, control of the number of apprentices, and ensuring proper training. While the principles of the scheme received general welcome, employers were not willing to forgo their authority which the established system of indentures gave, and progress was not made. It is, however, encouraging that other industries' schemes since published have included many of the suggestions made by the A.S.E.E.

The scheme is now under review and a revised version has been submitted for comment to a number of bodies in the industry, and the suggestions received will be studied by the Committee prior to the publication of a revised scheme.

"No body of men could better know what wiring rules should be," said the late Mr. W. W. Lackie, an Electricity Commissioner, referring to the A.S.E.E. The I.E.E. Wiring

By A. Brammer



Mr. H. W. Swann,
M.I.E.E., President
since 1939



Mr. J. Flood, Chair-
man of the Execu-
tive Council



Mr. A. Brammer,
General Secretary
of the Association

Regulations play an important part in the everyday work of our members and the Association has been represented on the Wiring Regulations Committee for twenty-three years. In 1926 it published its first "Employees' Guide to the I.E.E. Regulations for the Electrical Equipment of Buildings." As each successive edition of the Wiring Regulations has been published, the Association has compiled a new edition of the Guide. "The Guide" gives just those regulations which concern the installer; brings together, using practical language and tables, regulations dealing

with any one subject; by the aid of diagrams simplifies the meaning of the regulations; and gives by a series of notes A.S.E.E. interpretations.

The Association is also represented on a number of committees convened by the Institution of Electrical Engineers and has a liaison officer on the Electrical Installations Committee. Representatives have also been appointed to many committees of the British Standards Institution, the Advisory Committee on Installation Work of the City and Guilds of London Institute, the Electrical Industry Co-ordinating Committee, the National Committee on Statutory Wiring Regulations, the National Federation of Professional Workers and a number of other bodies.

The members are afforded every opportunity of keeping in touch with developments through the medium of formal and informal lectures, visits to places of interest, a technical library, a technical inquiry service, educational competitions and the Association's monthly journal, the *Electrical Supervisor*. In spite of the difficulties of war conditions, during the past year the Association held a technical meeting every three days, a record which must be unequalled by any other similar organisation.

Educational Competitions

In 1923, the W. E. Highfield Shield Competition was inaugurated by the late Mr. W. E. Highfield, then President of the A.S.E.E., the rules of which invited papers of not more than 2,000 words dealing with the electrical industry and/or the Association, and in addition to the Shield, money prizes of considerable value were offered. The competition was held annually until 1940, when in fairness to members in the Forces or engaged in other national services the competition was discontinued. The year 1925 saw the introduction of the Economic Premiums Competition in which prizes were offered annually for five years by Mr. Frank Gill (now Sir Frank Gill), President of the Association, for papers on economics, industrial relations, reduction of unit costs or encouragement of business.

Engineers as a body are usually reticent and not fluent in making known their views at public assemblies, and we welcomed in 1931 the institution of the Meetings Discussion Award by Mr. S. B. Donkin, President of the A.S.E.E. 1928-31, who gave prizes annually for those who made the best contributions to discussions at the Association's London lecture meetings. The A.S.E.E. Debating Society and the Speakers' Class did much useful work in this connection.

In 1941 the Association introduced its present Branch Papers Competition, under which papers not exceeding 2,000 words in length are submitted and read by members

at their branch meetings, and are then forwarded to head office and judged at the conclusion of the year by an examining board. The three winning entrants are awarded National Savings Certificates as prizes and invited to read their papers at a London meeting. This competition has been most successful, and the variety of subjects indicates the wide and varied knowledge of the membership. A Branch Merit Cup Competition was introduced last year and, as its title indicates, its object is to encourage branch efficiency and progress. The silver cup was presented by Mr. A. W. Jervis, a member of the Council, and the result of the first year's competition is awaited with interest.

The Swann Diploma

An important part of the Association's present work is the preparation of a scheme for award of a diploma to indicate a standard of ability in electrical installation or maintenance work, or both. The Swann Diploma—named after Mr. H. W. Swann, to whom its inception is due—will be awarded upon the results of an examination, and may be endorsed to show special qualifications, with credits or distinctions for high proficiency. The examination will be mainly oral in character, and so designed as to give full opportunity to the technically and practically sound man who suffers from "examination nerves," while eliminating the type that makes up in memory for lack of ability. Special regard will be paid to ability to pass to others the correct method of approach to, and the solution of, practical problems, and also to marshal facts and present a case.

Conditions of Service

One of the main objects of the Association is to encourage the employment of efficient engineers and to ensure that efficiency is adequately rewarded. Machinery provides for safeguarding the professional status and remuneration of the membership. Schedules of minimum salaries and designations have been compiled for members engaged in electrical installation and maintenance work and on the distribution and utilisation side of the supply industry. These are a guide to employers and members, but due to the varying duties and responsibilities the schedules are necessarily elastic and a large number of cases are consequently dealt with individually.

The Association's policy and activities have resulted in greatly improved status and salaries for supervising electrical engineers and have benefited a much wider field than that covered by the membership. There are other items such as legal assistance, an employment bureau, sickness and death benefits, a medical consultants' service,

inventions assistance and so on. An unemployment benefit scheme is on the annual refund principle, the refunds having ranged from 10s. to 13s. per share of 13s., the holder of ten shares being insured for £48 15s. annually. During the present war the Association has taken an active interest in the numerous Government regulations affecting the membership and negotiations with various Government Departments have been cordially conducted.

The A.S.E.E. Register formed in conjunction with the Central Register in 1939 has proved of considerable assistance in the national effort, and has been but one of the Association's efforts in keeping with its policy of ensuring employment of its members in the best national interests. With an eye to the future and to ensure that the Association shall be fully equipped to deal with the many problems which will arise on the conclusion of the present emergency, a special Post-War Problems Fund has been formed by special annual contributions from members.

Compulsory Regulations and Registration

The Association's interest in this subject is well known. Following numerous complaints from the membership regarding the inferior installation work carried out by incompetent persons, the A.S.E.E. in 1936 appointed a special committee to investigate the position, and in December, 1936, "The Case for Compulsory Wiring Regulations and Registration" was published by the Association.

This was the first occasion on which this much-talked-of subject had been investigated and the report, which gave particulars of the schemes in operation in the Dominions and other countries, along with a statement of the position in this country and a suggested scheme, was first discussed at an open meeting in London in January, 1937, and subsequently at similar meetings throughout the country, when the principle met with general approval. The outcome was the formation of what is known as "The National Committee on Statutory Wiring Regulations and Registration," under the chairmanship of Mr. S. B. Donkin. Organisations with which the A.S.E.E. has the privilege of co-operating on this committee include the Electrical Contractors' Association, which was responsible for the original move toward safe and efficient installation work. War conditions affected the activities of this Committee, but in 1941 it published a scheme to provide for examining, licensing and registering contractors, operatives and others engaged in electrical installation work, and compiled a statement of evidence in support thereof, and is to take active steps to bring its work to fruition.

Membership of the Association is recognised as a qualification of efficiency by the Association of Consulting Engineers and by employers in industry. The letters M.A.S.E.E. may be used by members, and in 1938 a certificate of membership was approved by the Executive Council for issue to members. The rules of the Association (which are under revision) provide for an annual general meeting of members, for branches and district organisations, and the management of the Association's affairs is vested in an Executive Council of fifteen members elected for three years, one third retiring annually, but eligible for re-election. Those having served for six consecutive years retire for one year, an arrangement which ensures change of personnel. The multitudinous duties of the Council are delegated to various committees, including the General Purposes, Organisation, Technical, Membership, Apprenticeship and Diploma Committees.

The Executive Council annually appoints its officers, those for 1944-45 being Mr. J. Flood, chairman; Mr. J. W. Noble, vice-chairman; and Mr. J. J. Smith, M.I.E.E., treasurer. The president of the Association is Mr. H. W. Swann, M.I.E.E., H.M. Senior Electrical Inspector of Factories, who has the record of occupying the position for five years. The past presidents are Messrs. A. H. Dykes, A. P. Trotter, J. S. Highfield, T. Vincent Smith and W. E. Highfield, Sir Frank Gill, Messrs. A. M. Sillar, S. B. Donkin and G. Scott Ram, Sir John M. Kennedy and Messrs. H. Hobson and J. R. Beard.

Branches and Centres

Local activities are dealt with through branches, centres and regional delegate meetings, ensuring close contact with headquarters and the districts, but direct contact between headquarters and the individual member is retained. National conferences of district officials are held biennially. To meet the many requests to take part in the educational and social activities which were frequently received from persons ineligible for membership, associate membership and associateship sections were instituted. These sections do not take part in the management of the Association's affairs.

Thirty years have passed since the first president, Mr. A. H. Dykes, and the first chairman, Mr. J. M. Crowdy, were appointed to their respective offices, and it is most gratifying that they are still actively interested in the Association's work. To-day, the A.S.E.E. is known for its standing and integrity, and its views on matters covering a wide field are constantly sought. Symbolic of the Association's work is the motto "Ease the Path to Progress" embodied in its emblem.

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.

C. B. ANNABLE.—"Electric immersion heaters." (Cognate applications 3800/43 and 9405/43.) March 9th, 1943. (562997.)

Automatic Telephone & Electric Co., Ltd., and P. N. Roseby.—"Electrical signalling systems." 960. January 19th, 1943. (562986.)

Automatic Telephone & Electric Co., Ltd., P. E. A. Cowley and E. C. Walls.—"Telecommunication systems." 1037. January 20th, 1943. (562990.)

British Thomson-Houston Co., Ltd.—"Oscillating mechanism for washing machines." 18390/42. December 31st, 1941. (563020.)

"Electric thermal control devices." 6308/43. April 30th, 1942. (563107.)

W. A. Coates and Metropolitan-Vickers Electrical Co., Ltd.—"Electric circuit interrupters having arc-extinguishing means." 2318. February 11th, 1943. (562994.)

Crompton Parkinson, Ltd., and A. W. Angold.—"Prepayment mechanism for meters and the like." 16879. November 27th, 1942. (562979.)

E. L. Eastell.—"Light-signalling apparatus." 806. January 15th, 1943. (563088.)

A. Emson.—"Lamp for use in fog and under water." 16114. November 13th, 1942. (563083.)

English Electric Co., Ltd., and R. J. Welsh.—"Power plant." 17821. December 15th, 1942. (563115.)

B. Erber.—"Dry cells." 1389. January 27th, 1943. (563054.)

General Electric Co., Ltd., and E. H. Nelson.—"Gastight seals wherein electric conductors pass through quartz or like vitreous material." 1032. January 20th, 1943. (Addition to 513025.) (563027.)

General Electric Co., Ltd., and E. H. Penwarden.—"Electric radiators and like apparatus." (Cognate applications 6110/43 and 3369/44.) April 16th, 1943. (563095.)

A. H. Hunt and R. A. Grouse.—"Processes for the treatment of metallised paper and the manufacture of electric condensers therefrom." (Cognate applications 14926/42 and 16674/42.) October 23rd, 1942. (563080.) "Manufacture of electric condensers." 16675. November 24th, 1942. (563084.)

Johnson & Phillips, Ltd., and R. T. Lythall.—"Electrical protective devices." 5720. April 9th, 1943. (563060.)

Johnson & Phillips, Ltd., and G. T. W. Whitehead.—"Winding drums employed on cable ships." 17885. December 16th, 1942. (563018.)

Landis & Gyr Soc. Anon.—"Prepayment apparatus with coin-inlet mechanism, for example, for electricity or gas." 11994/42. September 8th, 1941. (Addition to 550395.) (563041.)

R. Lloyd and Sun-Vic Controls, Ltd.—"Electrically heated blankets, flying suits and other articles of clothing." 5680. April 8th, 1943. (563005.)

Marconi's Wireless Telegraph Co., Ltd.—"Frequency modulating signal receiving system." 2310/43. February 12th, 1942. (562993.)

Philips Lamps, Ltd., and C. W. V. Davis.—"Magnetic cleaning devices." 813. January 15th, 1943. (563022.)

H. A. Rush.—"Electric water heater." 18386. December 28th, 1942. (563049.)

E. S. Russell and Service Electric Co., Ltd.—"Portable electric blowers." 983. January 19th, 1943. (562988.)

Standard Telephones & Cables, Ltd.—"Directive antenna system for guiding and direction-finding arrangements." 13291/40. November 7th, 1939. (563007.)

"Radio beacons." 13289/40. October 19th, 1939. (563075.)

"Radio beacon." 13290/40. October 11th, 1939. (563076.) "Electron discharge devices." 14509/42. October 23rd, 1941. (563113.)

Standard Telephones & Cables, Ltd., and J. K. Webb.—"Manufacture of electric insulators." 1119. January 22nd, 1943. (563032.)

Standard Telephones & Cables, Ltd., J. D. Holland and D. D. Robinson.—"Electric signal transmission systems." 1174. January 22nd, 1943. (563034.)

J. W. Tills and J. B. Lovatt.—"Electric arc welding sets." 5884. April 13th, 1943. (563064.)

J. B. Tucker.—"Method and means of installing electric switch mechanism or the like in walls or other surfaces." (Cognate applications 1993/43 and 2949/43.) February 6th, 1943. (562992.)

Versil, Ltd., C. E. Binns and S. Palmer.—"Electric insulating sheets or strips." 13398. September 23rd, 1942. (563043.)

Western Electric Co., Inc.—"Repeaters for submarine cables." 6136/43. April 18th, 1942. (563099.)

Westinghouse Electric International Co.—"Electric circuit-breakers of the gas-pressure operated type." 11101/44. March 31st, 1942. (Divided out of 562941.) (563040.)

Tower-Wagon Accident

AN inquest was held at Brighton recently on Alfred George Bullivant (57), an employee of the Corporation Electricity Department, who was fatally injured on a tower wagon. He was stated to have been struck by a cross-wire supporting trolley-bus cables. The driver of the vehicle said that his mate always knocked on the top platform with a spanner or hammer when he wanted the wagon stopped, but on this occasion witness did not hear any knock. Mr. H. Pryce-Jones, engineer and manager, stated that a new tower wagon had been purchased which was fitted with experimental electric bell communication between the tower and the driver's cabin, but this had not yet proved completely satisfactory. The experiment had been made entirely with a view to modernisation and not because of the possibility of an accident: the knocking method of communication had been practised for a long time and had always proved satisfactory. A verdict of "Accidental death" was recorded.

Irish Board's Operations

"Progressively More Difficult"

PREFACING its report for the year ended March 31st last the Electricity Supply Board of Eire says that the conditions under which it operated became progressively more difficult. For ten months water conditions were reasonably favourable, but a prolonged dry spell set in early in February and had not broken at the end of the period covered by the report. At the same time combustion problems at the Pigeon House steam station became more frequent as the quality of the fuel further deteriorated, supplies at the end of the year being confined for the most part to an almost unusable slurry. The conditions combined to create a critical situation in the maintenance of the electricity supply and during the spring increasingly severe restrictions had to be imposed. These have since been somewhat relaxed.

Despite the many handicaps the Board was able to achieve an output for the year of 443 million kWh as compared with 414 million kWh in the previous year, an increase of 6.8 per cent. In 1939, prior to the emergency, an output of 378 million kWh sufficed for all requirements, but throughout last year the demand far exceeded the supply.

Liffey Scheme Begins Operation

Some small assistance was given by the Golden Falls station of the Liffey Scheme which, it is revealed, was brought into commission on December 10th last, and consists of one propeller turbine rated at 5,700 HP coupled to a 5,000-kVA generator. Completion of the main Poulaphouca station is, however, still held up pending the delivery of some portions of the plant.

Of the total electricity generated, 274.9 million kWh was produced at the Ardnacrusha (Shannon Scheme) station, 164.5 million kWh at the Pigeon House station and 2.3 million kWh at Golden Falls; in the previous year 293.7 million kWh was generated at Ardnacrusha and 119.9 million kWh at Pigeon House. The maximum daily output was 1,884,000 as against 1,719,200 kWh and the maximum load 119,200 against 112,000 kW.

Motive power was the principal outlet for the increased amount of electricity generated, and the total supplies in this class exceeded those for domestic purposes, previously the largest item. An analysis of the sales of electricity is given in the accompanying table. During the year 11,538 new consumers were connected, making 222,013 in all.

The report contains a copy of the electricity ration card issued to consumers in March, 1943. On this the basic consumption for

two-monthly periods is recorded and it is stated that the penalty for exceeding the ration in force at any time is disconnection of supply.

The Board's accounts show a deficit of £196,120 and, added to the deficiency brought forward from the previous year, this makes a total debit balance of £219,394. Having regard to the size of the deficiency for the year, the growing costs of maintenance of

ANALYSIS OF SALES

Class of Supply	1942-43	1943-44
	Million kWh	
Domestic	131.6	129.6
General lighting	22.4	23.8
General heating, cooking and water heating	38.1	39.2
Motive power	118.0	135.6
Public lighting	6.8	7.7
Traction	7.1	7.1
Miscellaneous	4.1	3.9
Total	328.1	346.9

supply and the effects of curtailment of output, the Board views with anxiety the prospects for the current year. In November last sanction was obtained to an increase in tariffs, but this was limited to raising the 10 per cent. addition imposed in 1941 to 20 per cent.

Heavier Cost of Coal

Gross revenue for the year amounted to £2,433,803 (against £2,236,534), the average price per kWh sold being 1.68d. (1.63d. in 1942-43). Working expenses, including depreciation, were £1,705,076 (£1,453,659). This increase of more than a quarter of a million pounds was brought about by the substantially heavier expenditure on coal, appreciable increases in the amount spent on repairs and maintenance and in the cost of bonus under the Emergency Powers Order, and the contribution by the Board to the superannuation schemes which became payable for the first time during the year, the schemes (for general and manual workers, respectively) having come into operation on April 1st, 1943.

The profit and loss account has been debited with £75,850 instalments of advances repayable to the Minister of Finance and £12,827 repayment of capital liabilities assumed from local authorities. The total of the latter so far repaid is £660,473, leaving £95,548.

As a result of restrictions on the sale of appliances there was a decrease in the turnover on the merchandise trading account from £45,642 to £37,643, the net profit shown being £1,410. In the consumers' installation

department the credit taken for contracts completed amounted to £74,560 (against £79,630), with a net profit of £6,276.

The gross amount of capital invested in additional plant placed in commission during the year was £470,888 (compared with £329,389 in 1942-43), including £246,518 for generation, £57,833 for transmission and £129,212 for distribution.

Constructional works carried out during the year included extensions of 10-kV overhead lines aggregating 70 miles and of low-voltage overhead mains amounting to 53 miles, with smaller lengths of high- and low-voltage underground cables.

In readiness for the time when supplies of materials become available, plans are being made for extensive developments. During the year the Government decided to promote legislation enabling the Board to embark upon a ten-year programme of widespread rural electrification, and asked that plans should be prepared.

Investigations into Irish water power resources were continued. Proposals for the

development of the River Erne (next to the Shannon the most important potential source of hydro-electric power) were under examination; preliminary investigations were carried out on the lower reaches of the Boyne but did not appear to justify further consideration at the present stage; plans were completed for a small development on the Lower Liffey at Leixlip; and surveys and preliminary plans were in preparation for Torc Waterfall, Co. Kerry, and the River Lee, Co. Cork. Further rivers examined have included the Avonmore, Co. Wicklow; Clady and Gweedore, Co. Donegal; Nore, Co. Kilkenny; Slaney, Co. Carlow; and Ballysodare, Co. Sligo.

During the year one undertaking holding a permit from the Board was taken over and one ceased to supply, against which five new permits were issued, making the number of "permitted" undertakings 86 against 83.

The report is signed by Messrs. R. F. Browne (chairman), J. M. Fay, L. Forde, H. Kennedy, L. J. Kettle, T. A. McLaughlin, and P. J. Dempsey (secretary).

Electrical Engineering at Cambridge

I.E.E. Offer to Endow Professorship

WE briefly mentioned in our issue of June 9th that the Council of the Senate of the University of Cambridge had recommended the acceptance of an offer by the Institution of Electrical Engineers to endow for a period of years a Professorship of Electrical Engineering. A full account of this acceptance and the steps leading up to the Institution's offer is given in the *I.E.E. Journal* for July (Part I).

For some time the Council of the I.E.E. has felt that there should be established in the Faculty of Engineering of the University of Cambridge a Professorship of Electrical Engineering. It has known that the founding of such a Chair has been under consideration in the past but that circumstances have prevented the University from giving effect to the proposal. When the matter was discussed recently it was thought that, although the University might wish to proceed with the establishment of this Chair as a part of its plans for post-war reconstruction, circumstances might prevent the plan being put into force sufficiently quickly after the end of the war to deal with the pressure which will undoubtedly be experienced in all university engineering faculties; this pressure will be felt not only on the teaching side but also in research activity, which it is hoped will be greatly developed. The Council also felt that if electrical engineering as such, and particularly that part dealing with radio and electronic engineering, were more strongly developed in the Faculty of Engineering at Cambridge, the benefit of close association with the work of the Cavendish Laboratory would be assured.

It was resolved, therefore, early in May to offer to the University a sum of money which would provide for the establishment of a Professorship of Electrical Engineering for a limited period of, say, five years, in order that the Chair might be established without delay,

pending the completion of arrangements for a perpetual endowment. The report of the Council of the Senate on this offer, contains the following recommendations:—

"In the Lent Term the Faculty Board of Engineering placed the endowment of a Professorship of Electrical Engineering at the head of their list of post-war needs submitted to the General Board of the Faculties. Electrical engineering has always formed an integral part of the curriculum of the Department of Engineering, and its importance is such that the Council would welcome the establishment of a professorship for the further development of teaching and for the further encouragement of research.

"The offer of the Institution of Electrical Engineers provides endowment for a period of years, but not the permanent endowment which is normally required for the establishment of a professorship. The Council are, however, of opinion that the establishment of a Professorship of Electrical Engineering is a matter of sufficient immediate importance to justify a departure from normal practice. They therefore consider that the offer of the Institution of Electrical Engineers should be gratefully accepted and that the University should undertake the responsibility of making such further provision for the professorship as may be required, if no permanent endowment is obtained from external sources. The Council therefore recommend that the offer of the Institution of Electrical Engineers, conveyed in their Secretary's letter of 15th May to the Vice-Chancellor, be gratefully accepted."

It will be understood that no further action is possible until this report has been considered by the Regent House of the University, but the Council trusts that the necessary Grace will be given at a Congregation early in the Michaelmas Term.

Arc-backs in Rectifiers

A Complex Problem

By A. Robertson,
A.M.I.E.E.

THE phenomena of back-fires, arc-backs or failure of valve action in mercury-arc rectifiers have yet to be fully explained, and it is not yet clear what actions of the arc are relevant. In practice, the arc-back will usually develop into a short-circuit on the secondary side of the transformer and cause the high-voltage switch to trip on overload currents of ten to twenty times full load. This is liable to happen at all conditions of load and temperature for a given voltage and pressure and the risk is a maximum when the inverse current is greatest.

Either a back-fire is caused by the inverse current or is the symptom of a condition likely to cause it. This inverse current can be split into two components and is explained by reference to Fig. 1 which shows the flow of ionised vapour, the ions travelling towards the cathode during the period when the anode is positive and carrying current. The first component is produced by these positive ions which envelope the anode after the latter has stopped firing. When this occurs the anode voltage is rapidly becoming negative and therefore at a lower potential than the surrounding ion cloud. Consequently the latter are now attracted to the anode and in bombarding the surface might cause local heating and emission of electrons. With higher voltages the effect is greater and the inverse current will attain a maximum value immediately the anode has ceased working, but rapidly declines to zero.

At higher current strengths there is a larger number of positive ions available for striking the anode surface, causing greater heating and increasing the possibility of back-fire. The secondary effect of a higher anode temperature due to the greater current is important, as rectifiers can be considerably overloaded provided the working temperature can be kept within the requisite limits.

The second component of the inverse current is the result of a "glow discharge" between idle anode and cathode on the one hand and the idle anode and nearest working anode on the other, due to the potential difference between them. When a voltage is applied between such pairs of electrodes, a glow discharge will take place between them

increasing as the voltage is increased, as shown in Fig. 2, until the peak is reached, when the glow suddenly develops into an "arc discharge" indicated by the downward slope of the curve. The point at which the arc discharge takes place depends on gas pressure, voltage between electrodes and their spacing.

The design of a rectifier must be such that the spacing of the anodes and cathode is suitable for the operating range of pressure and voltage and the latter must be below the voltage required to cause breakdown. Should the vacuum fall for any reason or foreign gases be liberated, the breakdown voltage will be affected and may fall within the operating range of voltage.

The avoidance of arc-backs is mainly concerned with preventing the glow discharge being converted into an arc discharge, and this can be achieved by a longer gas path, hence the anode arms in the glass-bulb rectifier and anode shields in the steel-cylinder type. Unfortunately, the narrower shield while reducing the risk of arc-back increases the voltage drop and a compromise has to be made. Shielding of the anodes is also essential to avoid direct blast of mercury

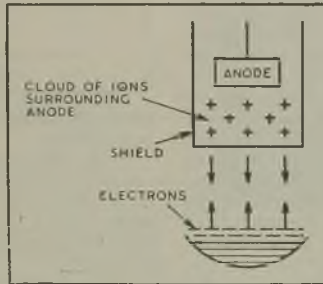


Fig. 1.—Path of ions with normal operation

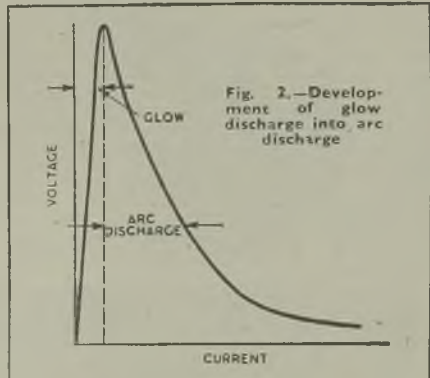


Fig. 2.—Development of glow discharge into arc discharge

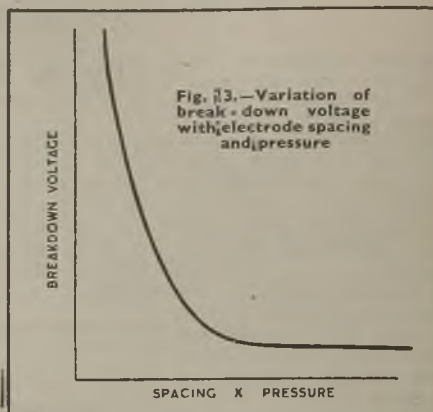
on the anodes from the cathode, since condensation of mercury on the anode may cause a back-fire at a later stage, usually when the rectifier is started up from cold conditions.

The sudden loading causes the globule of mercury to vaporise suddenly and emit electrons.

The proximity of the anode shield also assists in dissipating the residual ionisation remaining after the working anode has ceased firing. The positive ions surrounding the anode will, therefore, combine with these electrons to form neutral molecules of mercury. A similar effect is taking place on the walls of the container which in the case of steel assumes the characteristic of an insulator.

The use of grids reduces the tendency to back-fire by assisting the anode shield to neutralise the residual ionisation, but it is also contended that the grid, which will take up a potential approximating to the anode during the working period, will shield the anode at the instant when it ceases to fire. It is at this instant that the tendency to back-fire is greatest and the grid in maintaining the positive potential of the anode will shield the latter for an instant of time against the tendency for a reversal of action. One investigator contends that there is a thermal effect due to the fact that since the grid rapidly assumes the temperature of the anode it assists in vaporisation of the mercury and reducing the density. A further aspect is the fact that the arc-back potential increases with fall of pressure and reduction in spacing of

electrodes. It is therefore desirable to reduce the spacing of the electrodes, and the introduction of the grid greatly assists in this



direction, so that a higher operating pressure is permissible.

The subject is still the object of much research, but even if all the facts were known it is clear there are still many conditions which must be complied with to ensure freedom from back-fire.

Heaviside's Calculus

THE electrical engineer has been waiting for the best part of two decades for the kind of book which has just been published by Chapman & Hall ("Heaviside's Operational Calculus Made Easy," by T. H. Turney. Pp. 96; figs. 32. Price 10s. 6d.).

Oliver Heaviside's unique contribution to the analysis of circuit transients—a subject which is of ever-increasing importance—has hitherto remained a closed book to all but those with a flair for mathematics, for he has been badly served by writers on circuit theory up to the present time. The mathematicians have been at pains to justify Heaviside's powerful analytical methods by orthodox mathematical reasoning, and the authors of electrical text-books have in turn followed the mathematicians at a respectful distance. Dr. Turney, however, has made a welcome break with mathematical tradition, preferring to follow the revolutionary trail blazed many years ago by that great teacher of electrical engineering, Sylvanus P. Thompson, in his "Calculus Made Easy."

In his opening chapter the author explains in a disarmingly straightforward manner how ordinary differential calculus enters into electrical problems, and in so doing introduces us quite casually to Heaviside's operator " p " which forms the subject of the next chapter. As a simple illustration of the algebraic behaviour of p Dr. Turney applies it to the derivation of Helmholtz's Law for the inductive DC circuit and to the solution of Kelvin's oscillatory R-L-C circuit, the answers in both cases being

compared with the exponential solutions provided by the traditional methods of integration. By this time the reader is prepared for Heaviside's Expansion Theorem, the stage at which engineers as a rule begin to give up in despair their attempts to master Heaviside's methods by orthodox mathematical treatment. It is worth paying the price of the book for this chapter alone.

The next two chapters are devoted to travelling waves on cables and transmission lines and are comparable to the first in their happy combination of analytical treatment and electrical explanation.

The last two chapters, although a bit more "mathematical" as regards subject matter, are, nevertheless, models of simplicity. The author first makes quite clear the relation between Heaviside's treatment of impulses and Fourier's treatment of repeated waves—the harmonic analysis well known to electrical engineers—and then goes on to justify Heaviside's methods in general by the use of the ubiquitous experimental function.

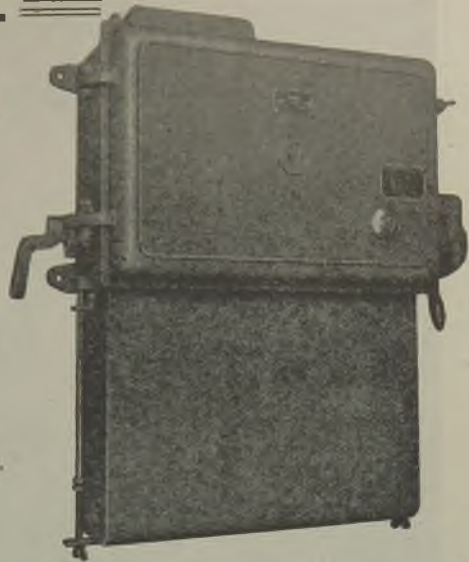
This final chapter is the key to Dr. Turney's original contribution to the explanation of Heaviside's methods. Certainly no other approach is at once so logical and illuminating from the electrical engineer's standpoint as that of the "spectrum of exponentials" developed by the author.

The book is well produced and free from all but a few trivial errors of proof reading. It should prove a godsend to students as well as to engineers.—H.R.

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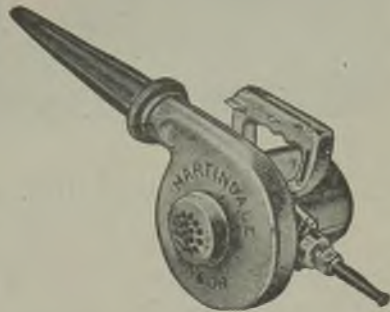
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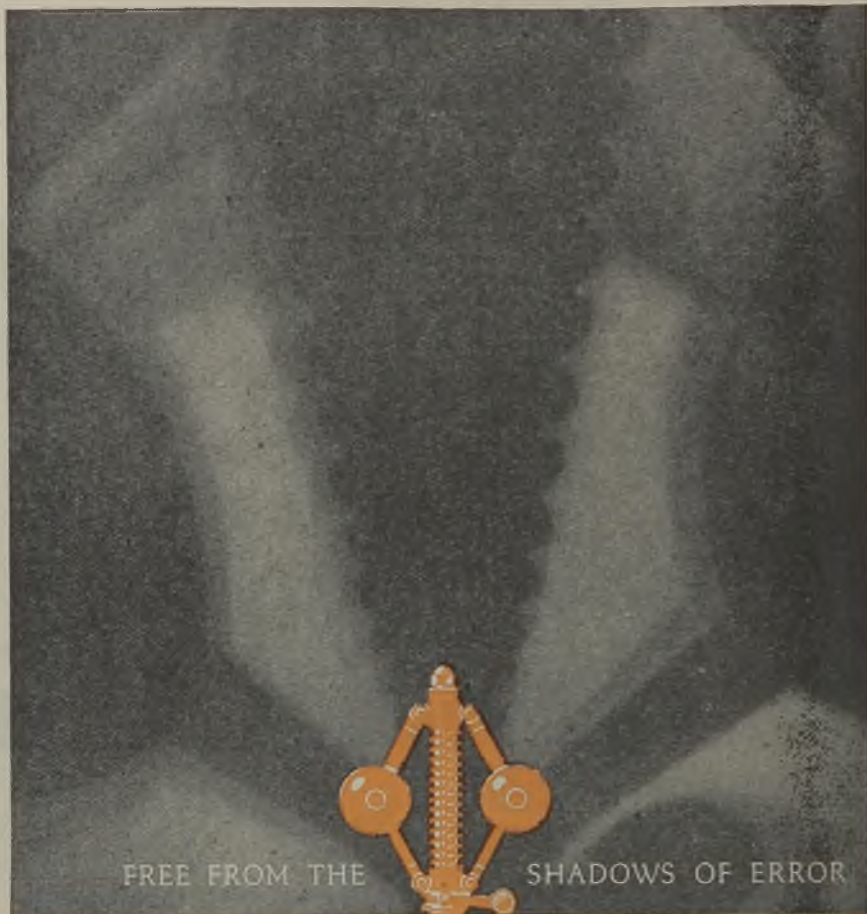
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FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Victoria Falls & Transvaal Power Co., Ltd., announces an increase in revenue (after meeting African taxation) from £1,580,742 in 1942 to £1,598,015 for 1943. To this is added interest, etc., amounting to £207,562 (against £169,321). The profit was £555,579 (against £533,848) after providing for administration, depreciation, etc. The reserve fund again receives £150,000 and the ordinary dividend is unchanged at 15 per cent.; £327,153 (against £328,866) is carried forward.

There was some falling off in the amount of energy sold while the cost per kWh showed a further small increase. There was an improvement in the number of kWh sold during the first seven months of this year. The extension to the larger of the stations operated for the Electricity Supply Commission has been brought into service and the other is expected to be put into commission before the end of the year.

McMichael Radio, Ltd., records a net profit for 1943 amounting to £42,699, as compared with £31,365 in the previous year. Taxes require £9,800 (£12,750), balance of preliminary and underwriting expenses written off £4,000 (£6,000), and dividends on 8 per cent. preferred ordinary shares for two years and six months to September 30th, 1938, £28,758, leaving £1,195 (£1,054) to be carried forward. Reserve for depreciation has been increased by £4,513 to £37,948, and the book value of the fixed assets is reduced to £66,472. Liquid assets now stand at £177,966, an advance of £14,302.

Richardsons, Westgarth & Co., Ltd., report trading profits of £122,481 for the year ended March 31st last (against £116,588 for 1942-43), after providing for taxation and deferred repairs. The net profit rose from £44,411 to £63,396 and the ordinary dividend is again 8 per cent. Last year the issued ordinary capital was increased by £176,936, the proceeds being used to repay the balance of the 5½ per cent. first mortgage debenture stock.

The Broadcast Relay Service, Ltd., reports a profit of £135,784 (after providing for E.P.T.) for the year ended March 31st, as against £148,895. Preference share redemption fund receives £12,129 (£11,525) and reserve for replacements, etc., £50,000 (£70,000). A final dividend of 3½ per cent. (same) is to be paid, again making 7 per cent. free of tax, and £39,925 (£28,083) is carried forward.

Greenwood & Batley, Ltd.—Speaking at the annual meeting on August 10th, the chairman (Col. H. A. Micklem) said that although the company's various works had been busy during the past year they had not been so hard pressed for output as in the earlier years of the war. Consequently they had been able to release a modest percentage of their workpeople to the Forces or for other work of high priority.

The Engineering & Lighting Equipment Co., Ltd., has declared a final dividend of 6 per cent., again making 10 per cent. for the year.

The Wellman Smith Owen Engineering Corporation, Ltd., reports a net profit of £93,357 before meeting taxation (£51,000), against £137,054 (taxation £101,000) for 1942-43. The final dividend is 5 per cent. with a cash bonus of 2½ per cent., making 12½ per cent. for the year (same).

The East African Power & Lighting Co., Ltd., has declared a final dividend of 4 per cent., again making 7 per cent. for the year. The net revenue was £141,543 (against £155,220).

Gabriel, Wade & English, Ltd., are to pay a first and final dividend of 6 per cent., plus a bonus of 4 per cent. (same).

Waste Heat & Gas Electric Generating Stations, Ltd., are again paying an interim dividend of 2½ per cent.

Telephone Rentals, Ltd., is paying a final dividend of 6 per cent., again making 10 per cent. for the year.

New Companies

Essaness Switchgear, Ltd.—Private company. Registered August 3rd. Capital, £2,000. Objects: To carry on the business of electrical and general engineers, manufacturers of, and dealers in, electrical switchgear, radio fittings, etc. Subscribers: Hannah Juliusburger, 41, Southfields, N.W.4; and Margaret E. Crichton, 59, Lyndhurst Gardens, N.3. Secretary: W. E. Crichton. Registered office: Rylstone, Holders Hill Crescent, N.W.4.

MacFadyen, Cochrane, Ltd.—Private company. Registered in Edinburgh August 4th. Capital, £100. Objects: To carry on the business of electrical engineers, mechanical engineers, boiler makers, etc. Directors: K. A. MacFadyen, Dale Cottage, Newton Mearns; J. C. Cochrane, 110, Esslemont Avenue, Glasgow; and A. E. Dickson, 226, St. Vincent Street, Glasgow. Registered office: 69, West Regent Street, Glasgow.

Cranley Electric, Ltd.—Private company. Registered August 3rd. Capital, £1,000. Objects: To carry on the business of electrical, motor and wireless engineers, service agents, etc. Directors: E. A. Rowland, 17, Eversley Crescent, Ruislip, and L. L. Jones, 20, Eversley Crescent, Ruislip. Registered office: 17, Eversley Crescent, Ruislip, Middlesex.

Regwell, Ltd.—Private company. Registered August 5th. Capital, £500. Objects: To carry on the business of manufacturers of, and dealers in, instruments and appliances connected with the generation, preservation, control and use of heat, cold, electricity, gas, light, steam power, etc., temperature and pressure controls, etc. Subscribers: J. C. Cowles, 74, Dale View Crescent, Chingford; and A. Fletcher, Ellerwood, Bowness-on-Windermere. Solicitors: Fletcher & Co., W.C.1.

Avon Electrical Services, Ltd.—Private company. Registered August 5th. Capital £6,000. Objects: To carry on the business of manufacturers of, and dealers in, magnetos, dynamos, starters, batteries, ignition appliances, motor

accessories, etc. Directors: G. Orton, 56, Bridge End, Warwick; and A. M. Perry, 145, Leam Terrace, Leamington Spa. Registered office: Magnet House, Elmscote Road, Warwick.

Lighting Trades & Welsbach, Ltd.—Private company. Registered August 4th. Capital, £10,000. Objects: To carry on the business of manufacturers of, and dealers in, fittings and appliances for electric, gas, oil and other light or power, wireless apparatus, valves and accessories, etc. Subscribers: H. A. Turner, 159, Railton Road, S.E.24; and W. G. Ford, 23, Long Lane, Croydon. Solicitors: Cardew Smith & Ross.

Companies' Returns Statements of Capital

Allbright Electric Co., Ltd.—Capital, £20,000 in £1 shares. Return dated April 7th. All shares taken up. £14,000 paid. £6,000 considered as paid. Mortgages and charges: Nil.

Increases of Capital

Progress Cables & Accessories, Ltd.—The nominal capital has been increased by the addition of £7,000 in £1 ordinary shares beyond the registered capital of £3,000.

Liquidations

Newtons of Taunton, Ltd.—Winding up voluntarily. Liquidator, Mr. F. D. Clough, 71, Edmund Street, Birmingham.

Thomson Bennet Magnetos, Ltd.—Winding up voluntarily. Liquidator, Mr. F. Clough, 71, Edmund Street, Birmingham.

E.I.C. Magnetos, Ltd.—Winding up voluntarily. Liquidator, Mr. F. D. Clough, 71, Edmund Street, Birmingham.

Eckington Electric Supply Co., Ltd.—Winding up voluntarily. Liquidator, Mr. J. Gadsby, 17, Glumangate, Chesterfield.

Bankruptcies

H. A. Mayhew, electrical contracting engineer, 96, London Road, Apsley, Herts, and 30, Elmer Gardens, Edgware.—Application for discharge to be heard on September 19th at the Court House, Town Hall, St. Albans.

P. W. Penty, electrical contractor, trading as the Sackville Electrical Co., 38, Mannville Terrace, Morley Street, Bradford.—Proofs for dividends by August 25th to the trustee, Mr. E. T. Sanders, Hallfield Chambers, 71, Manningham Lane, Bradford.

E. F. Hunt, radio and electrical dealer, trading with another as Hunt's Radio Service, Cameron House, High Street, Ingatstone, Essex.—First and final dividend of 1s. 0½d. in the £ payable August 22nd at the Official Receiver's Office, 25, Haven Green, Ealing, W.5.

H. C. Casselden, radio and electrical dealer, 67, London Road, Brighton.—The notice appearing in our August 4th issue has been amended as follows: Second and final dividend of 8s. in the £ and statutory interest at 4 per cent. payable August 15th at the office of Mr. A. E. Orbell, 6 and 7, Old Steine, Brighton, Sussex.

Canadian Production

Striking Wartime Advance

SOME details of Canadian manufacture of electrical goods for 1941 have been released, and comparison with 1939 is possible. Striking increases are shown. The aggregate was \$177,904,000 against roughly \$100,000,000 two years previously. The largest total was that of wires and cables, followed by radio apparatus, transformers, batteries, telephone material and refrigerators. The accompanying table gives the value of the chief groups in 1939 and 1941.

Class of Goods	1939 \$(000)	1941 \$(000)
Batteries and parts	7,970	11,346
Control and starting equipment	1,360	3,507
Converter equipment	84	2,991
Instruments and meters, except ammeters for autos	1,866	2,518
Electrodes	2,905	7,032
Fans	104	116
Heaters, air	50	66
Heaters, water tank	127	187
Heaters, electric unit	389	1,669
Insulating materials	219	350
Insulators, porcelain	847	1,642
Ironers and irons	498	781
Generators, AC	1,085	1,835
Generators, DC	146	645
Lamps	4,421	6,964
Washing machines	4,549	5,327
Motors, AC and DC	3,350	9,415
Radio apparatus and parts other than valves and transformers	11,608	16,482
Refrigerators	6,810	9,463
Transformers and parts	4,755	12,961
Telephone material	4,717	9,634
Stoves	2,930	3,401
Wires and cables	15,958	34,827
Apparatus and parts, n.e.s.	626	2,958

Compared with 1938 the value of some items nearly doubled in 1941, e.g. batteries, transformers, telephone material and stoves, while that of wires and cables showed nearly a treble advance. It may fairly safely be estimated that the growth in electrical manufacture equalled that in factory industry generally, which last year was between two and two-and-a-quarter times that of 1939. The effect on Canada's foreign trade in this branch may be imagined. On the import side it is likely to affect the United States far more than the United Kingdom, which did only a fraction of the trade. The latter, however, will with little doubt be subjected in export markets to competition much more acute than before the war. Meanwhile, Major J. S. P. Armstrong, the recently appointed Agent-General in London for Ontario, has been urging British firms to establish branch plants there.

That Extra Hour

THE popular "Osram" black-out chart reproduced in this issue has been rendered ineffective by Government decree. Of necessity these charts are prepared some time in advance and the chart for August was prepared on the assumption that the extra hour of daylight would be withdrawn in August as in former years. Will our readers please note, therefore, that the times for black-out shown in the chart should be suitably corrected in accordance with the Government announcement.

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange prices and business are being controlled to no small extent by the growing hopefulness that the war's conclusion is approaching. The quiet optimism, now current, received its impetus from Mr. Winston Churchill's recent speech, supplemented as this has been by the almost daily record of Allied advances on the various fronts, and the obviously waning power of the enemy. Therefore, the investor and the speculator are both looking forward to the time when post-war considerations are likely to come into practical effect, and for this reason, together with others that relate to cheap money and the closed market for capital issues, prices continue to advance.

The new issue of Savings Bonds emphasises the Government's intentions with regard to low rates of interest on capital. It exercises definite influence upon prices of ordinary shares in front-rank companies. The exodus from London, the holiday season and the normal August conditions are affecting the volume of Stock Exchange business, but the buying is decidedly better than the selling.

The Rising Tide

The Home electricity supply group shows pronounced strength; London, Provincial and Scottish shares are equally good. There are rises in Northmet Power, City Lights and County of London ordinary. The first-named can be sold at the middle price given in our lists. The other companies' shares have been bought by provincial purchasers. London Electrics, quoted at 31s. middle and yielding, at that price, no more than $3\frac{1}{2}$ per cent., can hardly be bought at all, so firmly are they held. Lancashires, Bournemouth, Llanelly and British Power are amongst those to show advances.

The overseas shares are quiet. The pressure to buy Indian industrials has been relaxed, but Cawnpore Electrics are better at 40s. Tokyo sixes have risen to 26. Atlas Electrics at 7s. 3d. are a few pence down.

Miscellaneous Matters

The rise last week of $3\frac{1}{2}$ points in Cable & Wireless ordinary has drawn attention to the stock, the price of which has gained a further $1\frac{1}{2}$, to 84 $\frac{1}{2}$. Anglo-Portuguese Telephones lost 6d. of their recent gain. International "Tel. & Tel." are down $1\frac{1}{2}$, the New York Stock Exchange being unsettled of late. Telephone Rentals show no change at 12s. Hall Telephones are better at 33s. and Telephone Manufacturing at 12s. 9d. A gain of 3s. lifted Westinghouse Brake to 78s., but Consolidated Signals have got out of step with them, and give a yield of £4 1s. 6d. per cent. against £3 11s. 9d from the "Brakes."

Crompton Parkinsons at 33s. 6d. are 1s. better and Crabtrees are $\frac{1}{8}$ up at 42s. 6d. Burco hardened to 17s., Associated Electrical Industries receded to 55s. 6d. Electric Constructions have gained 2s. 6d., at 57s. 6d. Metal Industries "B" are $\frac{1}{8}$ to the good at 55s. The Calcutta Tramways excitement has quietened down and the price is unchanged at 70s. 6d.

Oriental Telephone

The steady rise that has taken place in Oriental Telephone & Electric ordinary has lifted the shares to 52s. 6d. Business has been marked during the past few days at 54s. The company was formed to operate in India, China, Burma, Singapore and Mauritius. Its holdings of shares in the Indian companies were sold to the Government of India in 1941, and the surplus arising from the transactions was added to the capital reserve. At the end of last year, the company's investments in British Government securities amounted, on the then market value, to £1,149,575. The issued ordinary share capital is £570,199. The investments just mentioned are equivalent to £2 per share. In addition to this, the company's other assets are probably worth 10s. or 12s. per share. In the light of the conditions in China, Burma and Singapore, it seems to be something of a venture of faith to buy the shares at the present figure. But the current quotation certainly implies confidence in some directions.

Wireless Shares

Pye deferred, 1s. 3d. better at 36s. 3d., are the firmest spot in a quiet radio section. Philco have strengthened to 14s. 3d. The new shares at 14s. for the fully-paid are keeping in close relation to their seniors. E.M.I., the always popular, are a quiet market at the same price as Pye deferred. Cossor have eased to 26s.; E. K. Cole at 34s. are 6d. firmer. Speculation in this department has to some extent subsided, but confidence in television prospects in the post-war period is as firm as ever. McMichael Radio ordinary are changing hands on the basis of 8s. 6d., and the 8 per cent. participating preferred ordinary at 28s. 3d. The company is doing well, and has cleared off arrears of dividend on the preferred shares up to December 31st, 1939.

Watford Electric

The projected new issue of ordinary and preference shares by the Watford Electric & Manufacturing Company had not been made when this was written. The consent of the shareholders to the issue was duly given at the necessary meetings, but Treasury leave had yet to be obtained, which, as one shareholder remarked, seemed to be rather like putting the cart before the horse. That the

(Continued on page 251)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend		Middle Price Aug. 15	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price Aug. 15	Rise or Fall	Yield p.c.
	Pre-vious	Last					Pre-vious	Last			
Home Electricity Companies						Public Boards					
£ s. d.						£ s. d.					
Bournemouth and Poole ..	12½	12½	63/-	+1/-	3 19 4	Central Electricity : 1955-60 (Civil Defence) ..	3	3	100		3 0 0
British Power and Light ..	7	7	33/6	+6d.	4 3 7	1955-75 ..	5	5	115		4 3 0
City of London ..	7	5½	31/-	+1/6	3 11 0	1951-73 ..	4½	4½	107		4 4 1
Clyde Valley ..	8	8	42/-		3 16 0	1963-93 ..	3½	3½	104½		3 7 0
County of London	8	8	43/6	+1/-	3 13 3	1974-94 ..	3½	3½	101		3 4 4
Edmundsons :						London Elec. Trans. Ltd. ..	2½	2½	97½		2 11 3
7% Pref. ..	7	7	34/6		4 1 4	London & Home Counties 1955-75	4½	4½	111		4 1 1
Ord. ..	6	6	31/-		3 17 5	London Pass. Trans.:					
Elec. Dis. Yorkshire	9	9	45/6		3 19 6	A ..	4½	4½	121½		3 14 1
Elec. Fin. and Securities ..	12½	13½	59/-		4 11 4	B ..	5	5	121½		4 2 4
Elec. Supply Corporation ..	10	10	47/6	+6d.	4 4 2	C ..	3	3½	71		4 11 7
Isle of Thanet ..	Nil	Nil	18/-		—	West Midlands J.E.A. 1948-68 ..	5	5	108½		4 12 4
Lancs. Light and Power ..	7½	7½	37/-	+6d.	4 1 1	Telegraph and Telephone					
Llanelli Elec. ..	6	6	26/6	+6d.	4 10 7	Anglo-Am. Tel.:					
London Assoc. Electric	3	4	26/6		3 0 6	Pref. ..	6	6	120½		4 19 7
London Electric	6	6	31/-		3 17 5	Def. ..	1½	1½	30		5 0 0
London Power Red. Deb. ..	5	5	105½		4 14 7	Anglo-Portuguese	8	8	23/6	-6d.	5 12 4
Metropolitan E.S.	8	8	42/-	+6d.	3 16 2	Cable & Wireless :					
Midland Counties	8	8	41/6		3 17 0	5½% Pref. ..	5½	5½	115		4 15 8
Mid. Elec. Power	9	9	44/-		4 1 9	Ord. ..	4	4	84	+1½	4 14 8
Newcastle Elec. ...	7	7	31/-		4 10 4	Canadian Marconi	11 Nil	4cts.	10/-		—
North Eastern Elec.:						Globe Tel. & Tel. :					
Ordinary ..	7	7	35/-		4 0 0	Ord. ..	8½*	5*	40/6		2 9 4
7% Pref. ..	7	7	35/-		4 0 0	Pref. ..	6	6	30/6	+6d.	3 18 8
Northampton ..	10	10	50/6	+1/-	3 19 6	Great Northern Tel. (£10) ..	Nil	Nil	24½		—
Notting Hill 6% Pref. (£10) ..	6	Nil	11		—	Inter. Tel. & Tel.	Nil	Nil	22	-1½	—
Northmet Power :						Marconi-Marine ..	7½	7½	36/-		4 3 4
Ordinary ..	7	7	41/3	+¼	3 8 0	Oriental Tel. Ord.	16	10	52/6		—
6% Pref. ..	6	6	30/6		3 18 8	Telephone Props.	6	Nil	18/6		—
Richmond Elec.	6	6	25/6		4 14 1	Tele. Rentals (5/-)	10	10	12/-		4 3 4
Scottish Power ..	8	8	41/6	+6d.	3 17 2	Traction and Transport					
Southern Areas	5	5	23/-		4 7 0	Anglo-Arg. Trans. :					
South London ..	7	7	29/-	+1/-	4 16 7	First Pref. (£5)	Nil	Nil	2/6		—
West Devon ..	5	5	23/6		4 5 1	4% Inc. ..	Nil	Nil	6		+½
West Glos. ..	4½	3½	24/6		2 17 0	Brit. Elec. Traction :					
Yorkshire Elec. ...	8	8	43/-		3 14 5	Def. Ord. ..	45	45	1315		3 8 5
Overseas Electricity Companies						Pref. Ord. ..	8	8	180		4 9 0
Atlas Elec. ..	Nil	Nil	7/3	-3d.	—	Bristol Trains ..	10	10	57/-	+6d.	3 10 2
Calcutta Elec. ..	6*	6*	50/-		2 8 0	Brazil Traction ..	\$1	\$1	26½		6 10 10
Cawnpore Elec. ...	10	7	40/-	+9d.	3 10 0	Calcutta Trams	5½	6½	70/6		1 17 2
East African Power	7	7	34/6	+6d.	4 1 4	Cape Elec. Trams	5	6	25/6		4 14 1
Jerusalem Elec. ...	7	5	29/6		3 8 0	Lancs. Transport	10	10	45/6		4 8 0
Kalgoorlie (10/-)	5	5	11/6		4 7 0	Mexican Light :					
Madras Elec. ..	4*	Nil	33/-		—	1st Bonds ..	5	5	107½		4 13 0
Montreal Power	1½	1½	25	+1½	—	Rio 5% Bonds	5	5	105½		4 14 9
Palestine Elec. "A"	4*	5*	40/6		2 10 0	Southern Rly. :					
Perak Hydro-elec.	6	7	14/-		—	5% Prefd. ..	5	5	76		6 11 3
Shawinigan Power	33cts.	90cts.	16½		—	5% Pref. ..	5	5	116½		4 5 3
Tokyo Elec. 6%	6	6	26	+2	—	T. Tilling ..	10	10	80/-		3 6 8
Victoria Falls Power	15	15	4½		3 12 7	West Riding ..	10	10	46/-		4 7 0
Whitehall Inv. Pref.	—	6	24/6		4 18 0	(Continued on next page)					

* Dividends are paid free of Income Tax.

Company	Dividend		Middle Price Aug. 15	Rise or Fall	Yield p.c.	Company	Dividend		Middle Price Aug. 15	Rise or Fall	Yield p.c.
	Pre-vious	Last					Pre-vious	Last			
Equipment and Manufacturing											
Aron Elec. Ord. ..	10	15	61/-	..	£ 4 18 4	General Cable (5/-)	15	15	15/-	..	£ 5 0 0
Assoc. Elec. :						Greenwood & Batley	15	15	46/-	..	6 10 4
Ord. ..	10	10	55/6	-1/-	3 12 0	Hall Telephone (10/-)	10	12 1/2	33/-	+6d.	3 15 9
Prof. ..	8		40/-	..	4 0 0	Henley's (5/-)	20	20	28/3	..	3 11 0
Automatic Tel. & Tel.	12 1/2	12 1/2	65/-	..	3 17 0	4 1/2% Pref. ..	4 1/2	4 1/2	24/-xd	+3d.	3 15 0
Babcock & Wilcox	11	11	53/6	-6d.	4 2 1	Hopkinsons ..	15	17 1/2	71/3	..	4 18 4
British Aluminium	10	10	51/6	..	3 17 8	India Rubber Pref.	5 1/2	5 1/2	23/6	..	4 13 9
British Insul. Ord.	20	20	5 1/2	..	3 8 0	Intl. Combustion	30	30	6 1/2	..	4 10 8
British Thermostat (5/-)	18 1/2	18 1/2	20/9	..	4 9 0	Johnson & Phillips	15	15	79/-	..	3 16 0
British Vac. Cleaner (5/-)	15	30	30/-	..	5 0 0	Lancashire Dynam	22 1/2	22 1/2	98/9	..	4 11 2
Brush Ord. (5/-)	8	9	10/9	-3d.	4 3 9	Laurence, Scott (5/-)	12 1/2	12 1/2	13/6	..	4 12 7
Burco (5/-)	15	17 1/2	17/-	+6d.	5 3 0	London Elec. Wire	7 1/2	7 1/2	39/-	..	3 17 0
Callender's ..	15	20	5 1/2	..	3 11 2	Mather & Platt ..	10	10	53/9xd	..	3 14 3
Chloride Elec. Storage	15	87/6	3 8 7	Metal Industries (B)	8	8 1/2	55/-	+ 1/8	5 1 10
Cole, E. K. (5/-)	10	15	34/-	+6d.	2 4 2	Met. Elec. Cable Pref.	5 1/2	5 1/2	21/3	..	3 3 6
Consolidated Signal	24	27 1/2	6 1/2	..	4 1 6	Murex ..	20	20	103/9	-2/-	3 17 3
Cossor, A. C. (5/-)	7 1/2*	10*	26/-	-6d.	1 18 6	Eye Deferred (5/-)	25	25	36/3	+ 1/8	3 9 0
Crabtree (10/-)	17 1/2	17 1/2	42/6	+ 1/8	4 2 6	Revo (10/-)	17 1/2	17 1/2	43/-	..	4 1 4
Crompton Parkinson Ord. (5/-)	20	22 1/2	33/6	+1/-	3 7 3	Reyrolle ..	12 1/2	12 1/2	72/6	..	3 9 1
E.M.I. (10/-)	6	8	36/3	..	2 4 6	Siemens Ord. ..	7 1/2	7 1/2	35/6	..	4 4 6
Elec. Construction	10	12 1/2	57/6	+ 1/4	4 6 10	Strand Elec. (5/-)	7 1/2	10	8/-	..	6 5 0
Enfield Cable Ord.	12 1/2	12 1/2	65/-	..	3 17 0	Switchgear & Cowans (5/-)	20	20	19/-	..	5 5 1
English Electric	10	10	53/3	..	3 15 2	T.C.C. (10/-)	5	7 1/2	22/6	..	3 6 8
Ensign Lamps (5/-)	25	15	21/3	..	3 10 8	T.C. & M. ..	10	10	54/6	..	3 13 6
Ericsson Tel. (5/-)	22*	20*	56/3	..	1 15 7	Telephone Mfg. (5/-)	9	9	12/9	+3d.	3 10 7
Ever Ready (5/-)	40	40	44/6	..	4 10 0	Thorn Elec. (5/-)	20	20	26/-	..	3 17 0
Falk Stadelmann	7 1/2	7 1/2	35/-	..	4 5 9	Tube Investments	20	20	100/-	..	4 0 0
Ferranti Prof. ..	7	7	31/3	..	4 9 7	Vactric (5/-)	Nil	Nil	16/6	-6d.	—
G.E.C. :						Veritys (5/-)	7 1/2	7 1/2	8/3	..	4 11 0
Prof. ..	6 1/2	6 1/2	34/-	..	3 16 6	Walsall Conduits (4/-)	55	55	51/-	..	4 6 3
Ord. ..	17 1/2	17 1/2	38/-	..	3 11 6	Ward & Goldstone (5/-)	20	20	28/9	..	3 13 6
						Westinghouse Brake	12 1/2	14	78/-	+3/-	3 11 9
						West, Allen (5/-)	7 1/2	7 1/2	8/9	-3d.	4 5 9

* Dividends are paid free of Income Tax.

Stocks and Shares (Continued from page 249)

Treasury's permission to make the issue would be granted, there seemed to be no doubt. As previously stated, the company proposes to offer its new preference shares at 10s. 3d. and the new ordinary at 3s. 1 1/2d., both in the proportion of three new shares for every five old shares held. The price of the old ordinary shares is about 6s. and of the preference 12s., the latter being 10s. shares; the ordinary are of 2s. each. The company has paid an annual 15 per cent. on its ordinary shares since 1937. The increase in the capital will bring up the amount to £160,000.

Newton Bros. (Derby)

Newton Brothers (Derby), Ltd., carry on business as manufacturers of electric generators, aircraft electrical equipment, etc., and the report for the year ended last March 31st came out last week. This showed trading profits of £174,000, a reduction of £86,000 on the year, due to lower prices at which Government contracts have been placed and to increased labour costs. The actual turnover constituted a record, but taxation took £161,400 and the net profits came to £13,400,

which is less than £1,000 below the figures for 1943. The company repeats its previously-paid 17 1/2 per cent. dividend on the 2s. ordinary shares, the price of which is about 8s., showing a yield of £4 8s. per cent.

Globe Telegraph & Trust

The Globe Telegraph & Trust figures for the past year show that the investments stand at a little over £5,000,000, an increase on the year of £149,000. The company during the year realised a considerable portion of its preference shareholdings and re-invested the money. The private investor would be greatly interested to know in what direction the Globe Telegraph & Trust, with its experienced and expert board, has employed the cash realised by the sale of these shares. The ordinary shares remain at 40s. 6d., showing at that price a yield of £2 9s. 4d. per cent. net, equivalent to £4 18s. 8d. per cent. with tax at 10s. in the £. This, after all, is not a bad yield as things go at the present time. The preference at 30s. pay 4 per cent. on the money and are well secured. The Trust's principal holdings are in Cable & Wireless and Cables Investment Trust issues.

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.

Clacton.—September 4th. Urban District Council. 11-kV switchgear. (August 11th.)

Manchester.—August 25th. Electricity Department. 33-kV and multicore control cables. (See this issue.)

West Midlands.—August 25th. Joint Electricity Authority. Travelling crane. (July 28th.)

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.

Bingley.—Welfare institute and club; The Secretary, Eldwick Institute and Club Committee, Bingley.

Bury.—Youth café and club, Haymarket Street; J. Chadwick, borough engineer, 28, Bank Street, Bury.

Cadishead.—Central School kitchen for 1,000 meals daily; A. T. Nicholson, county architect, county Buildings, Fishergate Hill, Preston.

Chesterfield.—Maternity centre and nurses' home, Ashgate Lodge and Ashgate House; J. Harrison, county architect, County Offices, Derby.

Chorlton-cum-Hardy.—Private hotel, Manchester Road, for M. Kranmer; Taylor and Mainprice architects, 8, John Dalton Street, Manchester, 2.

Coventry.—Reinstatement of buildings and plant at swimming baths, Livingstone Road (£5,142); D. E. E. Gibson, city architect, 1a, Warwick Row, Coventry.

Community Centres at Aldermoor, Bell Green, and Hen Lane. Recreation Room, Exhall Lodge Institution; D. E. E. Gibson.

Desborough.—School central kitchen; J. Perkins, county architect, County Hall, Northampton.

Droitwich.—Community centre, Cutnall Green; J. Raymond (president), Cutnall Green and District Community Centre Committee, Droitwich.

Felling-on-Tyne.—Central kitchen and dining hall, Falla Park School; W. Lamb, architect.

Gosforth.—Hotel; Cackett, Burns Dick, and McKellar, Ellison Place, Newcastle-on-Tyne.

Hulme.—Additions to brewery, Cornbrook Brewery, Ltd.; E. A. Newton, architect, 28, Kennedy Street, Manchester, 2.

Keightley.—Branch library, community centre and welfare clinic, Bracken Estate; E. G. Felgate, borough architect, College Street.

Leigh.—New out-patients' department, Leigh Infirmary (£50,000); Secretary.

Macclesfield.—School dining centre, Longacre Street School Hall; M. Tetlow, borough architect, Pear Tree House, Jordangate.

Manchester.—Extensions to Brownlow Green School, Wythenshawe (£1,640); G. Noel Hill, city architect, Town Hall, Albert Square.

Structural alterations to the "Peveril of the Peak" Hotel; Architects' Department, Walker & Homfray, Ltd., Woodside Brewery, Eccles New Road, Salford, 5.

Morpeth.—Completion of 46 houses for the R.D.C.; Mauchlen and Weightman, architects, Saville Row, Newcastle-on-Tyne.

Newcastle-on-Tyne.—Conversion of premises, Hawthorn Street into flats for City Council (£500); R. M. Chamberlain & Co., Ltd., builders, Belle Vue Bank, Gateshead.

Canteen, Infectious Diseases Hospital, for City Council; A. Anderson Ltd., builders, Stanmore Road, Newcastle.

Refrigerating plant at General Hospital; city architect, 18, Cloth Market.

Northampton.—Health clinic for Health Committee; R. A. Winfield, borough engineer, Guildhall.

North Riding.—School meals arrangements at Comondale Council School and Eston South Bank Victoria Street School; county architect, County Hall, Northallerton.

Northumberland.—Hospital in the south-east of the county, for the County Council.

Oldham.—Extensions to municipal offices and new lift; G. E. Hardy, borough engineer, Municipal Offices, 75, Union Street.

Salford.—Bakery; W. W. Bellamy, Dean Street, Broughton, Salford 7.

Sheffield.—Works extensions; Hattersley & Ridge Ltd., 120, Penistone Road.

South Shields.—School kitchen, Olive Street; borough engineer.

Stoke-on-Trent.—Extensions, Maternity Hospital, for T.C. (£6,104); Geo. Minshall & Son, builders, Waterloo Road, Cobridge.

Remedial work and residential school for delicate children, Westwood Manor, Wetley Rocks; A. Burton, city engineer, Town Hall.

Stretford.—Works additions, Praed Road; W. H. Smith & Co. (Electrical Engineers), Ltd. Works additions, Chester Road; Lookers Ltd.

Works additions, Westinghouse Road; Imperial Chemical Industries, Ltd.

Tynemouth.—Hospital for T.C. and Whitley Bay U.D.C.

West Boldon (Co. Durham).—Adaptation of large mansion as home for aged teachers; National Union of Teachers, London.

Whetstone (Leics.)—Public Hall; Secretary, Building Committee.

Wingerworth.—Houses, Lydgate Farm; G. F. Kirk, Ltd., builders, 172, Chatsworth Road, Chesterfield.

Worcestershire.—Farm institute for County Council; H. Rowe & Son, county architects, 38, Foregate Street, Worcester.

Workington.—Fire station for N.F.S.; A. B. Cooper, borough engineer, Town Hall.



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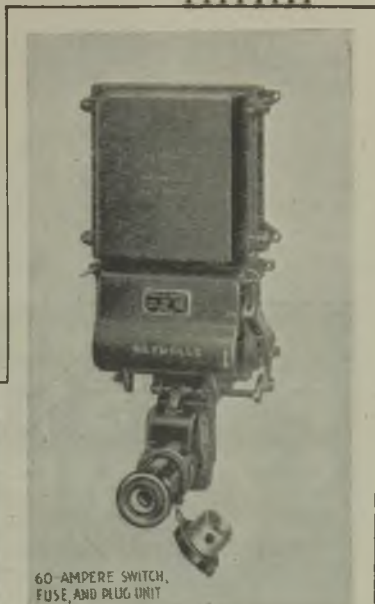
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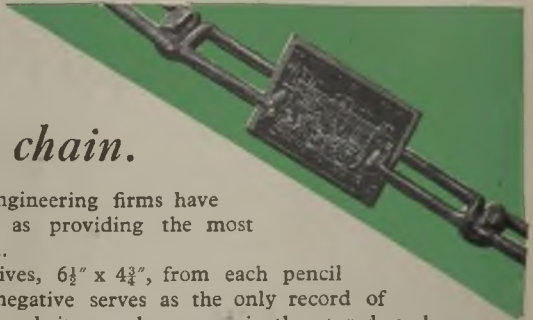
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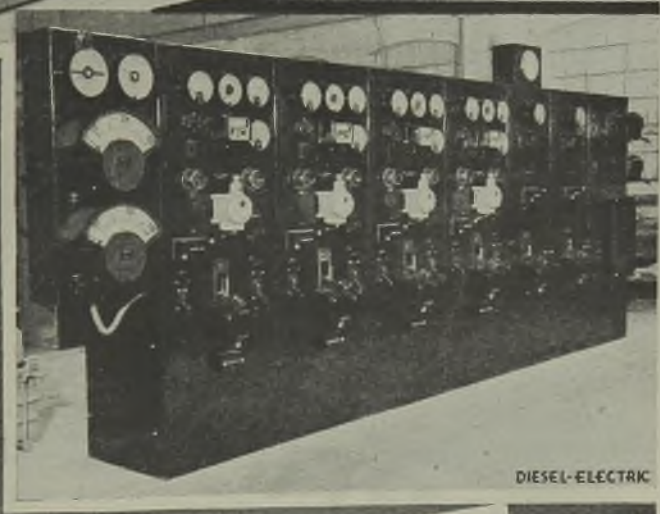
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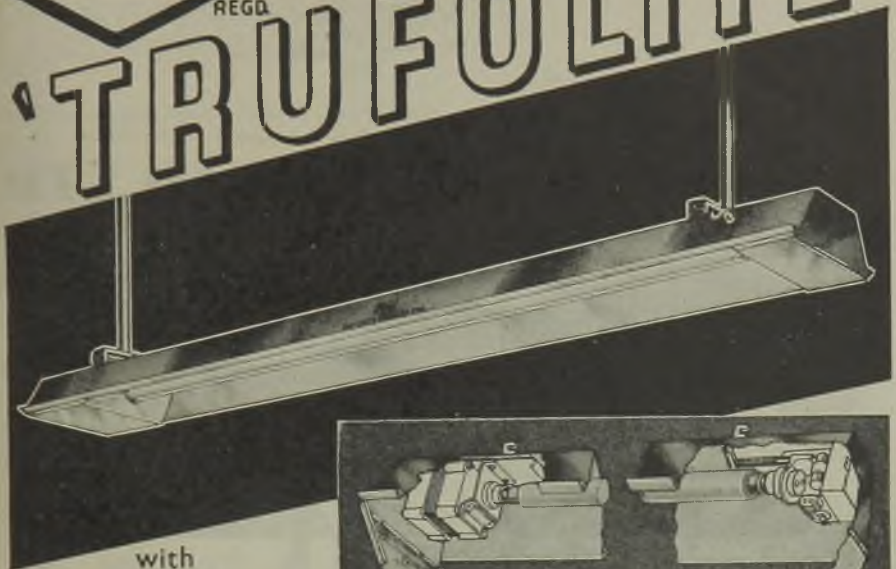
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This Revolutionary design (Patents applied for) compactly and uniquely houses all control gear in the ends of the reflector. ● Hinged end covers afford immediate access to control gear accessories. ● Alternative mains connections—either plug and socket detachability or separate mains terminal block. ● Internal wiring. ● Spring-loaded lampholders make lamping amazingly simple. ● Universal mounting fixture caters for any fixing position. ● The entire unit can be instantly lowered for inspection, cleaning, lamp replacements, etc.

Full particulars and prices on application to

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We rightly think of Stephenson's 'Rocket' as the beginning of our railways, but we should go back to Cugnot's steam lorry, illustrated here, for the birth of steam propulsion.

As regards electric lighting, that began in real earnest in this country over sixty years ago, when we made the first storage batteries and lit the Law Courts, Royal Exchange, and other important buildings.

Today our batteries have wider fields of application. In addition to Train Lighting they are supreme for Country House Lighting, for Motor vehicles and Aircraft, and now are being widely used for Emergency Lighting in buildings where light is necessary when the mains fail.

P & G and E.P.S. Cells have also an enviable record of reliability in Central Stations, Telephone Exchanges and in every other application.



● **REPLATING.** Ensure long and reliable service by having your present batteries replaced by us.

PRITCHETT & GOLD and E.P.S. CO. LTD

—formerly the Electrical Power Storage Co., Ltd.—

MADE THE FIRST BATTERIES



PG 12b/44

50 GROSVENOR GARDENS, LONDON, S.W.1. Phone: SLOanc 7164. Grams: Storage, Sower, London

<h1>MICA</h1> <p>Processed Parts Precision Gauged for CONDENSERS, ETC.</p>	<h1>DACIER</h1> <p>LTP, 22, Bargates, Christchurch, Hants. Telep: Christchurch, 1011. <i>Electrical Insulation Specialists</i></p>	<h1>BAKELITE</h1> <h1>MICANITE</h1> <p>Sheet and Machined Parts of all kinds.</p>
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SCRUIT

ONE PIECE
PORCELAIN
CONNECTORS

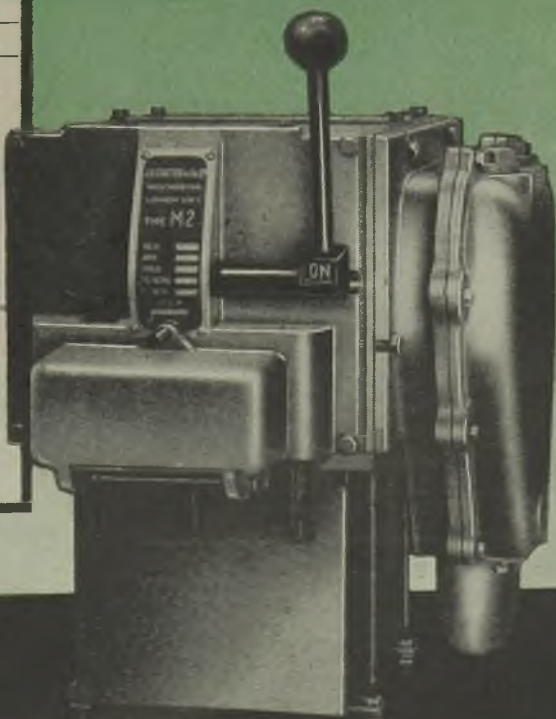
Easiest to fit -
SHORT-PROOF, FIRE-PROOF, WATER-PROOF

Sold under the names SCRUIT, TENBY, "G" SCRUIT.
Made by V. G. Manufacturing Co., Ltd. Gorst Road, Park Royal, London, N.W.10.
Distributors: S. O. Bowker, Ltd., and GEE (Birmingham), Ltd. Birmingham.

Type "M"

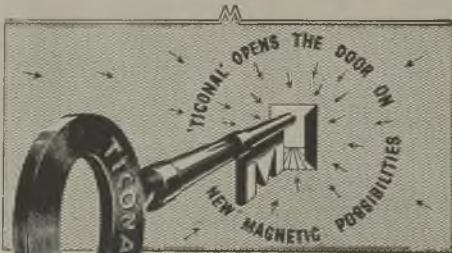
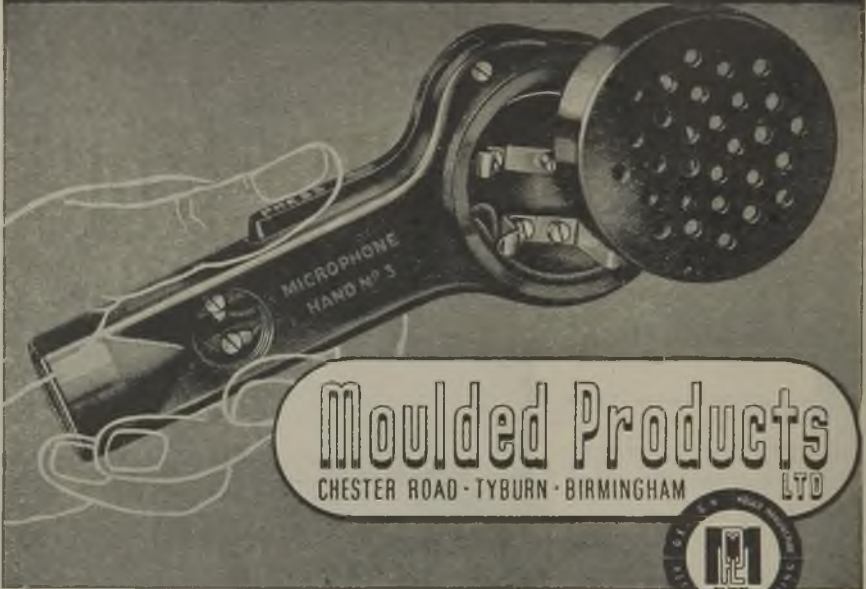
CIRCUIT BREAKERS

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LAMINATED

"Strength where you need it"
SHEETS, RODS, BOLTS, COMPONENTS

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**BAKELIZED PAPER
BUSHINGS & TUBES**

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Since 1783 Boltons have known more than one period of national crisis followed by progressive reconstruction. The combination of metallurgical research with specialisation in manufacture has enabled Bolton Copper Products to play a notable part in the scientific and industrial developments of the last 150 years and in the unprecedented tasks of the war to-day, and will continue to do so in the days of peace.

- ★ "COMBARLOY"
(for commutator bars, brushes, etc.)
- ★ COPPER WIRE, STRIP, BUS-BARS,
COMMUTATOR SEGMENTS.
- ★ PATENTED CELLULAR CONDUCTORS
(for extra high tension currents).
- ★ TROLLEY WIRE.



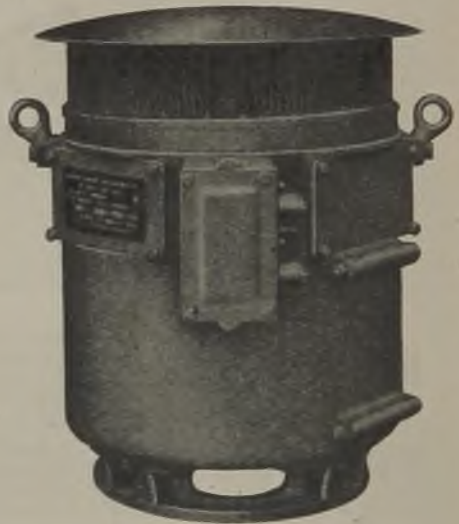
THOMAS BOLTON & SONS LTD. HEAD OFFICE : WIDNES, LANCs. P.O. BOX No. 3
Telephone : Widnes 2022.
London Office : 168 Regent Street, W.1. Telephone : Regent 6427/8,9.

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MARINE TYPE MOTORS AND GENERATORS

24 H.P., T.E. Vertical Pump
Motor, 1,600 R.P.M., 110 lbs.
32" high, 25 5" dia.

ST. MARY CRAY, KENT
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5. K.V.A.

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for the production of articles from
PLASTIC MATERIALS

(including Rubber and Synthetic Rubber)

We offer a comprehensive service for the production of certain plastics required for priority work. You are invited to submit particulars of your requirements.

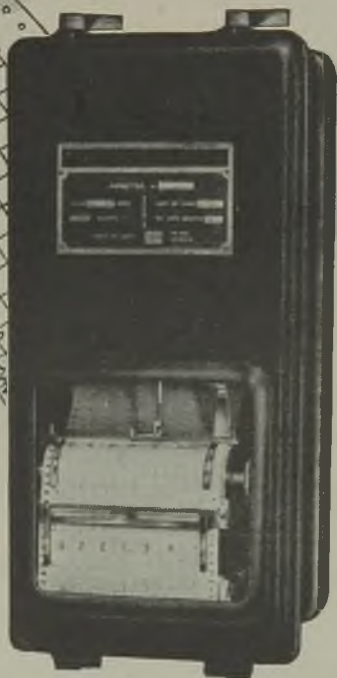
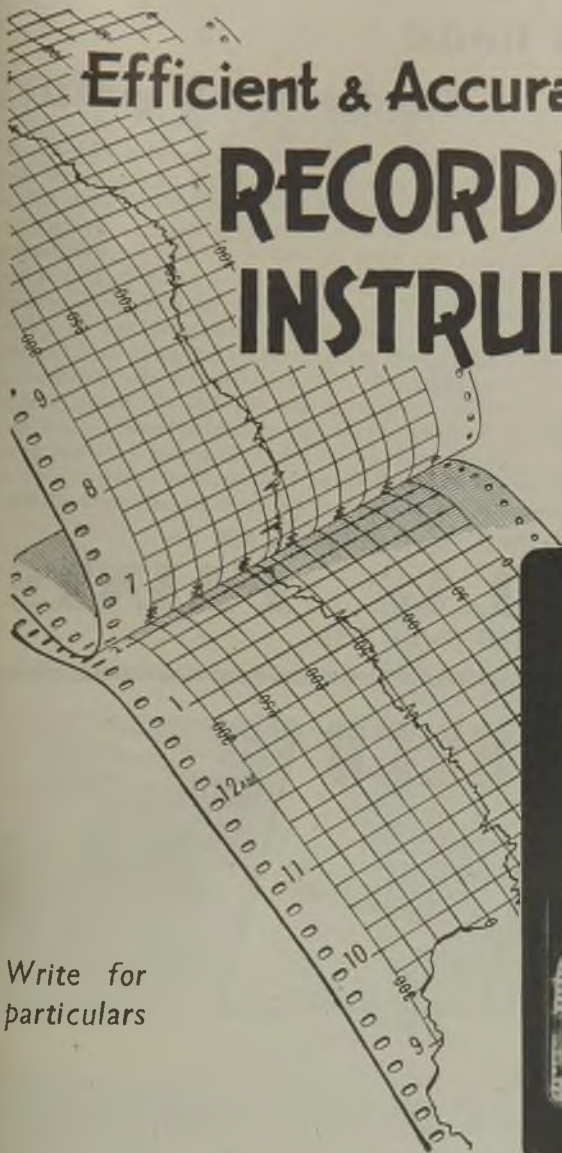
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UNITED EBONITE AND LORIVAL LIMITED
LITTLE LEVER • NEAR BOLTON • LANCASHIRE

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ESTABLISHED 1800

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What has a bend

to do with paint?



When a piece of painted sheet metal is distorted by bending, the surface is subjected to stress. A good paint must stand up to a reasonable amount of this treatment without cracking or flaking. In fact, the paints of Jenson & Nicholson, Ltd. have to demonstrate that they can "take the bend." This is how it's done. The paint is applied to a piece of sheet metal and, when dry, it is bent quickly through 180 degrees over a thin rod or mandrel held between hinged boards. If it is up to the standard of

flexibility demanded by the Jenson & Nicholson organisation, the paint must be able to be "caught bending" without cracking or flaking away—only then do the scientists consider it fit for service in war or peace. When peace returns again you will find Jenson & Nicholson, Ltd. at your service with all classes of "cracking" good paints and varnishes which do not crack, and meet all needs.

JENSON & NICHOLSON, LTD.

ROBBIALAC PAINTS

LONDON, E.15

Soldering—then **ELCO**

ELCO design and build soldering irons, machines, melting pots, and special furnaces for all soldering needs to suit any voltage from 24 v. up. Illustrated are four interchangeable units.

There are many others.

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Abbey 4266



Let **ELCO**
Solve
Soldering
Problems

Blackheart & Whiteheart

MALLEABLE CASTINGS FOR THE
ELECTRICAL INDUSTRY

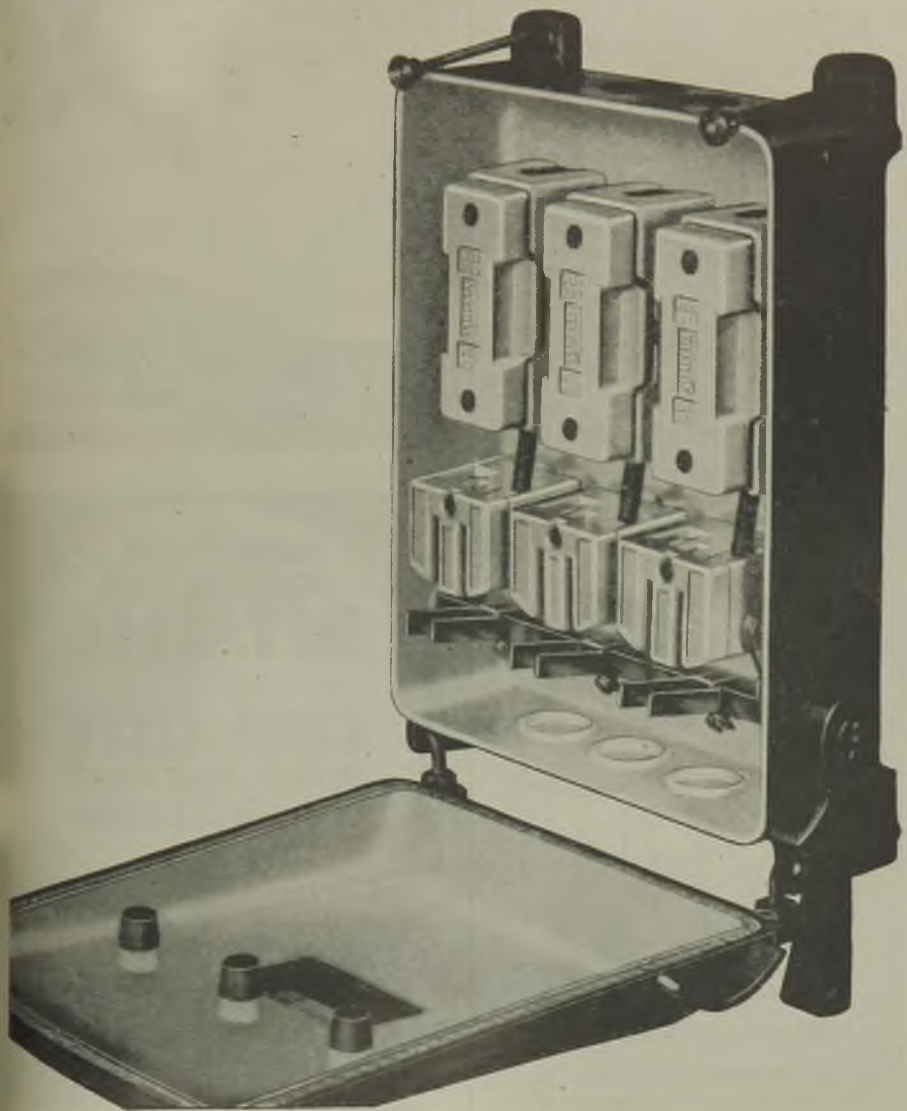
HARRISON & Co. (Lincoln)

NORTH HYKEHAM, LINCOLN

Telephone: North Hykeham 206/7

Telegrams: Malleable, Lincoln

SIMPLEX



18, 1944

aint?

distorted by
 A good
 amount of iron
 In fact, the

 This is how
 piece of sheet
 ... through 30
 ... held between
 ... standard of
 ... paint must be
 ... -only die
 When race
 service with all
 and meet all tests

ENTS



DEAR

THE

coin

Simplex Line

SUPPLIES FOR
ESSENTIAL PURPOSES ONLY

ELECTRIC GLUE POT



- ★ HEAVY DUTY
- ★ RELIABLE
- ★ HEAT REGULATION
- ★ CAST INTERIOR AND EXTERIOR

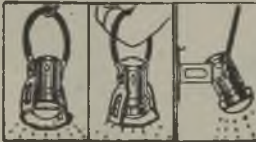
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Thousands in use
Price 69 6

Please state voltage required

EMERGENCY PORTABLE LIGHTING

A practical, sturdy, 6-volt lantern for A.R.P., Civil Defence, factory use, etc.

Very adjustable, both arms free when mounting a ladder. Price 28 6 with battery or 25/- without battery, plus purchase tax.

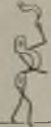


NOTE VARIETY OF POSITIONS

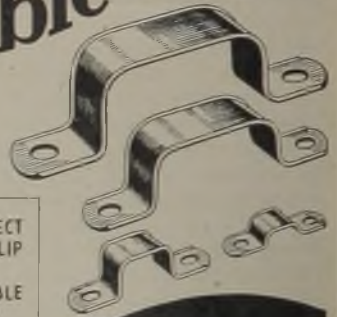
The above are two examples of "SUPREME" Guaranteed Electric Products

L. G. HAWKINS & CO., LTD.
30/35, DRURY LANE, LONDON, W.C.2
Phone: Temple Bar 5811

ELECTRICIANS! Specify & use K-A-ble Clips



THE PERFECT CABLE CLIP FOR EVERY CABLE IN ANY COMBINATION



A PRODUCT OF

B. Kimber, Allen & Co
LONDON, S.E.13

The
CONSISTENT ACCURACY OF METALLIC STEEL CONDUITS MEANS TIME SAVED IN FITTING



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ENCLOSED CIRCUIT AIR COOLERS

FOR VENTILATING TURBO-ALTERNATORS



- Highly efficient cooling surfaces.
- Dead-air spaces for trapping any leakage from tube joints
- Large inspection doors hinged to headers.
- Tube bores accessible without breaking pipe joints.
- Special layouts of air dampers for emergency operation
- Automatic alarm devices for signalling excessive temperatures.

HEENAN & FROUDE LIMITED
ENGINEERS WORCESTER ENGLAND



A small income... but a large refrigerator!

IN a happier, healthier, post-war Britain every housewife will be "cold-store-minded" and it is to be hoped that even the most modest home will possess a refrigerator to safeguard the precious vitamins, etc., in perishable foods. Prestcold designers suggest in the illustration above a built-in refrigerator which can be mass-produced at a popular price. It would be of $4\frac{1}{2}$ cubic feet capacity and hold sufficient perishable food for a family of four, a practical size which renders a larder unnecessary. It has several other major advantages. Note the features below:—

Storage capacity of approximately $4\frac{1}{2}$ cubic feet, which will hold all the perishable foodstuffs for a family of four.

Larder space rendered unnecessary. Dry goods and non-perishable foodstuffs would be kept in kitchen cupboards.

Waist-high refrigerator door, allowing access to interior without stooping.

Height adaptable by varying position of supporting frames.

Refrigerator can be built into kitchen fittings with cupboard space above and below it.

Design provides for adequate ventilation of mechanism without the necessity for special air-bricks or ducting.

PRESTCOLD

Refrigeration

A PRODUCT OF THE PRESSED STEEL COMPANY LIMITED

LIGHT



The Danger Spots!

That corridor with a blind corner, that awkward stairway, that doorway in a dim corner—these are the danger spots. Wigan [and] Lacent Prismatic Lighting your solution.



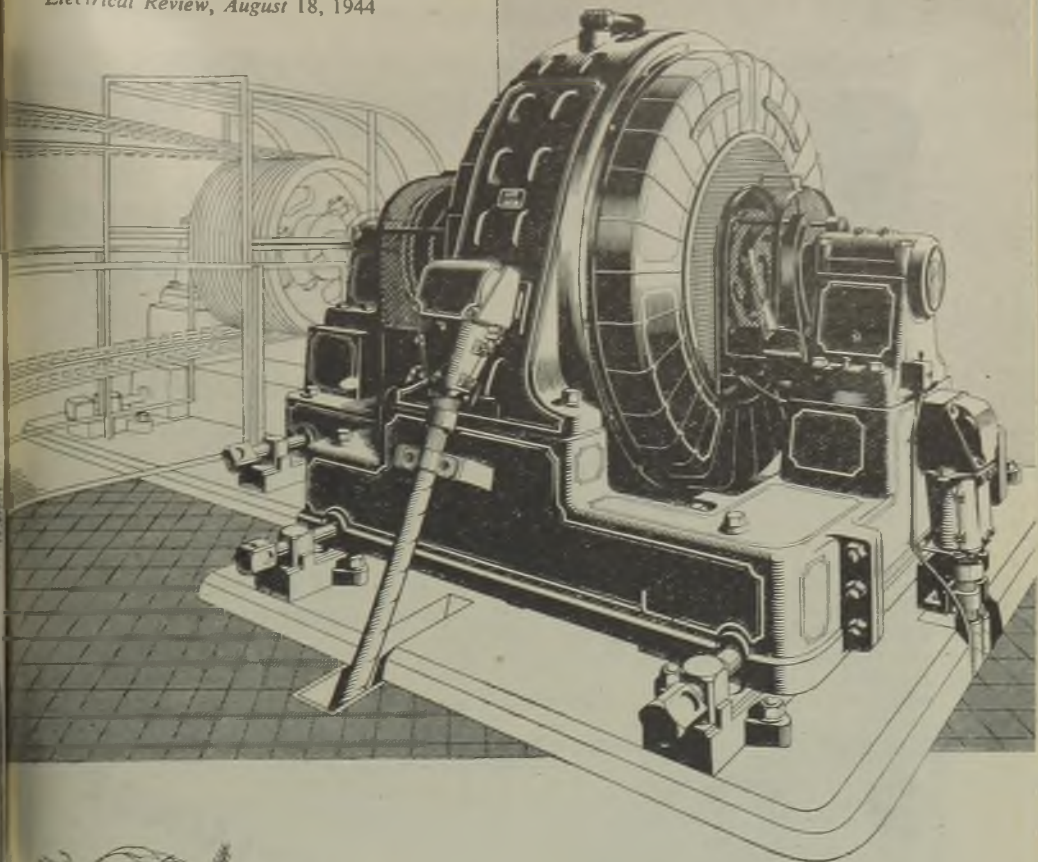
HEYES

Wigan and Lacent fittings comprise a full range of units. Fully descriptive leaflets and specifications are available on request.

of Wigan


HEYES & COMPANY LIMITED WATER HEYES WORKS, WIGAN

Agent: F. G. Ketelby, Gazette Buildings, Corporation Street, Birmingham.



A 1,000 h.p. gale! This

Crompton Parkinson 1,000 h.p. Induction Motor drives one of the largest fans in existence. For large and important motors like this, rely on Crompton Parkinson's 60 years experience . . .

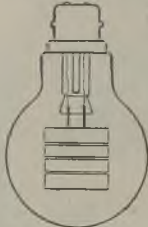
CROMPTON  **PARKINSON**
LIMITED

CENTRAL HOUSE LONDON, W.C.2 and Branches



For War Emergency Lighting

ROBUST CONSTRUCTION — LONG LIFE
in two colours:—



Patent No. 545506

NEOGLO — Neon Red
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200-260 VOLTS
2 WATTS

Price **3/6** No Purchase Tax

INVALUABLE WHERE SUBDUED LIGHTING IS REQUIRED

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All Enquiries to:—

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Transformers

**FAMOUS THROUGHOUT
THE WORLD**

"There is a type for every
radio purpose, and it is the
right type. Satisfaction as-
sured if it bears our name."

RADIO INSTRUMENTS LTD.
Purley Way, Croydon.



**SIGNALLING
EQUIPMENT
LIMITED**

Manufacturers of

Small Transformers, Heavy Duty Resistances,
Plugs and Sockets, Fuse Holders, Electric Bells,
Buzzers, and Switches. Also Plastic Mouldings,
Coil Windings, Light Pressings, Turned Parts,
and other components and accessories for the
Wireless and Electrical Trades

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Phone: POTTERS BAR 3133

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PUMPS FOR:
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AS SUPPLIED TO
PETROLEUM
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**ROTOPLUNGE
PUMPS**

Pumps for
Petrol, Water,
Tar, Fuel Oil, etc.
Suction lifts 25ft.
without priming.

Variable stroke and Auto-
matically Reversible pumps.

ROTOPLUNGE PUMP Co. Ltd.
58 Victoria Street, S.W.1

Phone: VIC 4395

Grams: Rotoplunge

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ROTARY
CONVERTERS**

Petrol Electric Generating
Plants, H.T. Generators, D.C.
Motors, Frequency Changers,
etc., up to 25 K.V.A.

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ERM



copper

for the machinist

Many hundreds of tons of **ERM high-Speed** machining copper have been sold during the last few years; if your production engineer has not heard of it, then we certainly ought to get to know one another better. Briefly, we have alloyed copper with certain other elements, to produce **ERM high-Speed** machining copper, with its high electrical conductivity (98%), plus its resistance to elevated temperatures, plus machinability such that it can be worked easily in automatics. Our experience is at your disposal. One penny (we blush at having to ask you for it) will bring you our technical leaflet about these alloys.

Enfield Rolling Mills Ltd

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AGRO BAKELITE BLOCKS

THE ALTERNATIVE TO WOOD BLOCKS



AS SUPPLIED TO THE
AIR MINISTRY
PROMPT DELIVERY

No. 5050 Round type for one 2" or 2½" 5-ampere switch.

No. 7070 Round type for one 2" centre Ceiling Rose.

No. 8080 Oblong type for two 2" or 2½" 5-ampere switches.

BROWN BAKELITE



Marketed by

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

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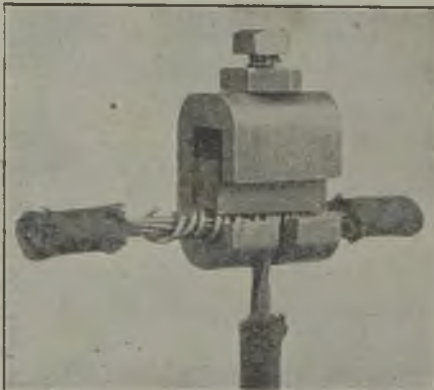
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FOR

QUICK RELIABLE REPAIRS
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THE MIDLAND DYNAMO Co. Ltd.
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The "MOORHOUSE"
One-piece cable connector

Manufactured by

SPERRYN & CO.

Moorsom Street, Birmingham

Established over 50 years

To-day we cannot do all that we would like for you, but we hope to have the opportunity when the war has been won.

In Advance . . .

Metropolitan - Vickers—
leaders in Transformer Design
for over forty years.



The Giant 18,500 kVA Transformer
— 66 kV, manufactured in
this Country.

75 MVA, 3-phase
66 kV Transformer
recently supplied.



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Vickers**
ELECTRICAL CO. LTD.
TRAFFORD PARK · MANCHESTER 17.

METROVICK TRANSFORMERS



The strongest line of attack against LOW POWER FACTOR

**AUTOMATICALLY
CONTROLLED**

The photograph, reproduced above, shows the most effective solution to the problem of low power factor, a problem which may have to be faced eventually by every industrial consumer, particularly where the load comprises a large number of individually driven machines.

In the example illustrated, the overall power factor is never less than .95, obtained by the employment of automatically controlled B.I. Condensers, without which the power factor would not be higher than .68

High power factor ensures the most efficient use of distribution and shows a substantial saving in power costs.

The B.I. Technical Advisory Service is available to investigate conditions on site, and to recommend the best arrangement for ensuring efficient and reliable Power Factor Correction.

Write for full particulars.

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SYSTEM OF
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CONTROL

BRITISH INSULATED CABLES LTD.

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Telephone : PRESCOT 6571

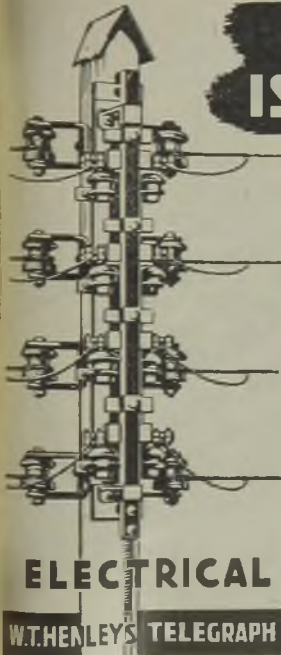
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AN INDEPENDENT COMPANY, MAKERS OF E.H.T.
AND L.T. PAPER MAINS CABLES, VARNISHED CAMBRIC
C.T.S. MINING TRAILING, "IVERITE" INSULATED CABLES
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BRITANNIC ELECTRIC CABLE & CONSTRUCTION CO. LTD. IVER, BUCKS
Telephone: IVER 491; Telegrams: "BRITANNIC, IVER"

L.T. OUTDOOR ISOLATING SWITCHES



Specially designed for isolating low tension overhead distribution lines erected in vertical formation. The switch embodies a quick-break mechanism and self-aligning contact blades. The operating shaft can be fitted either for hooked rod operation or for operation by hand from ground level. The whole assembly including the pole fittings makes a very neat and inconspicuous arrangement.

Available for 2, 3, 4 or 5 wire lines, working current 150 amperes, up to 500 volts.

An alternative design embodies H.R.C. Cartridge Fuses up to 150 amperes max. working capacity, 500 volts. Write for Catalogue W.O.3.

HENLEY

ELECTRICAL DISTRIBUTION EQUIPMENT

W.T.HENLEYS TELEGRAPH WORKS CO.LTD. MILTON COURT, WESTCOTT, DORKING, SURREY

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.

Original testimonials should not be sent with applications for employment.

OFFICIAL NOTICES TENDERS, ETC.

CITY OF MANCHESTER

THE Electricity Committee invite tenders for the supply and delivery of 33,000-VOLT AND MULTICORE CONTROL CABLES (Specification No. 803).

Specification, etc., from Mr. H. C. Lamb, Chief Engineer and Manager, Electricity Department, Town Hall, Manchester, 2, on payment of a fee of one guinea, which amount will be refunded on receipt of a bona fide tender.

Tenders to be delivered by 10 o'clock a.m. on Friday, 25th August, 1944.

Town Hall, Manchester, 2.
3rd August, 1944.

R. H. ADCOCK,

Town Clerk.

502

SITUATIONS VACANT

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

BOROUGH OF WALTHAMSTOW

Appointment of Commercial Assistant in Electricity Undertaking

APPPLICATIONS are invited for the above appointment from persons with suitable qualifications and experience in an Electricity Supply Undertaking, at a salary in accordance with Grade D of the North Metropolitan District Council's scale of salaries, i.e., £485, rising by annual increments of £20 per annum to a maximum of £525 per annum, plus cost of living bonus, at present amounting to £49 10s. 9d.

The appointment will be subject to one month's notice on either side; to the provisions of the Local Government Superannuation Act, 1937; to the Council's Sick Pay Scheme for the time being in force, and to other conditions relative to staff appointments.

Applications, stating age, qualifications, previous experience, present salary, accompanied by copies of three recent testimonials, and endorsed "Commercial Assistant, Electricity Undertaking," to be delivered by post only to the undersigned not later than Friday, 25th August, 1944.

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

In the event of the person appointed ceasing to serve the Council in order to take up War Service, the difference in pay will not be made up by the Council.

G. A. BLAKELEY,

Town Clerk.

503

Town Hall,
Walthamstow, E.17.

BOROUGH OF GRAVESEND

Appointment of Borough Electrical Engineer and Manager

APPPLICATIONS for the above appointment are invited from engineers who are experienced in the management and administration of an electricity undertaking. Candidates must have been engaged in the business of electricity supply for an extended period and have had practical experience in the generation and distribution of electricity.

The salary will be in accordance with the Agreement made by the National Joint Committee of Local Authorities and Chief Electrical Engineers, dated 9th July, 1941. The present salary according to the scale is £1,422 per annum, and this salary will be paid from the date of taking up duties.

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

Application forms for the appointment may be obtained from the undersigned and must be returned by Friday, 1st September, 1944.

Canvassing either directly or indirectly will disqualify.

H. H. BROWN,

Town Clerk.

4, Woodville Terrace,
Gravesend, Kent.

3rd August, 1944.

492

CITY OF CHICHESTER

Appointment of Chief Electrical Engineer and Manager

APPPLICATIONS are invited for the above appointment from qualified engineers not exceeding 45 years of age who are experienced in the management and administration of an electricity undertaking.

The salary will be in accordance with the Agreement made by the National Joint Committee of Local Authorities and Chief Electrical Engineers, dated 9th July, 1941. The present salary according to the scale is £1,013 per annum.

In accordance with the provisions of Clause 10 of the Agreement, 85% of the salary will be paid for the 1st year, 92½% for the 2nd year, and the full scale salary at the commencement of the 3rd year. A car allowance will be paid.

The appointment will be terminable by 3 months' notice by either party and is subject to the provisions of the Local Government Superannuation Act, 1937.

The person appointed will be required to pass a medical examination.

Application forms, with conditions of the appointment, may be obtained from, and must be returned to, the undersigned not later than 31st August, 1944.

Canvassing, either directly or indirectly, will be a disqualification.

ERIC BANKS, Town Clerk.

31st July, 1944.

483

ELECTRICAL Wholesalers require a Clerical Assistant, conversant with trade and materials as handled.—London Electrical Co. (Blackfriars) Ltd., Blackfriars Road, S.E.1.

LIFTS. Representatives required South Coast areas by leading lift manufacturer. State area covered and experience in this class of work.—Box 487, c/o The Electrical Review.

COUNTY BOROUGH OF HALIFAX

Light, Heat and Power Committee

Electricity Department

A PPLICATIONS are invited for the position of Control Room Attendant at the Foundry Street Power Station, at a salary in accordance with the National Joint Board Schedule, Grade 9a, Class G.

Applicants should have experience in the operation of a selected station with large units. Experience with rotary and motor converter plant is also desirable.

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

Applications, endorsed "Control Room Attendant," stating age, experience and when at liberty, and accompanied by a copy of not more than 3 recent testimonials, should be addressed as under, and should be received not later than 12 noon, Thursday, August 24th, 1944.

Envisaging directly or indirectly will be a disqualification.

A. G. CONNELL,
M.I.E.E., M.I.Mech.E., F.Inst.F.,
Borough Electrical Engineer and Manager.

Halifax Corporation Electricity Department,
19/23, Northgate, Halifax.

508

CHELTENHAM ELECTRICITY UNDERTAKING

Lady Demonstrator

A PPLICATIONS are invited for the temporary position of LADY DEMONSTRATOR of electric cooking and other appliances. Candidates must be ineligible for National Service, have had a good general education, hold a diploma in cooking and/or electrical housecraft, and have a thorough knowledge of domestic electric appliances; they must be competent to conduct lecture-demonstrations and to advise on the selection and use of apparatus.

Salary £180 per annum, rising to £240 by annual increments of £10, plus war bonus, at present amounting to £36 8s.

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

Schedule of duties and application form can be obtained from the undersigned. Applications, giving full particulars of training and experience, with copies of recent testimonials, to be sent to the undersigned not later than the first post on Monday, 27th August, 1944.

R. W. STEEL,
Borough Electrical Engineer.

Municipal Offices,
Cheltenham,
2nd August, 1944.

500

DESIGN and Production Manager, West of England manufacturers require an experienced Engineer for production of Cooking and Water Heating Equipment for the Services. Applicants must be capable of designing and producing economically, possess initiative and have previous experience in a similar capacity. Salary £600 per annum, plus bonus, rising rapidly for competent man. Pension scheme working. Applicants should write, quoting D.815XA, to the Ministry of Labour and National Service, Room 432, Alexandra House, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 1st September, 1944.

LECTURER in Electrical Engineering with special reference to Design of Electrical Machinery wanted. Applications to be sent to the Principal, Faraday House Electrical Engineering College, 66, Southampton Row, W.C.1. Duties to commence in September. Initial salary £450 a year. 515

MANAGER required for Electric Control Gear Factory (London) employing 100. Experience production, stores & drawing office control essential. Write, stating age, experience, salary required.—Box 516, c/o The Electrical Review.

MANAGER to take complete control of electrical contracting section of large engineering business. Essentials—first-class technical qualifications, wide knowledge of installation design, estimating and general business experience (preferably in contracting field). Salary up to £1,500, according to qualifications. Good prospects. Applications held confidentially. State age, education and detailed employment record.—Box 489, c/o The Electrical Review.

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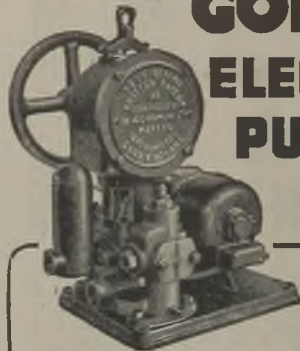
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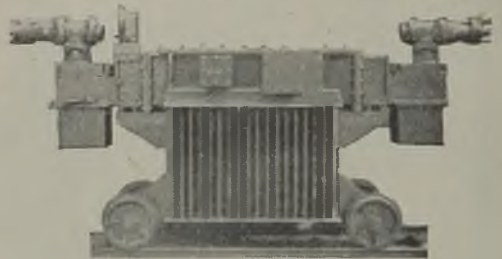
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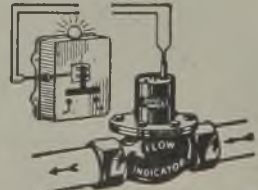
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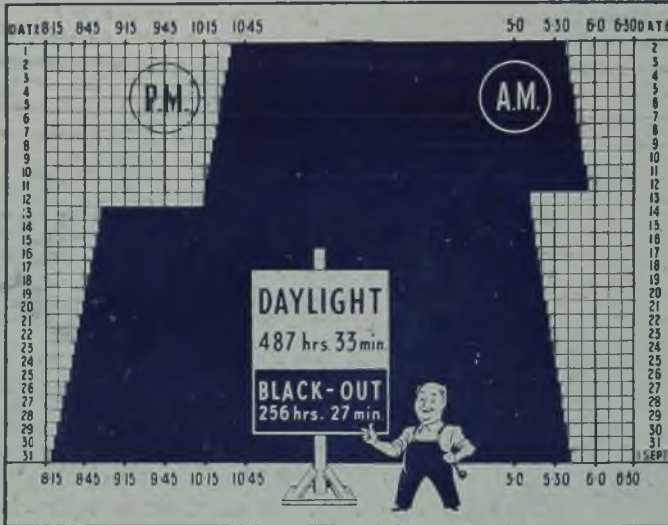
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