

# ELECTRICAL REVIEW

VOL. CXLIV

11th FEBRUARY, 1949

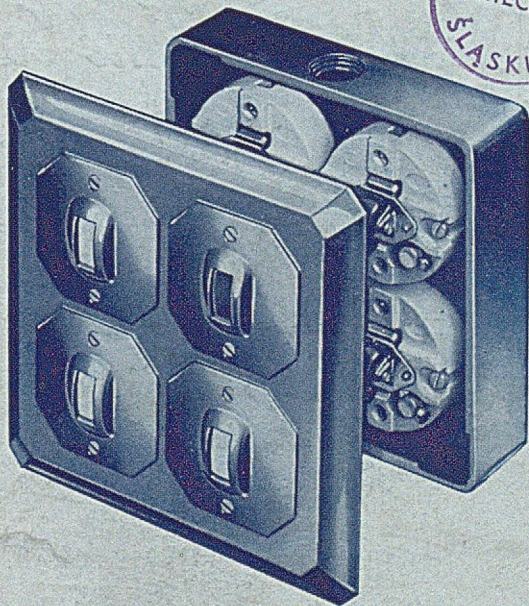
No. 3716

~~2444/II~~

P. 58/49/I

~~S. 58~~

SECRETS OF SWITCHCRAFT



## FLUSH WITH SUCCESS

MEM have entered the tumbler switch market with resounding success. Look for instance at this four-gang flush mounting unit. It is typical of the range which also includes one, two and three gang horizontal and vertical types with wood and iron boxes. The finish is right; the design is right and the price is right. You know why, of course. The MEM factory is the home of Switchcraft where production wonders are being worked every day.

For full details of the range send for folder No. 293

**MEM**

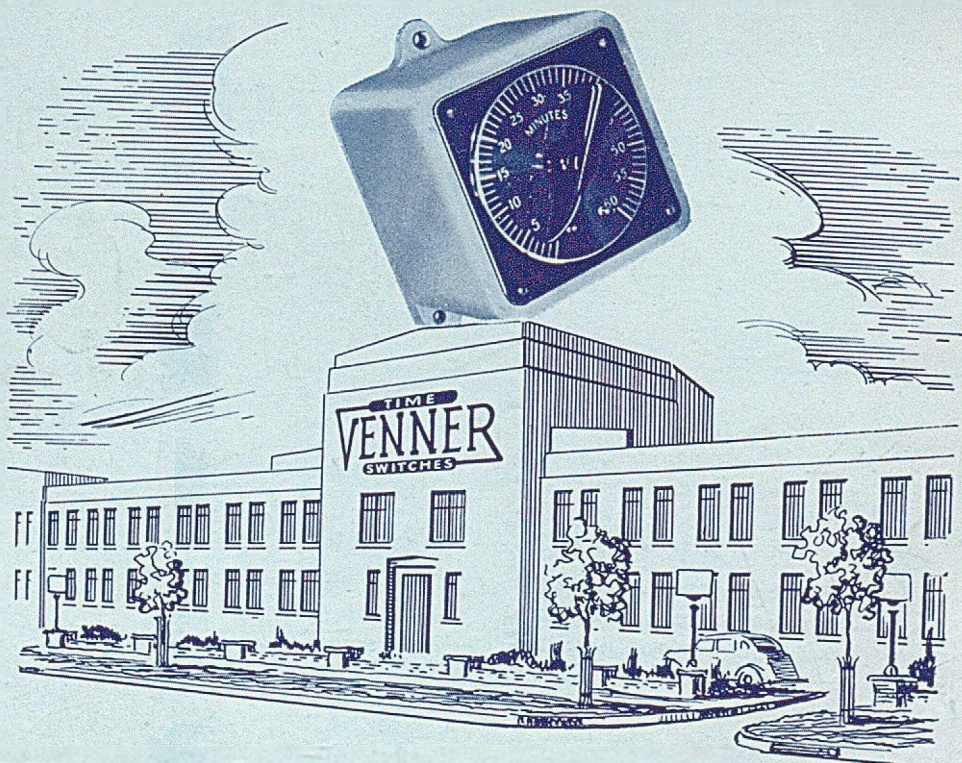
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MIDLAND ELECTRIC MANUFACTURING CO. LTD., BIRMINGHAM 11  
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As Spurs to High Adventure

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It is in the spirit of pioneering research that Heatrae forges ahead.



HENRY HUDSON

Henry Hudson's determination to find a North-West passage to China resulted in a life of hardship and a death of ingratitude - he and his infant son being set adrift in Hudson Bay by a mutinous crew and left to die.

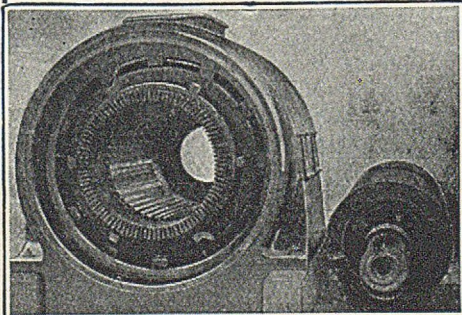


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Entirely Rewound

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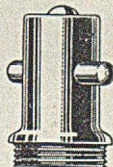
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requirements of  
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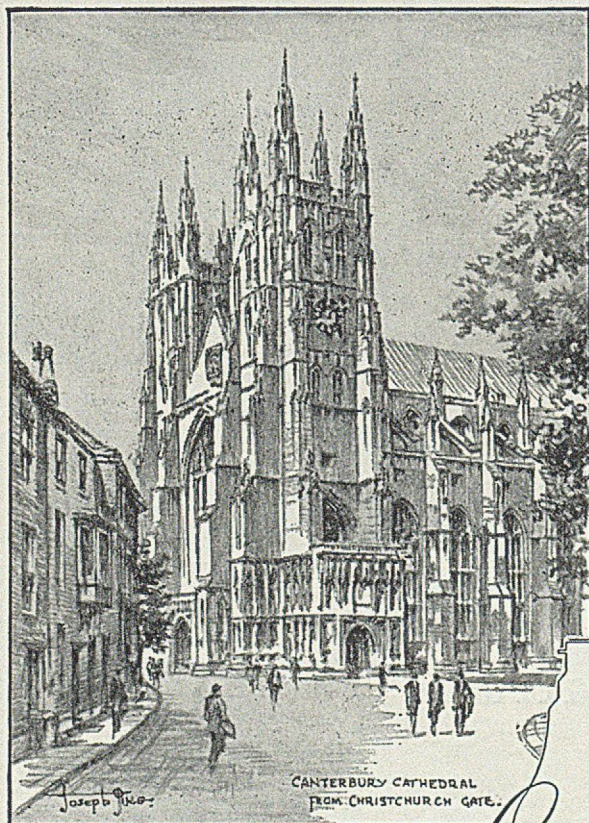
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tomb of the Black Prince

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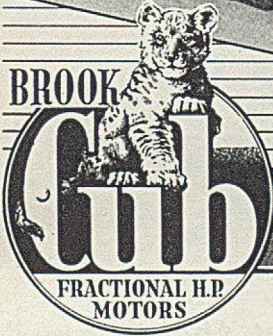
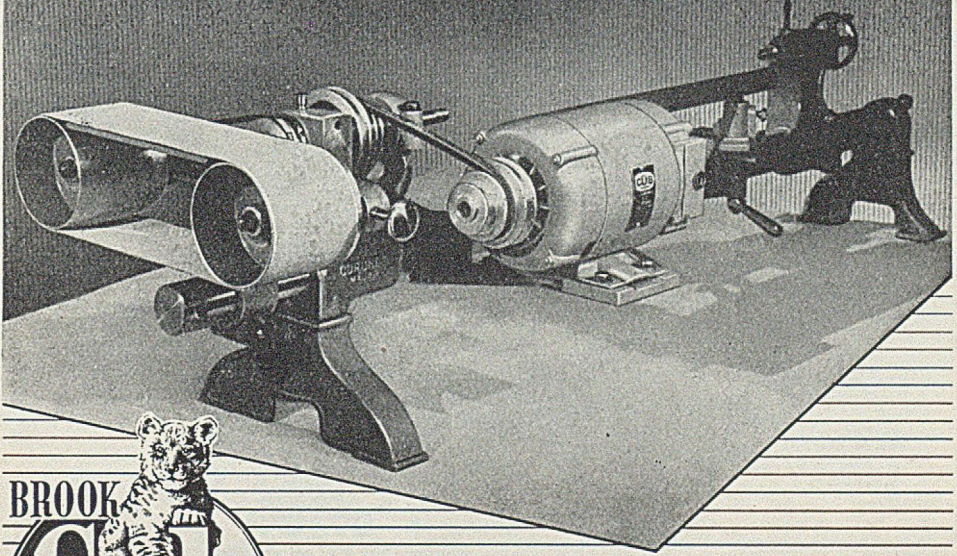
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A sound machine with a reliable driving unit—The one motor is easily interchangeable for driving the lathe and all its attachments.

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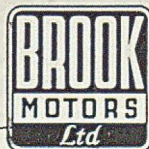
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MAY 2-13  
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**SEE OUR EXHIBIT**

STAND C. 214

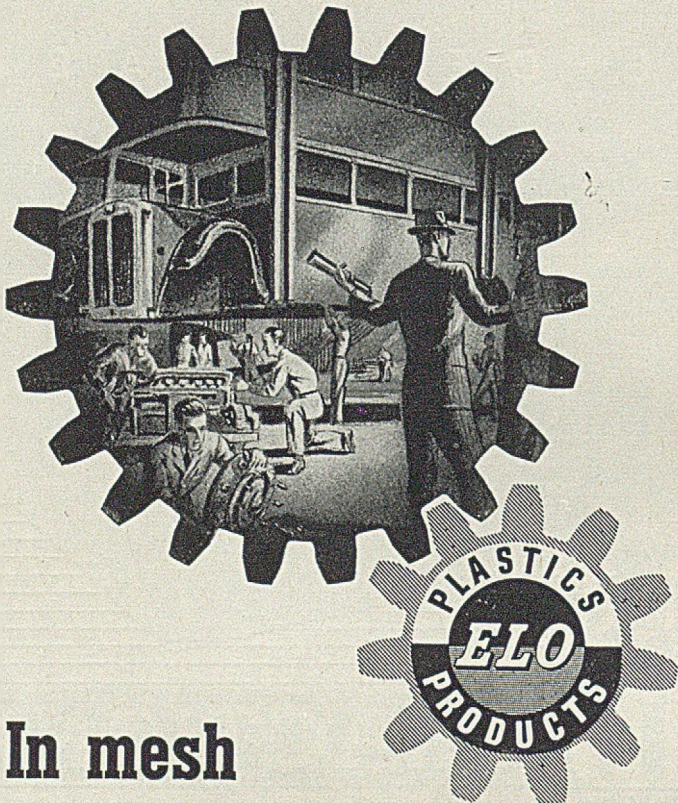


EM PRESS WORKS

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HP. 77.





**In mesh**

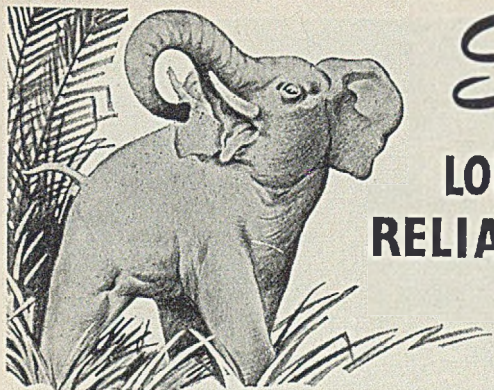
*with today's requirements for the*

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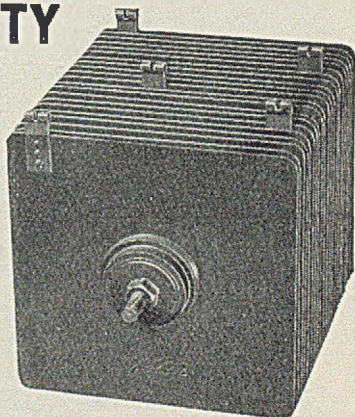
*Full information and data from Sales Development Department  
Birkbys Ltd., Liversedge, Yorkshire, England  
London Office : 79, Baker Street, W.1*





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*steady power  
at the turn  
of a switch*

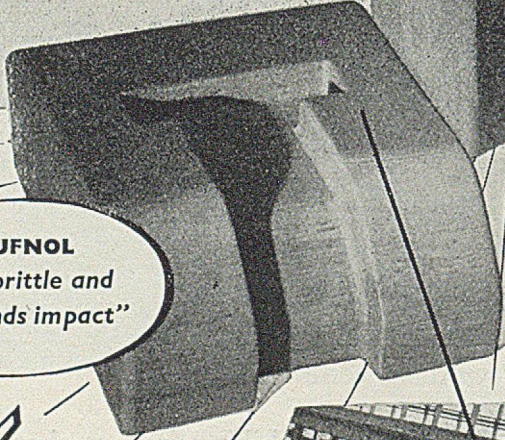
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**WESTINGHOUSE BRAKE & SIGNAL CO. LTD.**  
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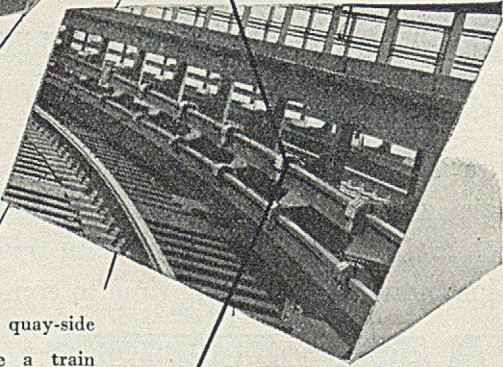




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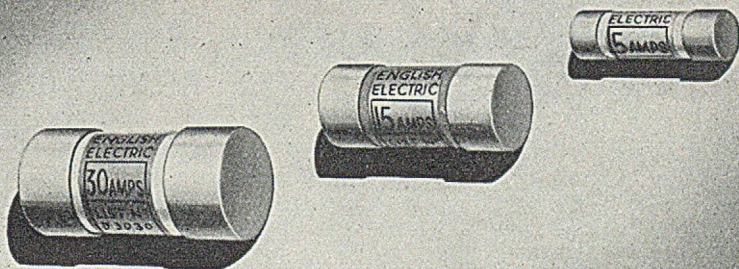
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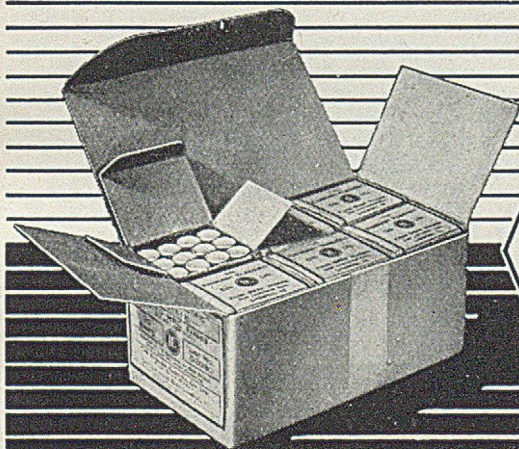


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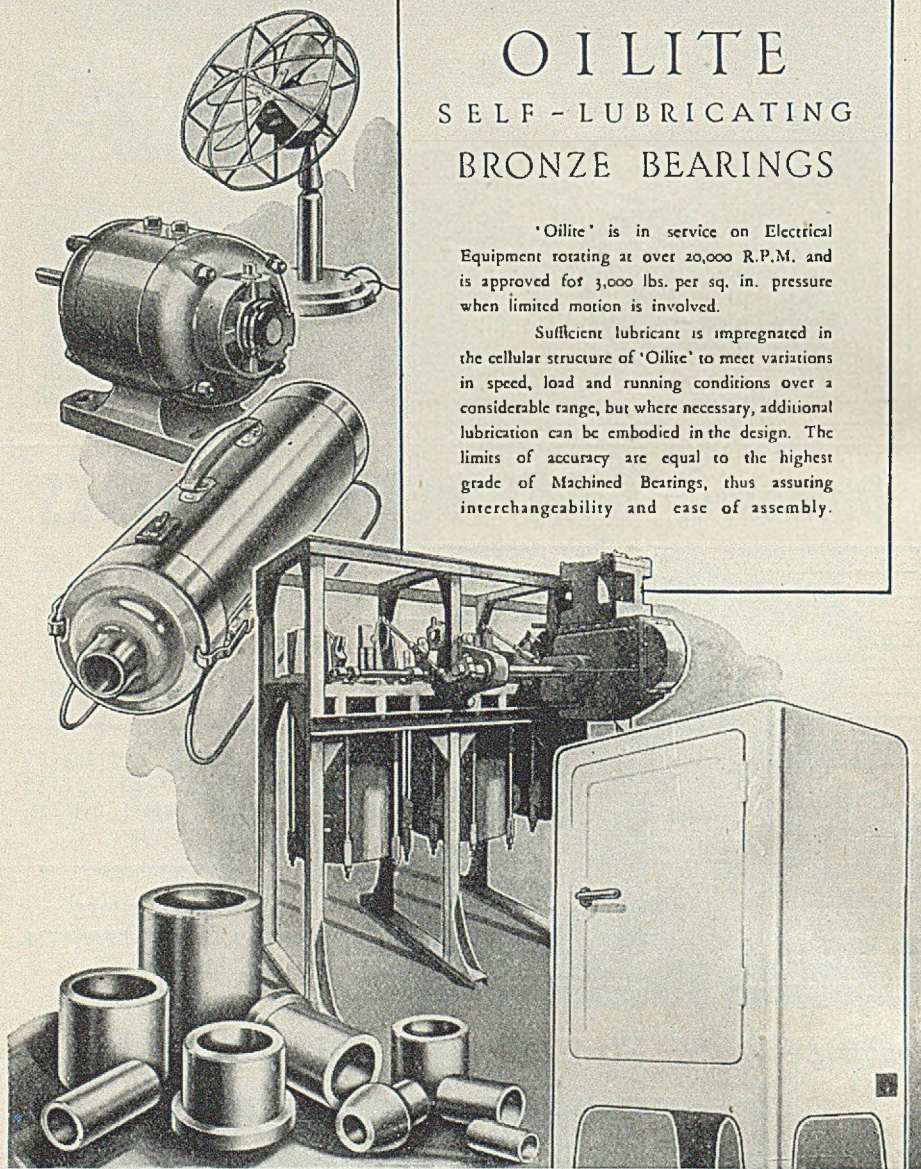
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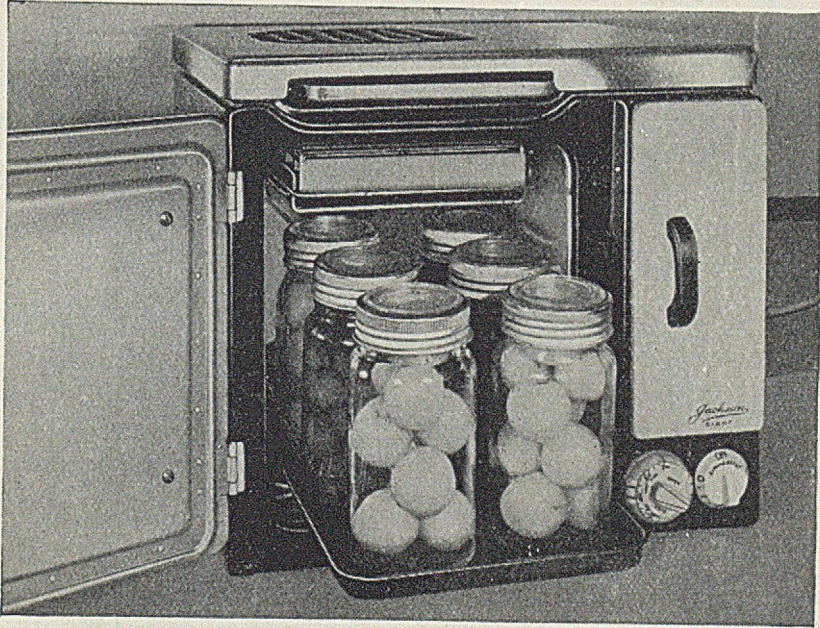


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*It can be connected to a power point (13 amp.)*

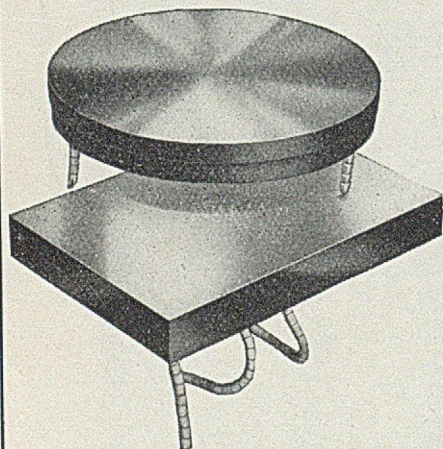
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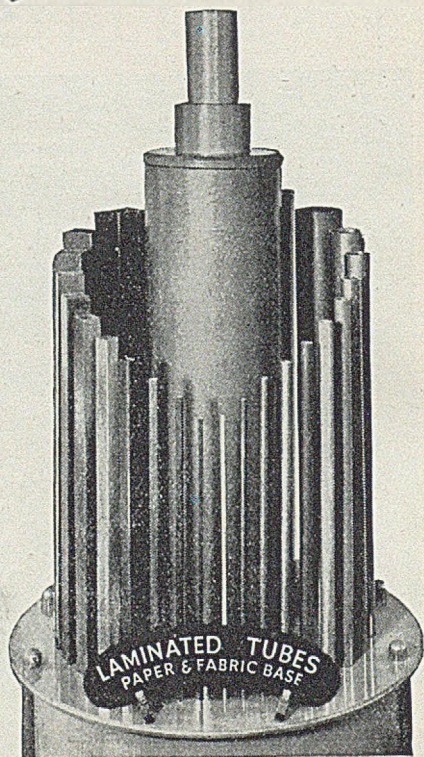
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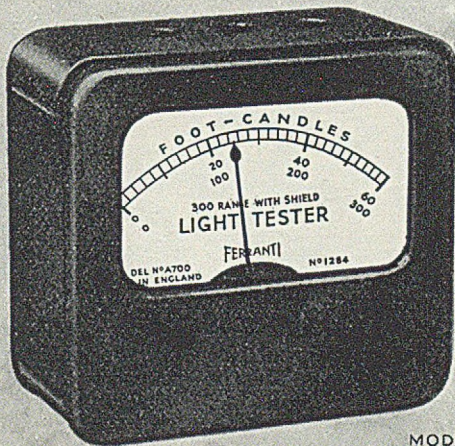
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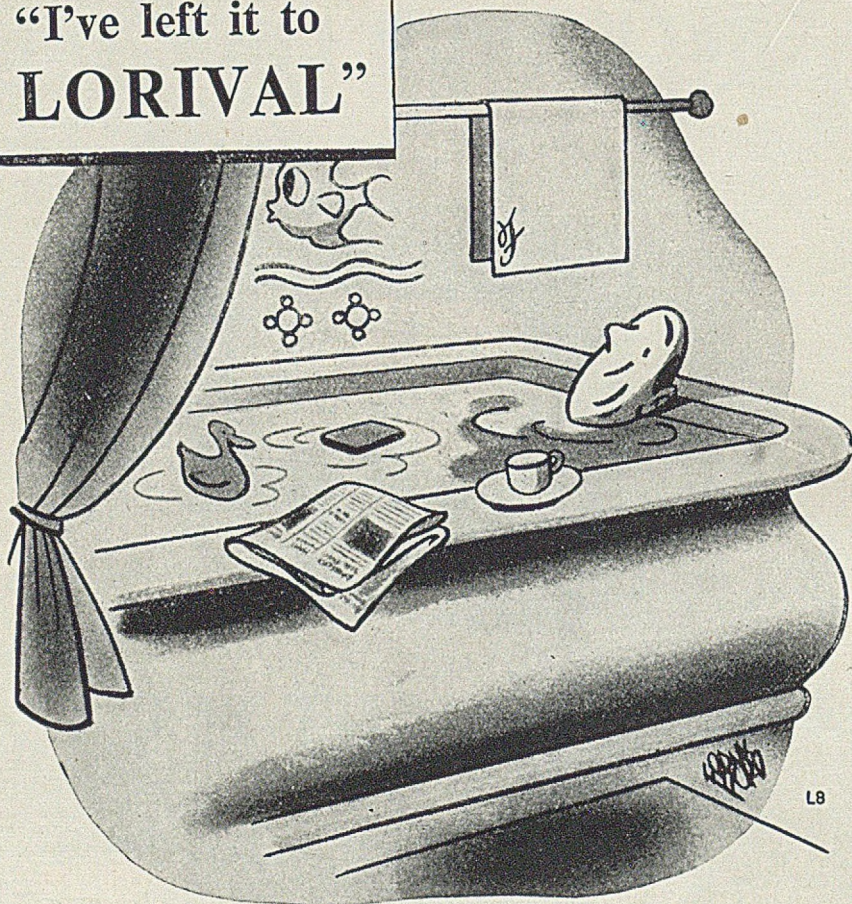
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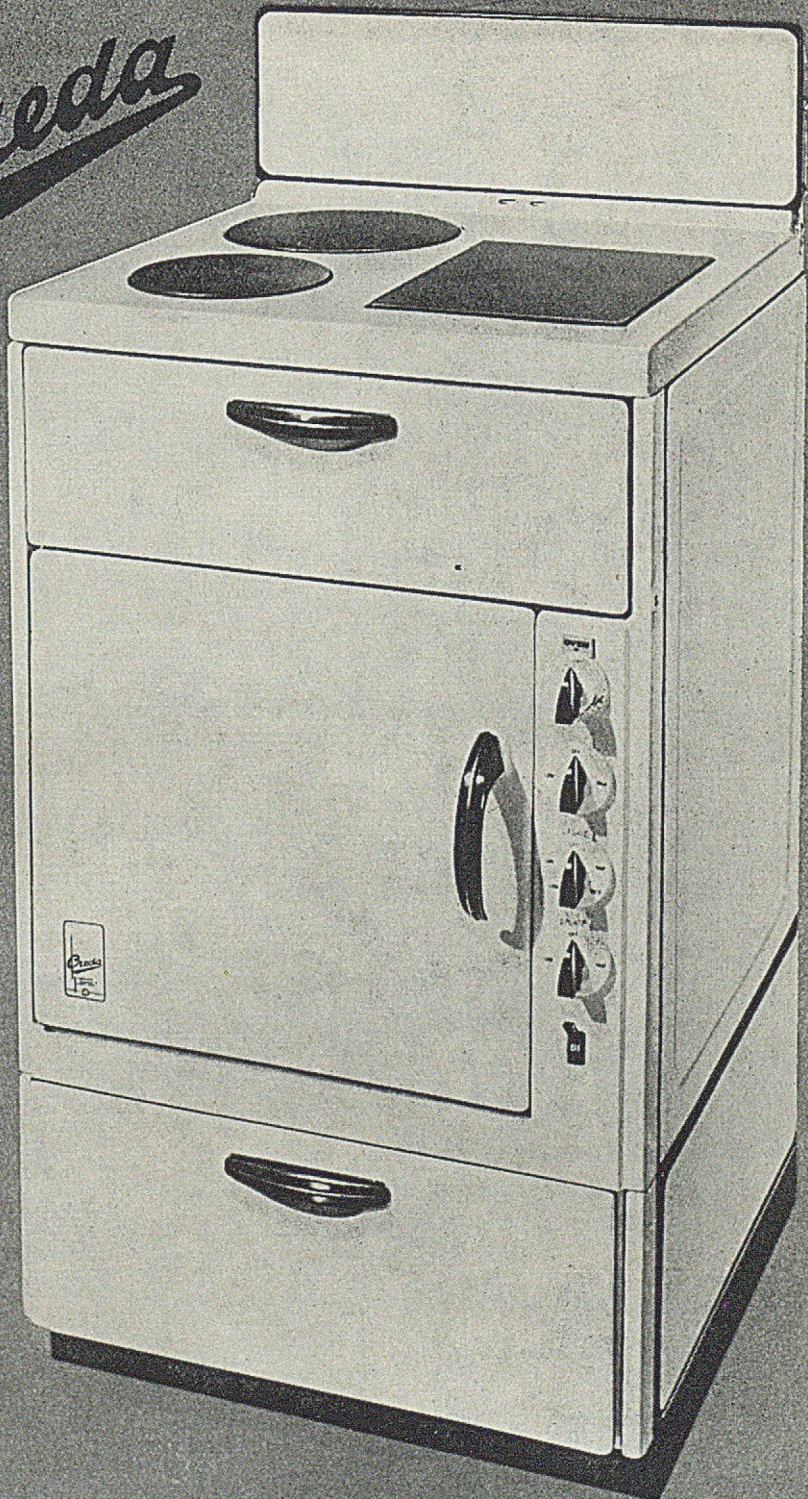
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*Creda*



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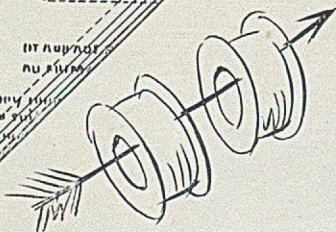
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or 500



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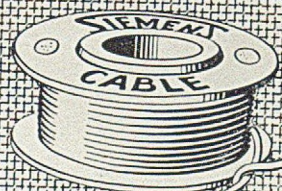
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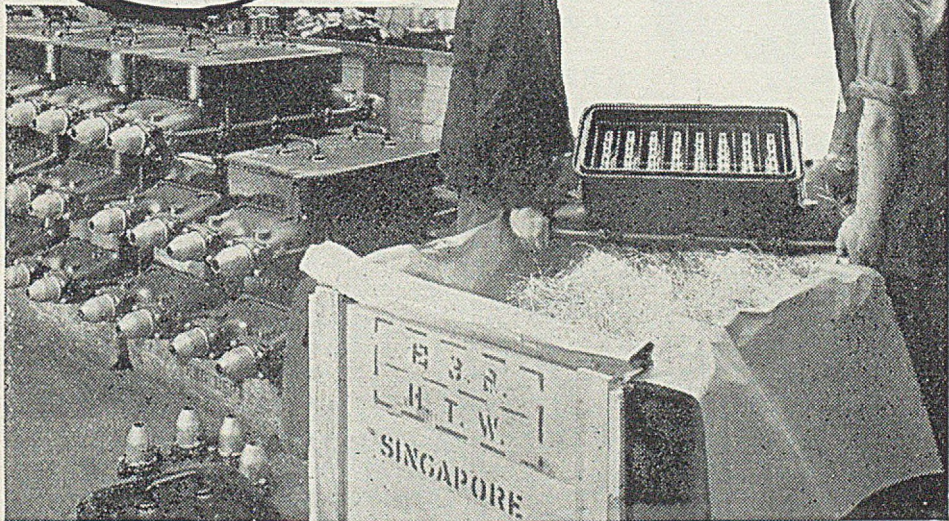
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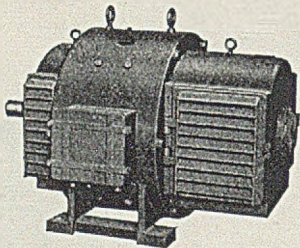


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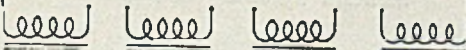
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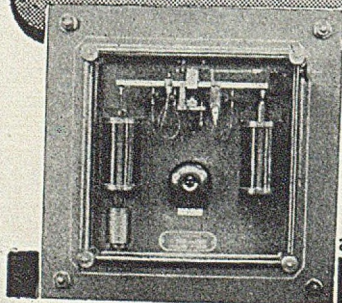
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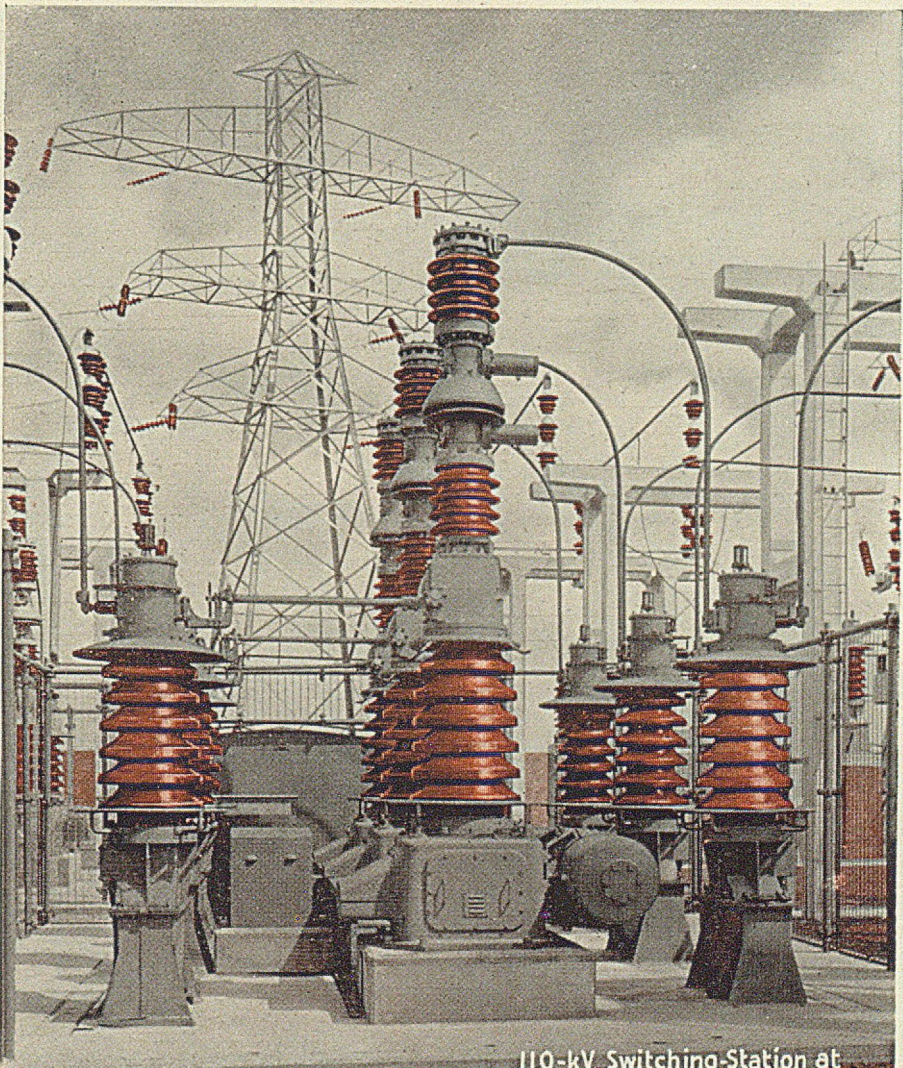


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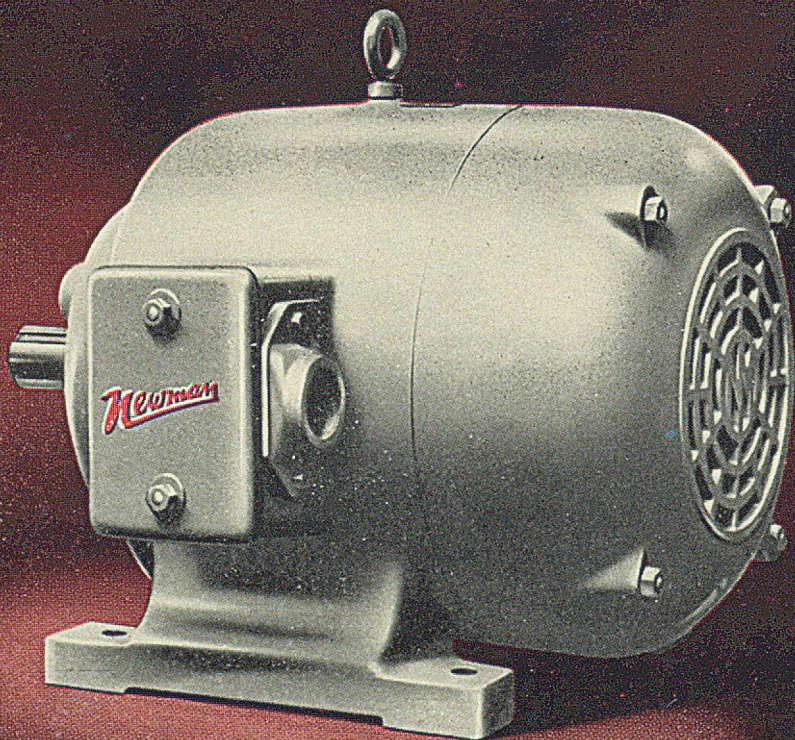
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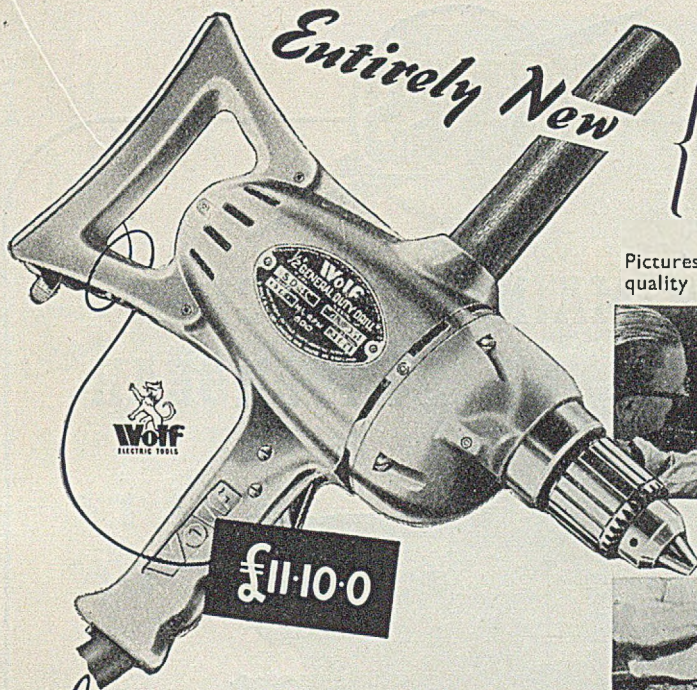
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*Pioneers in the Universal Application of Totally Enclosed Motors*

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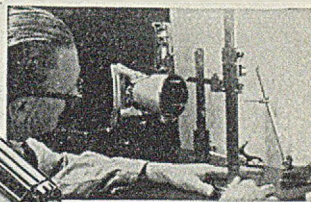




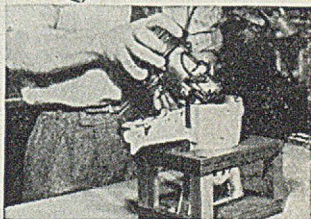
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Fixture provides maximum component protection.

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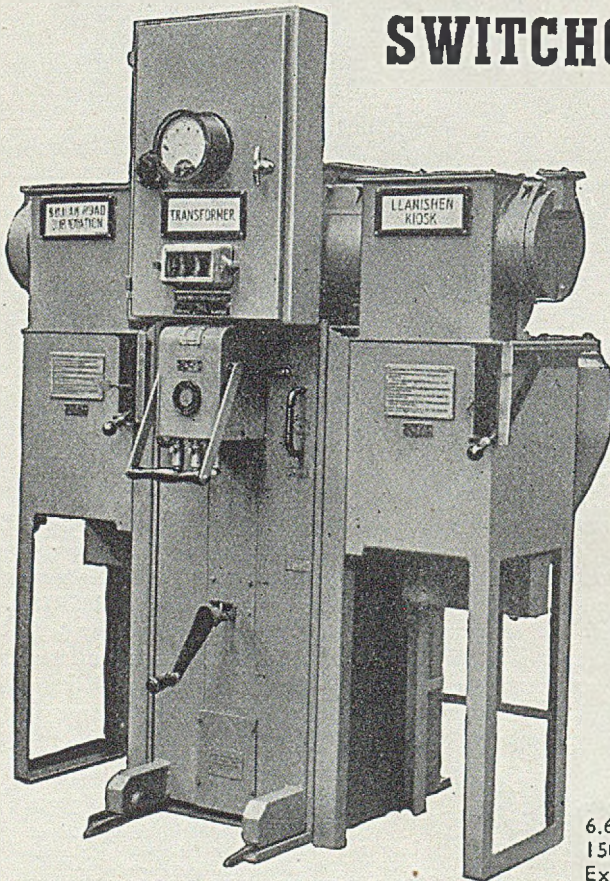
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6.6 or 11kV, 400 amp  
150 or 250 MVA. Fully  
Extensible.

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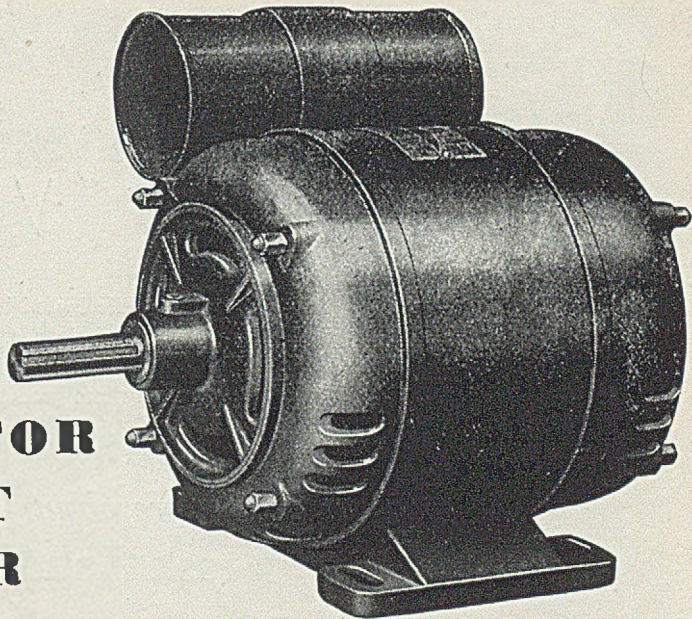
**SOUTH WALES SWITCHGEAR LTD. BLACKWOOD MON.**



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NEW



**CAPACITOR  
START  
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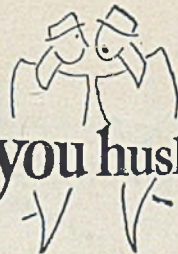
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Ⓢ SWF. 1



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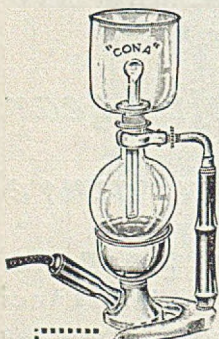
*If you want to know more about 'ASHLAM'*  
ask Ashdowns

ASHDOWNS LIMITED, ECCLESTON WORKS, ST. HELENS, LANCS. Phone: St. Helens 3206  
"ASHLAM" is the registered trade mark of Ashdowns Ltd. Ashdowns is a subsidiary of Pilkington Brothers Ltd.

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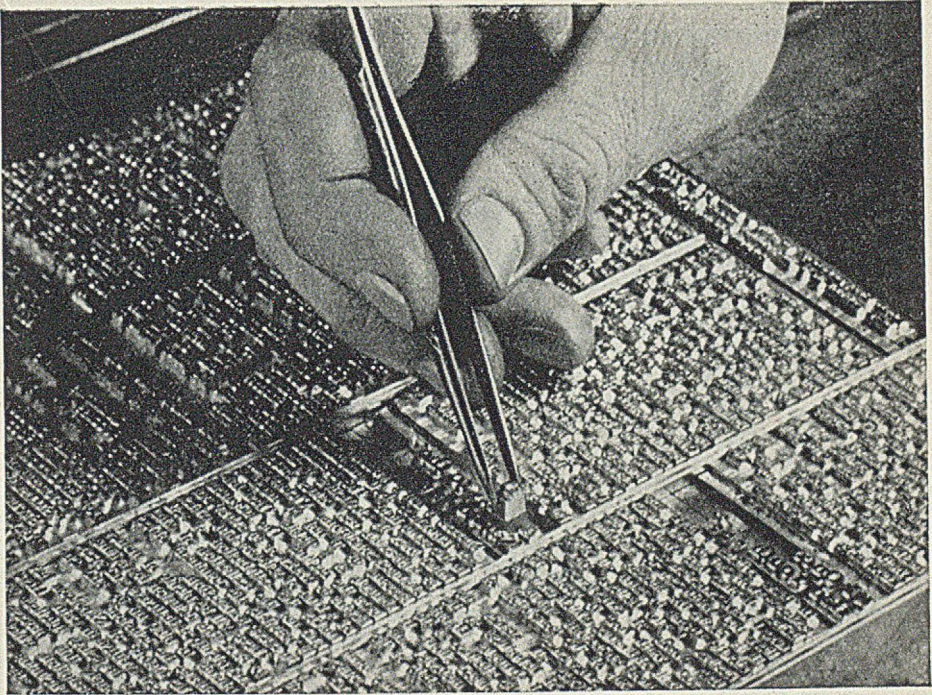
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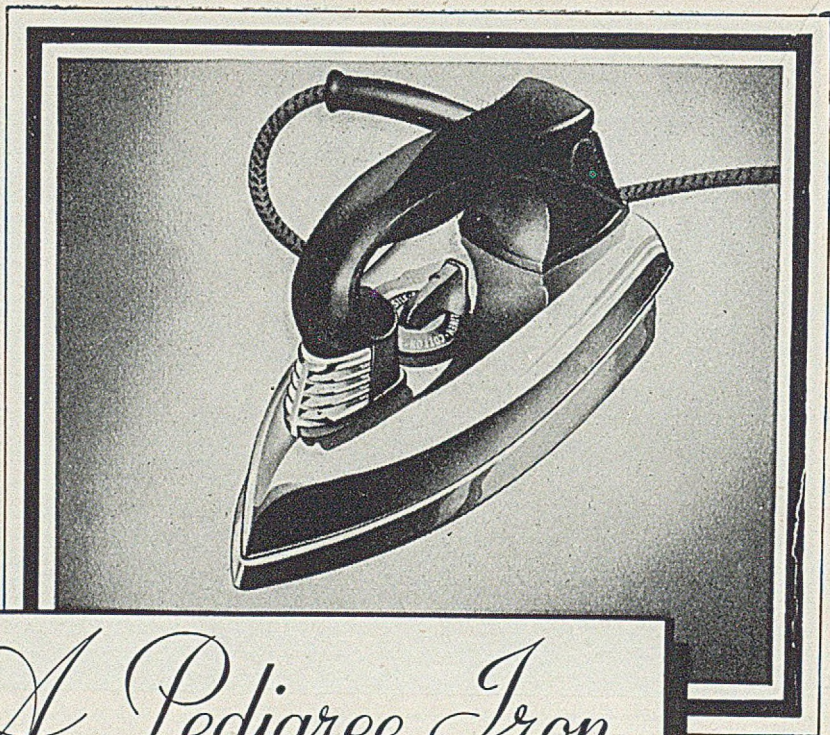
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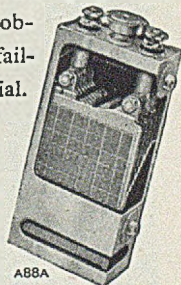




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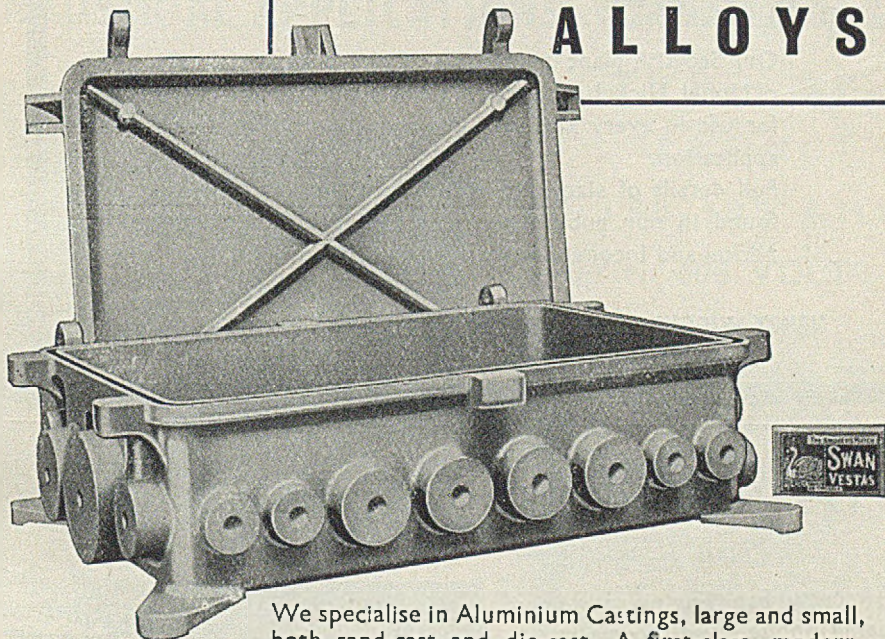
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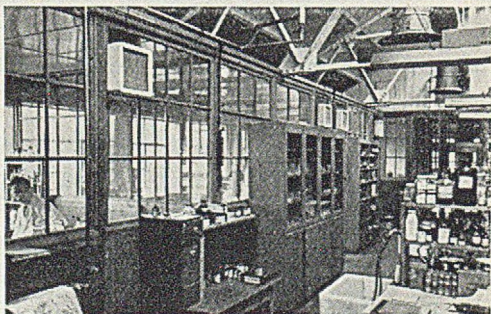
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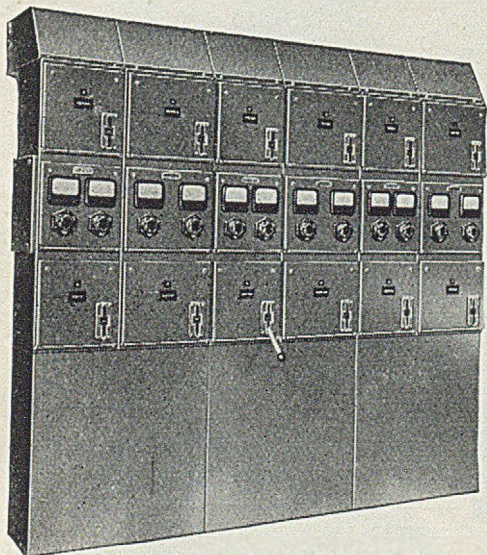
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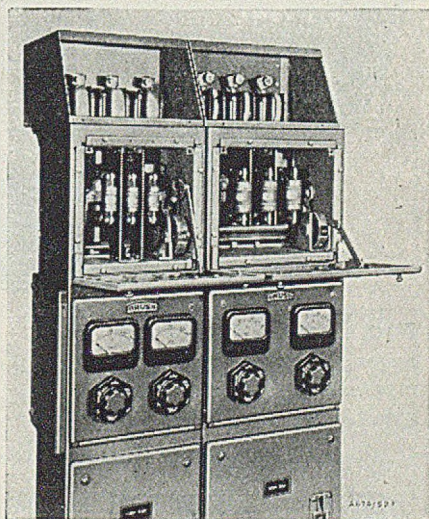
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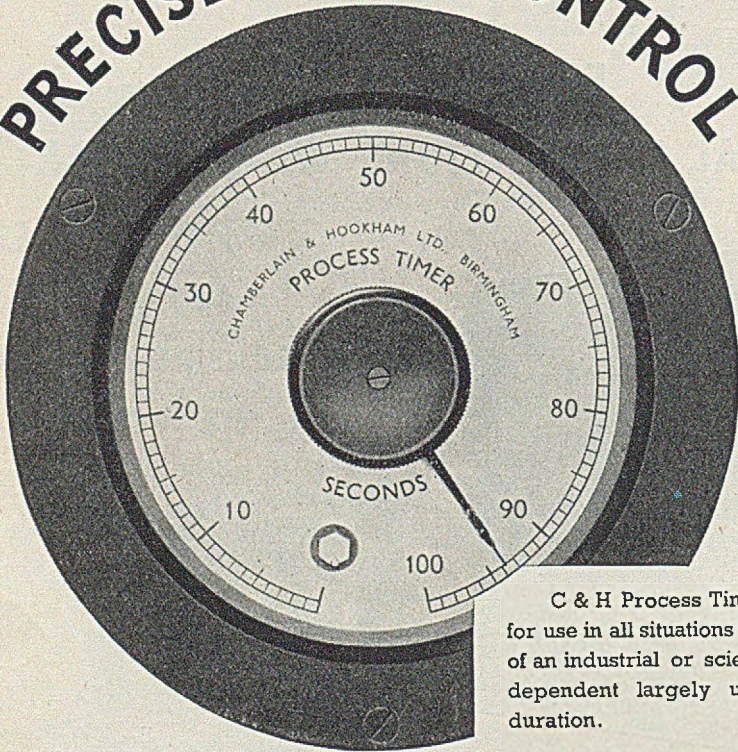
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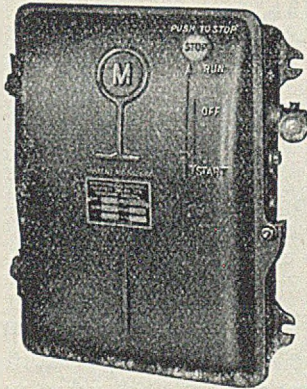
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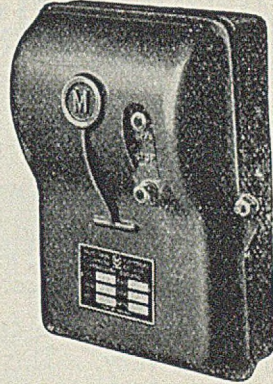
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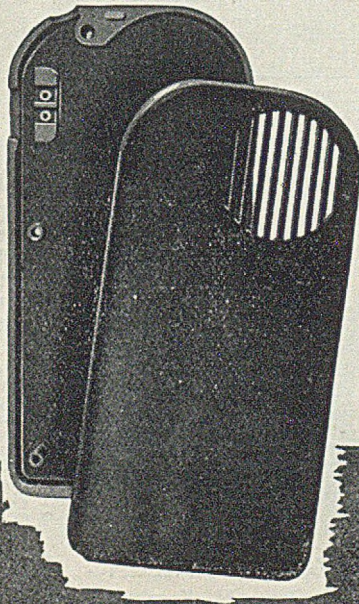
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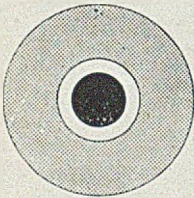
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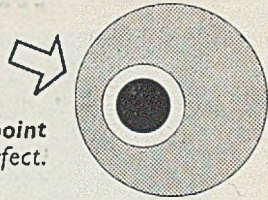
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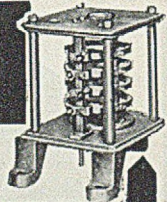
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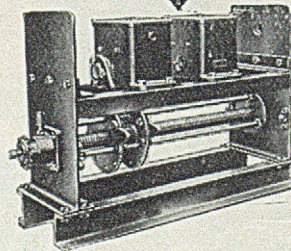
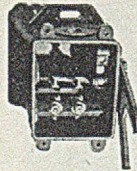
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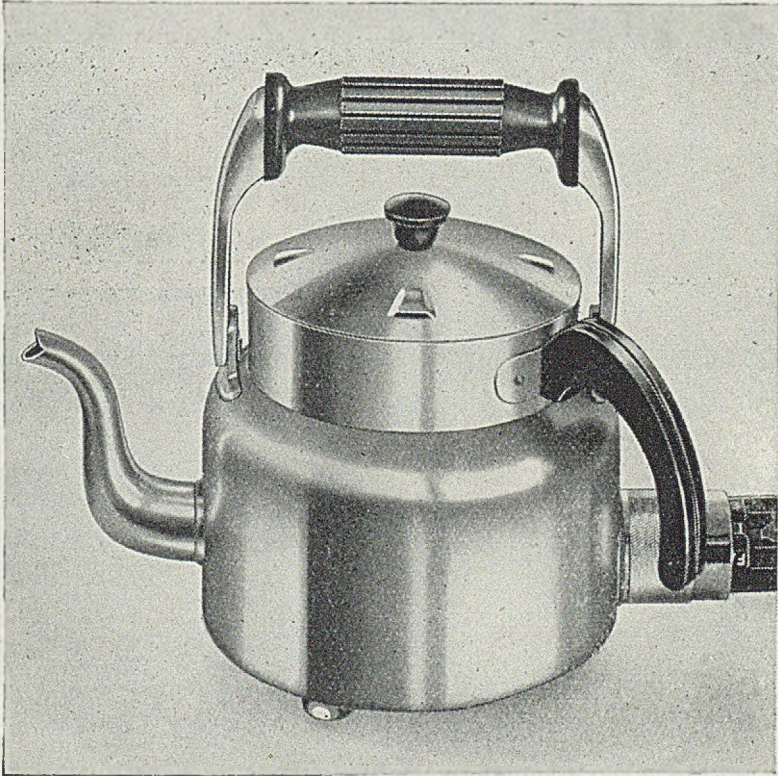
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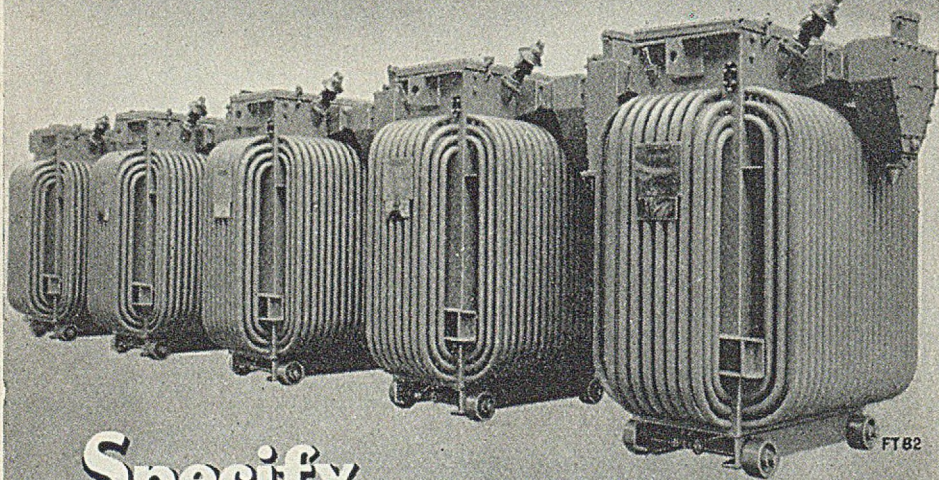
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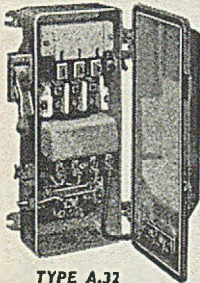
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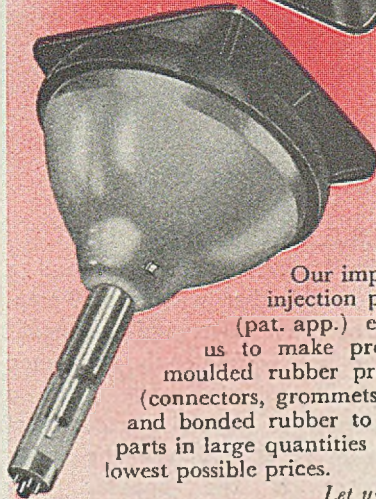
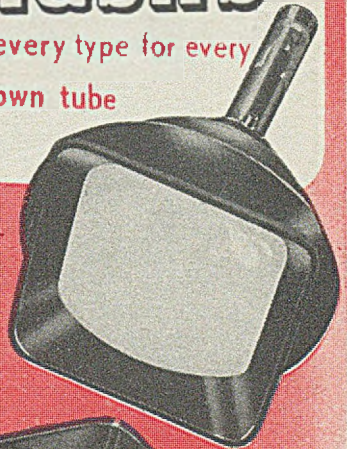
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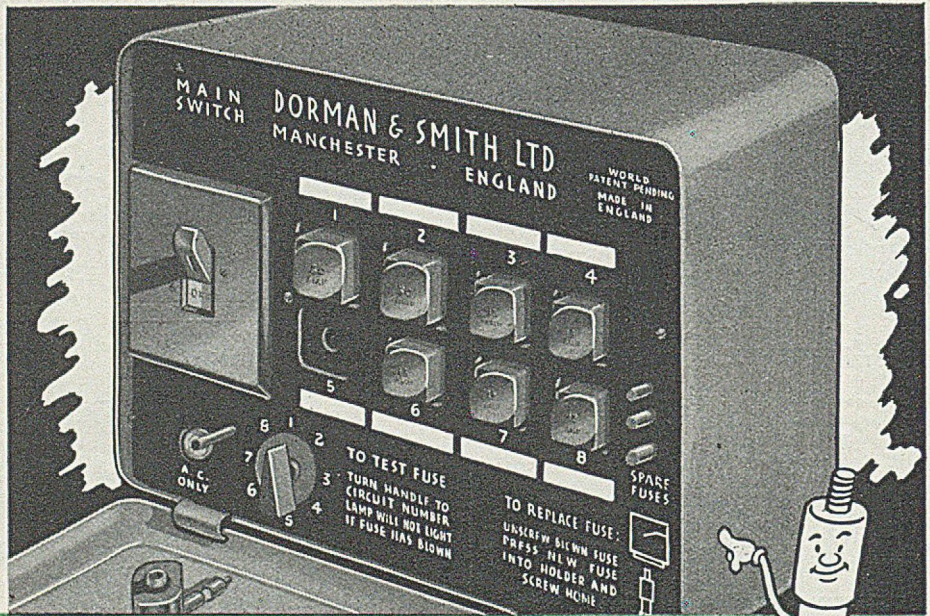
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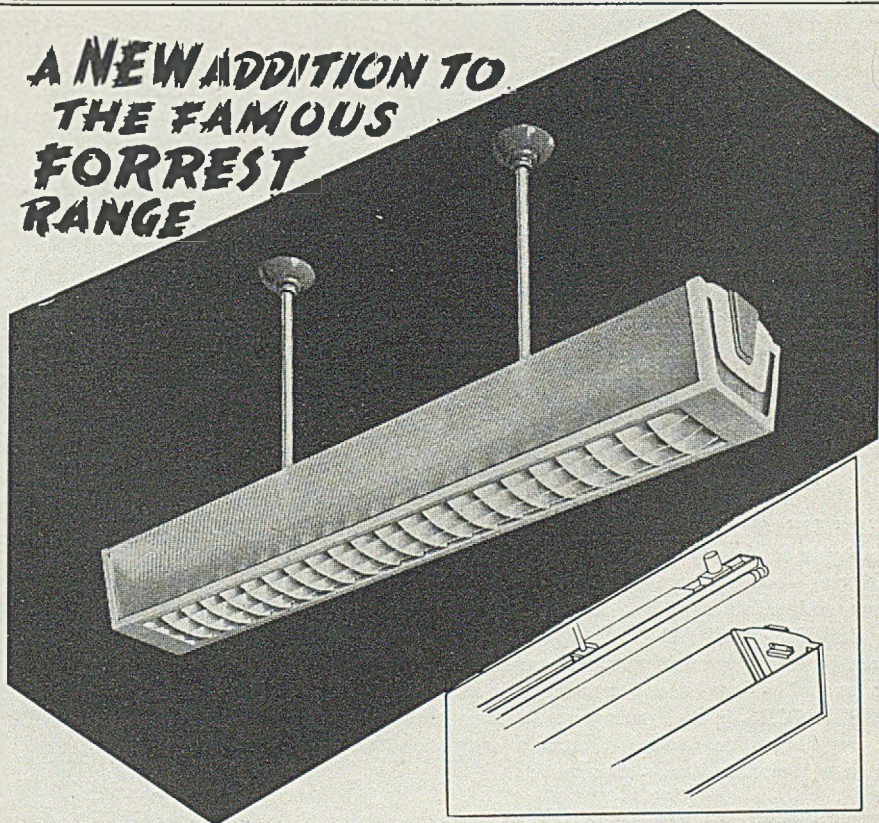
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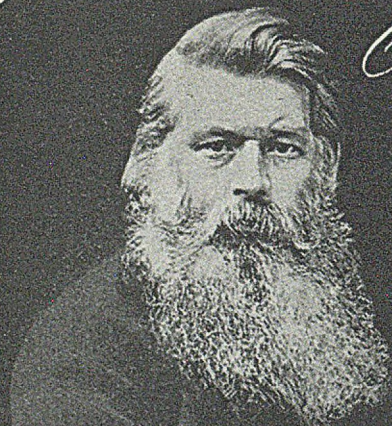
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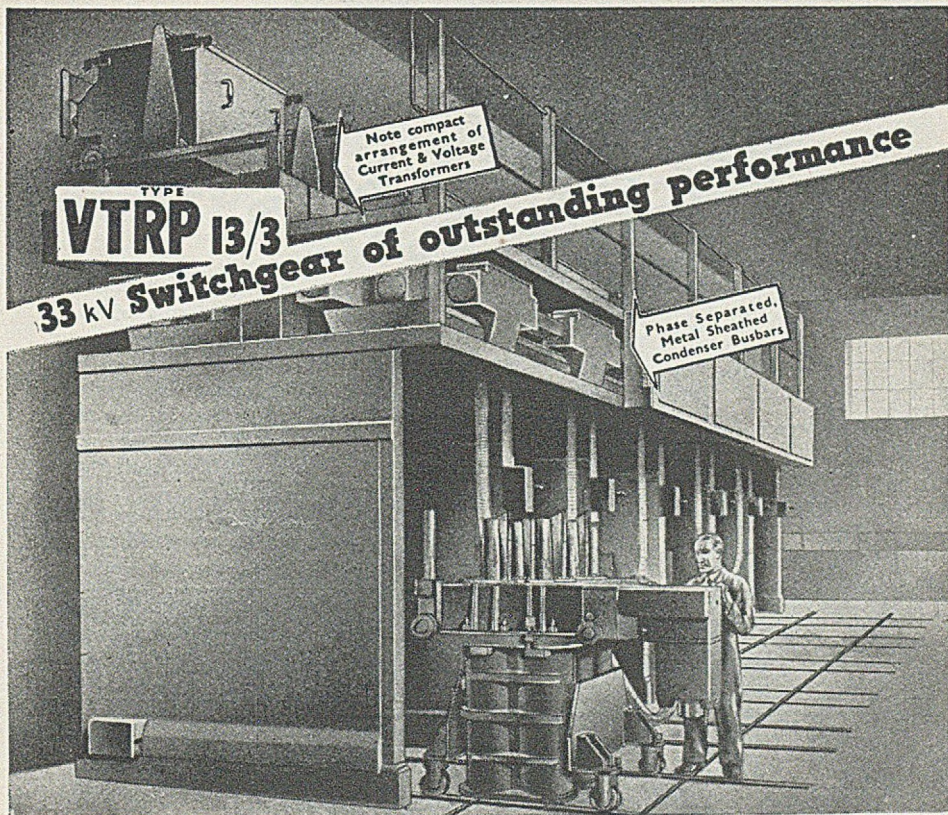
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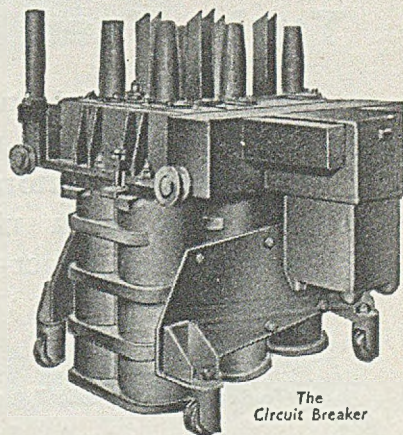




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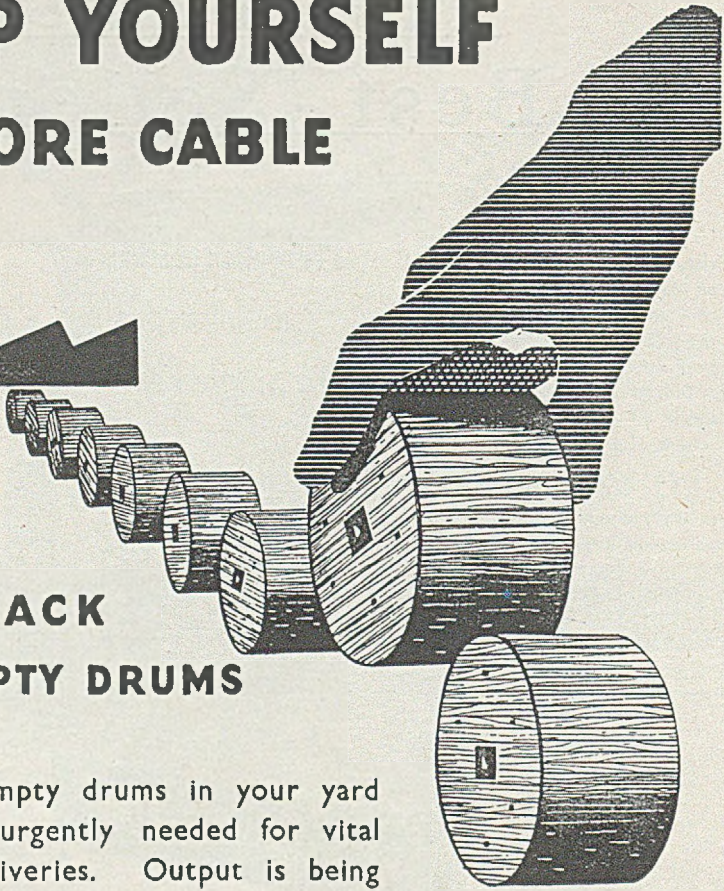
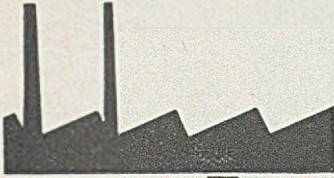
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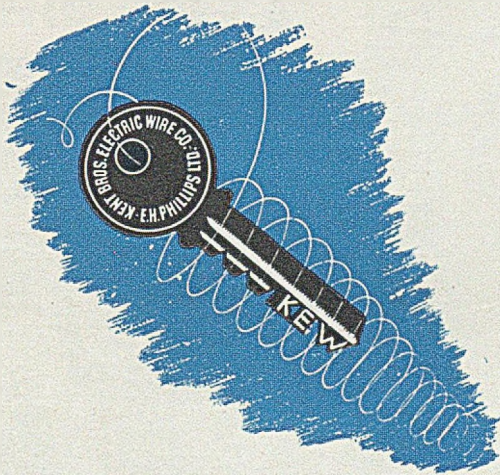


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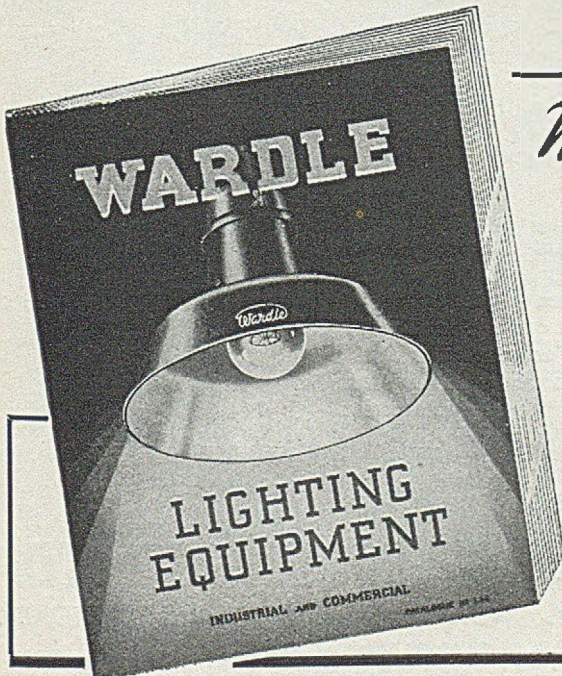
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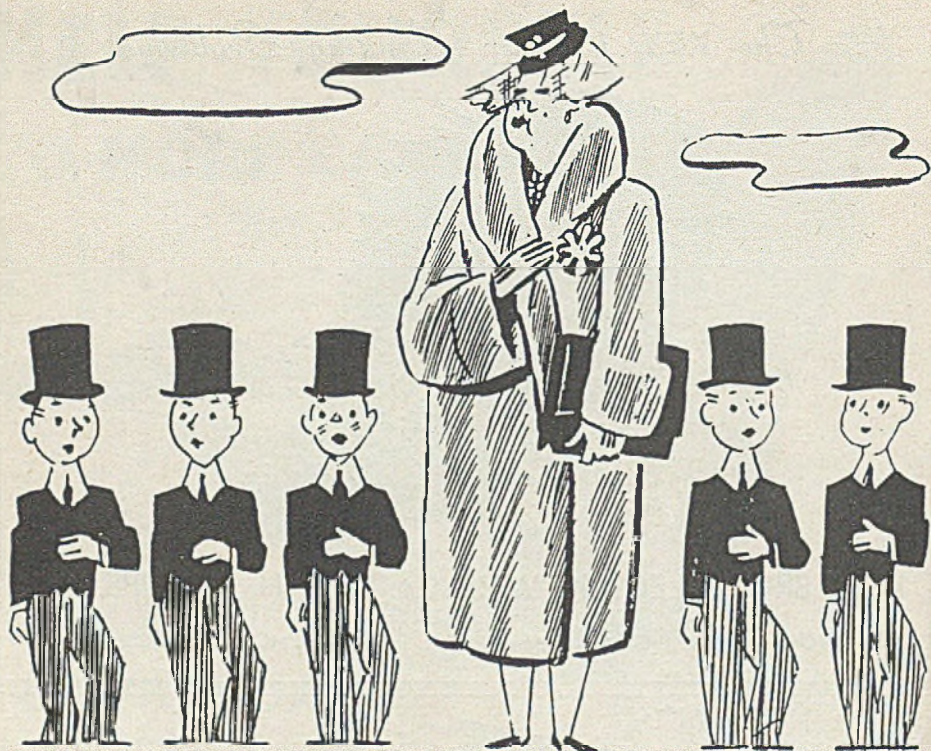
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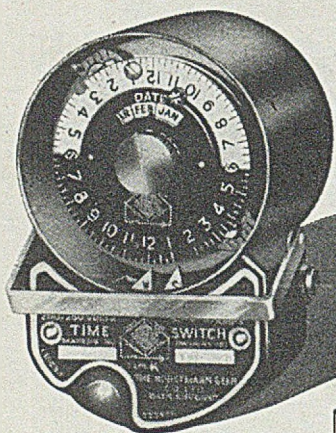
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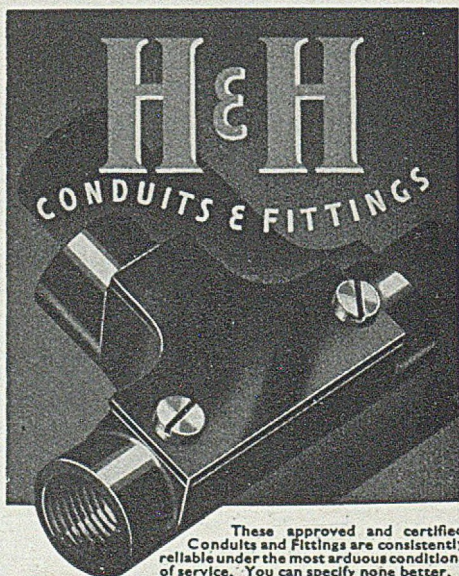
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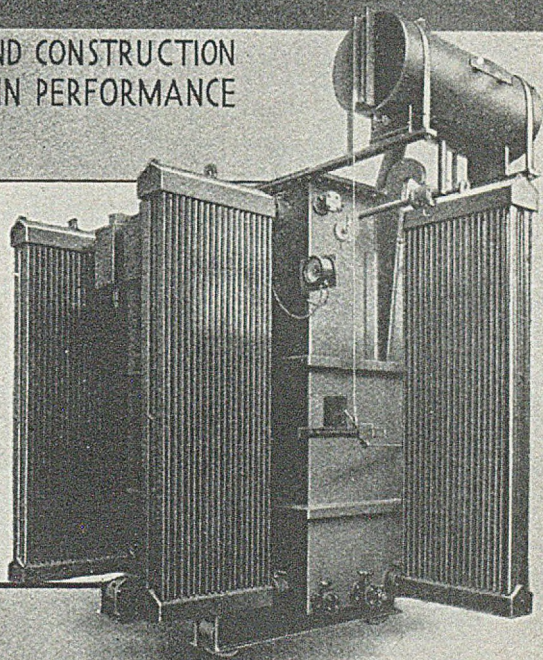


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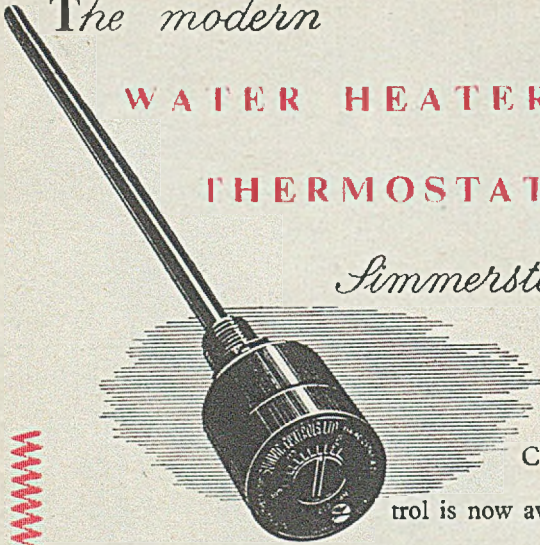
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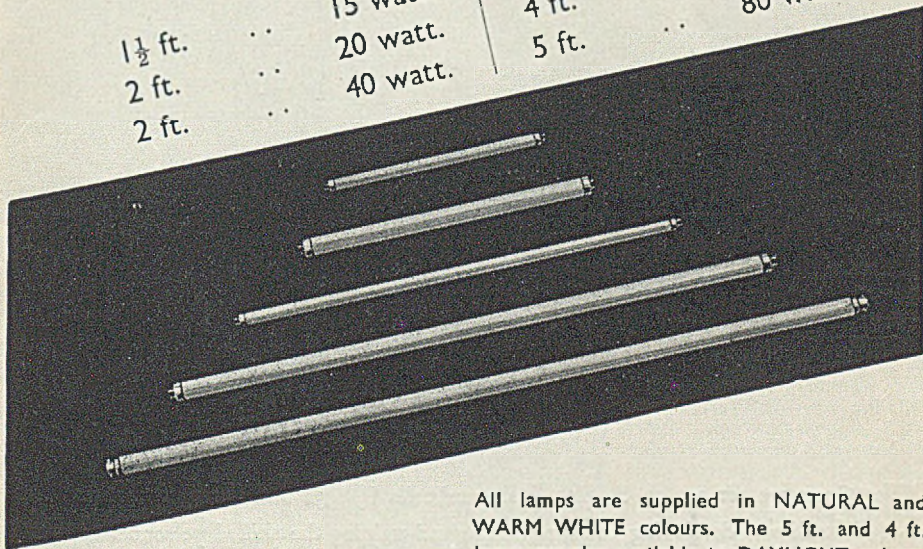


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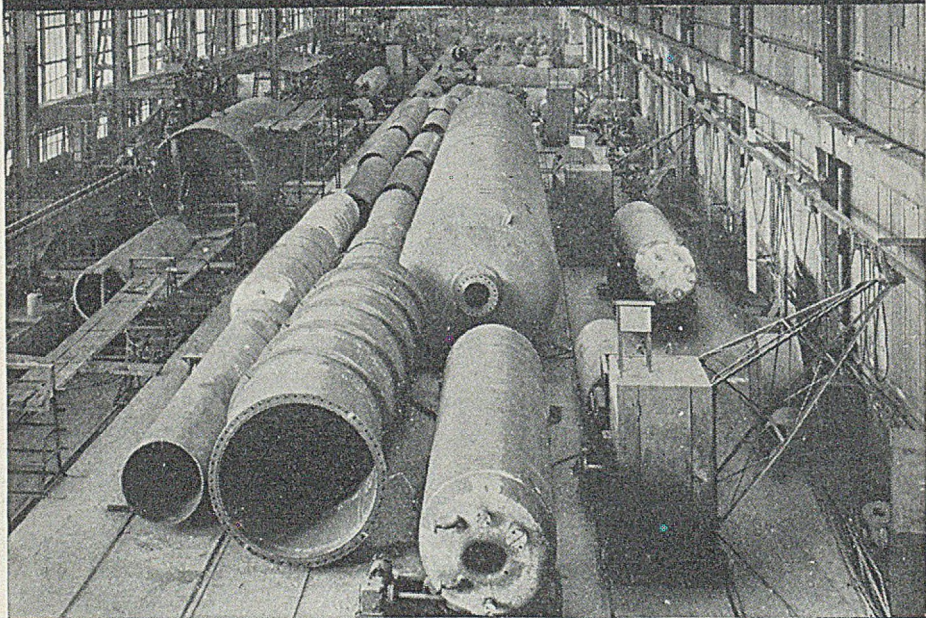
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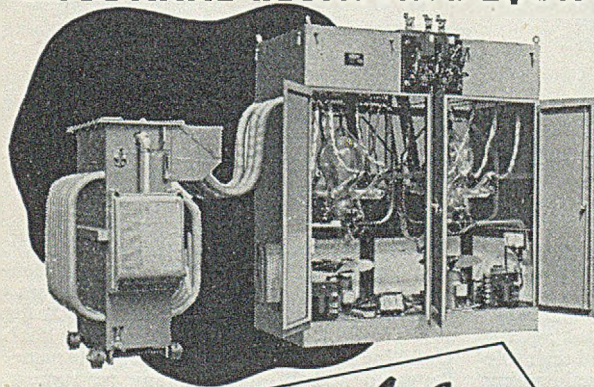
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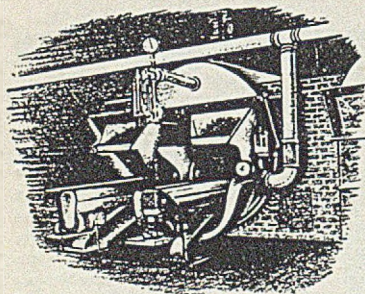
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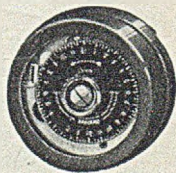
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# ELECTRICAL REVIEW

THE OLDEST  
ELECTRICAL PAPER

ESTABLISHED  
1872

Vol. CXLIV. No. 3716

11th FEBRUARY, 1949

## Contractors and Nationalization

### A CASE FOR ARBITRATION

**E**LECTRICAL contractors are becoming very anxious about the outlook now that some of the Electricity Boards have announced their determination to go into the installation business in a big way. Their doubts have not been dispelled by the speeches at the recent annual dinner of the E.C.A. Mr. J. G. Briggs, the president, hinted that in spite of Lord Citrine's assurance that any competition of the Boards with contractors would be fair, some of the Boards were adopting inequitable methods. Mr. F. J. Erroll referred to the "fight" which lay ahead, but Mr. H. Nimmo, chairman of the Southern Electricity Board, spoke of the imminence of an agreement between the Boards and the E.C.A.

It certainly seems to be Lord Citrine's desire that the private electrical contractor should continue to exist but is there a similar desire on the part of the Boards? We know that the Chairman of the B.E.A. is most anxious that the Electricity Boards should have the fullest possible autonomy and he would be reluctant to impose any obligation upon them in this matter.

#### Existing Installation Departments

It is too much to expect the Boards to close down the installation departments which they inherited from their predecessors, but need they expand them with a view to taking over the bulk of the installation work in their areas or operate them on an uneconomical basis, recouping themselves from electricity revenue?

There is really only one aspect from

which the general subject should be viewed—the public's. Can the public secure to-day sound installation work at reasonable prices from the private electrical contractor? The answer will vary from district to district, but it may fairly be claimed by the E.C.A. that where it has a substantial membership (whose work is guaranteed) the public is well served and there have been few complaints. The E.C.A. branches cover the country pretty thoroughly and there are very few towns in which a satisfactory contracting service is not available.

#### Unnecessary Duplication

Generally speaking there seems to be little justification for the establishment of a parallel system to further divide up such work as may be available. And here we may mention parenthetically the personal service which we do not believe the Boards will easily achieve. If, on the other hand, existing arrangements are inadequate the Boards will be compelled in their own interests to step in and apply a remedy.

The problem then posed is: who shall judge whether the public is being properly served or not? It might be thought that the Boards and the E.C.A. in co-operation could come to a decision but in practice it is likely that this would lead to a deadlock with each side adhering rigidly to its preconceived ideas.

Of course, the public, which pays the piper in any event, should be allowed to call the tune but who shall act for the public? Although among the people's



representatives, the local authorities, some resentment still exists at the loss of their electricity undertakings to the B.E.A. and Boards it is likely that in the long run their bias will be in favour of "authority" and against the private contractor. If it were not for this the Consultative Councils might be competent to decide but the local-authority element in their composition is very strong.

The Boards and the E.C.A. should be prepared to accept the rulings of an independent tribunal and it should be possible to establish one. Such a body would have to be composed of men with knowledge of the electrical industry. Are there not in the industry and profession men with these qualifications whose sympathies lie neither with electricity supply authorities nor contractors?

In this consideration we have referred particularly to the E.C.A. but we recognize that there are many others (registered or otherwise) in the electrical installation business. All of them want to know whether they have any future and they should be told immediately.

## FUTURE OF GAS

AN argument in favour of retaining the gas industry is that its works are well equipped for providing coke and by-products. For disposing of the gas, its use as fuel in electric power stations has been suggested, but (apart from the demand this would create for valuable coking coal with a loss of the main market for the low grades burned for generating electricity) the double conversion of the coal would clearly be uneconomic. The suggestion made by Mr. P. Schiller (see page 232) to use the gas in synthesizing oil is in an altogether different category and appears to us to warrant investigation. It certainly supports his plea that the whole question of comparative fuel economics should be examined on a strictly scientific basis.

## GERMAN COMPETITION

REFERENCE was made in our leading article to the resurgence of German competition as an adverse influence upon our export trade. This is a matter in which we find ourselves in a cleft stick. It is to our advantage to have a stable Germany as an im-

portant part of a settled Europe. At the same time we must maintain our exports and cannot tolerate competition based on unequal terms, partly financed by ourselves. The anxieties of British industries were expressed to Mr. Harold Wilson, President of the Board of Trade, last week by a deputation which included Sir Harry Railing, chairman of the General Electric Co., Ltd., and other employers as well as trade unionists. Mr. Wilson promised to make an early statement on the subject in the House of Commons.

## TRADE WITH CANADA

LAST week we drew attention to the increased importance to this country of the Canadian market. How to set about securing and maintaining a foothold in Canadian trade is the subject of the report, now available, of the Engineering Mission which visited Canada last year. From the electrical angle the possibilities, according to the Mission, are limitless and United Kingdom manufacturers are advised to take immediate steps to seize the opportunities which lie open. We are told that the electrical member of the Mission, Mr. D. Maxwell Buist (export director of B.E.A.M.A.) is preparing a more detailed study of the electrical trade aspects for the benefit of the industry. We hope to say more about this at an early date.

## A "PREMATURE" APPLICATION

THE outcry in Warwickshire against a proposal by the B.E.A. to build a power station at some future date in the Hill Wootton district has suddenly ceased, for the Authority, through its divisional controller, has withdrawn its application for consent to the use of the site under the Town and Country Planning Act, 1947. It appears from the withdrawal letter that in any case the station would not be wanted until 1955. In the meantime extensions of existing stations will meet the growing demand. Nevertheless, experience has shown that much time is wasted in the discussion of preliminaries with public authorities before work can proceed and, having this in mind, perhaps the Authority's application was not really so "premature" after all.



# Power System Earthing

## Use of External 3-phase Reactors to Form an Artificial Neutral

**I**N order to earth a three-phase system satisfactorily when a suitable point is not available, or when the system intake is from a delta winding either in a generator or transformer, it is necessary to provide some form of apparatus which has a low impedance to zero phase sequence currents. This statement, to those familiar with the

By **G. W. EDGLEY,\***  
M.I.E.E.

supplying a three-phase star/star transformer, the latter having its neutral

earthed and a line-to-neutral load applied to AN. The magnitude of the current flow, shown by arrows, cannot be obtained by dividing the phase voltage AN by the impedance of the load L because a transformer must be operated so that ampere-turns balance can be maintained between primary and secondary windings, which arrangement does not comply with the above requirement. The current flow in AN will tend to destroy the flux in this limb and phase voltage can only be maintained by equivalent ampere turns in the primary restoring the flux. When a current tries to flow in A, N<sub>1</sub>, its only path to the generator is through N<sub>1</sub>, C<sub>1</sub>, and N<sub>1</sub>, B<sub>1</sub>, in parallel, but the impedance of these two windings is high because there are no secondary "bucking" ampere turns.

Thus the maximum current that can flow in A, N<sub>1</sub> is small and consequently only a small current can flow in AN without reducing the flux and the voltage in this phase. In effect L has changed the characteristics of limb A, N<sub>1</sub>, from a high impedance to a very low one and Fig. 1b shows the system conditions at a stage in this transition. The system has become

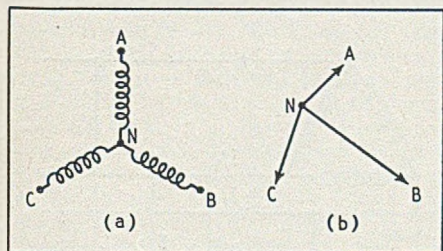


Fig. 1

theory of symmetrical components, will convey much more than the uninitiated may think, and an attempt is made in this article to explain in simple language what a satisfactory artificial neutral entails.

The first diagram (Fig. 1a) is so commonly used that it is sometimes forgotten that it is only a winding diagram, not necessarily the shape of the vector diagram of a three-phase system: for instance Fig. 1b may be the vector diagram of a system supplied by the star winding shown in Fig. 1a. The point N is at

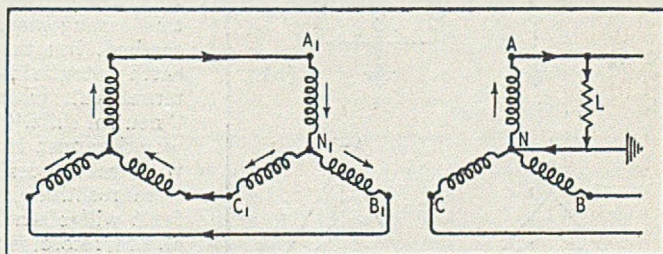


Fig. 2

earth potential, the voltages between lines are equal, but the phase voltages are unbalanced and are not displaced 120 deg. in time.

A system can easily get into this undesirable condition through unsatisfactory earthing arrangements, one way being shown in Fig. 2, representing a generator

distorted because there is no low impedance path for single-phase currents in the primary: it could easily be provided by solidly coupling the neutrals of the generator and transformer primary together by a conductor, thereby short-circuiting the high impedance paths N<sub>1</sub>

\* Manager, Transformer Sales Department, B.T.H. Co. Ltd



C<sub>1</sub> and N<sub>1</sub>, B<sub>1</sub> and allowing a primary current to provide balancing ampere turns to those created by the load on AN. A satisfactory alternative would be to earth both the generator and transformer primary star points; earthing only one of these is not a solution.

While the simple star connection (Fig. 2) may not give a satisfactory artificial neutral (because the secondary of the transformer in the arrangement shown can be considered as such), the problem will be considered from that point of view first and then ways will be discussed to see how the drawbacks can be overcome.

Fig. 3a shows a star point consisting of three equal resistance legs: the IR drop across each being equal, N can be earthed without any disturbance to the system, the potential of each line to earth then being  $0.58 \times$  line volts. If a fault appears on line A (shown by a resistance to earth) another resistance has been paralleled with resistance AN: the total resistance from A to N is now lower than that from B or C to N and not only will the currents flowing in the limbs alter

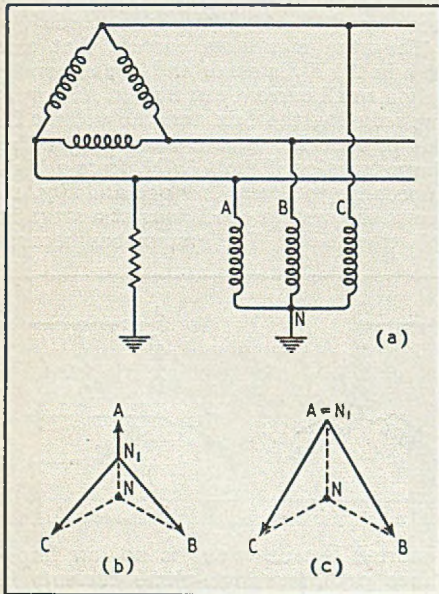


Fig. 3

but the IR drop across BN and CN will increase and that across AN be reduced. If N is solidly earthed, the potential of A to earth must fall and consequently

that of B and C rise. Fig. 3b shows this condition and when taken to its conclusion (a dead short on line A) the voltage diagram becomes as Fig. 3c.

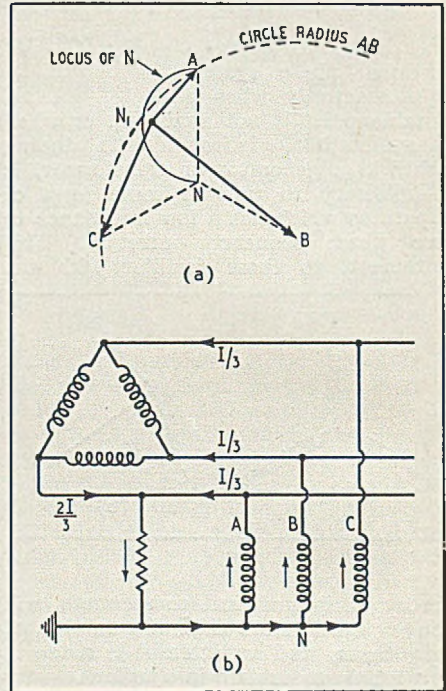


Fig. 4

Full line voltage now exists between BN and CN and the current in each of these limbs will be 1.73 times its value when the system was symmetrical. With this arrangement, the system has been earthed, but the point of the system at earth potential has been moved by an external fault, which movement is known as "neutral shift." Exactly the same thing would happen if the star point were made with reactances and the external fault were reactive. In practice the external fault will often be largely non-inductive and therefore, with a reactance star point, instead of the neutral moving along the phase A it will move in a circle because the relationship between R and X will alter in the transition from normal to "dead earth."

Fig. 4a shows the condition when  $X = R$  and the semi-circle shows the locus of neutral shift. (It is interesting to note that BN volts increase from phase volts

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to line volts, but a circle of radius AB cuts the semi-circle, rendering it possible with some combination of X and R to get a voltage higher than  $1.73 \times$  phase volts).

If the reactances were iron cored, as in transformer design, the effect of over-voltage on the windings might be serious since the exciting current is controlled by the flux densities in the cores and when they become saturated a small increase in voltage will produce very large increases in exciting currents.

Another way of looking at this problem is to consider the fault current flowing through the external circuit and back into the system through the three limbs in parallel, as Fig. 4b: the three currents in the limbs will be equal and in phase as regards time so a flux will be produced also as shown by the arrows. If the core were shell type, or if three single-phase reactors were used, a good magnetic circuit would be provided for this flux; but if a three-limbed core construction be employed the only return path for the flux is through the surrounding air or any extraneous iron. This is a high reluctance path for the flux caused by earth currents and a low reluctance path for normal three-phase conditions, i.e., high impedance for three-phase currents and low impedance for earth currents.

Carrying the argument still further, if some means could be devised to lower the impedance by "bucking" out fluxes caused by

ages in the auxiliary windings; these voltages are in phase and additive, and a current will flow in this auxiliary circuit, the resulting ampere turns "bucking" out the flux due to the flow of earth currents. On the other hand, assuming a balanced three-phase condition when, say, the instantaneous amperages in A, B and C are  $+0.866$ ,  $0$  and  $-0.866$  respectively, the voltages induced in the auxiliary winding are equal and opposite, so no current flows, and the high impedance to this condition is maintained; this is shown in Fig. 5b. An arrangement such as this is therefore quite suitable for use as an earthing reactor, it being none other than a star-delta transformer.

Just as in the case of a power transformer, there would be a reactance drop between star and delta windings (the flux caused by ampere turns of one winding would not completely link with the other winding), and as the current increases so the flux neutralization diminishes and

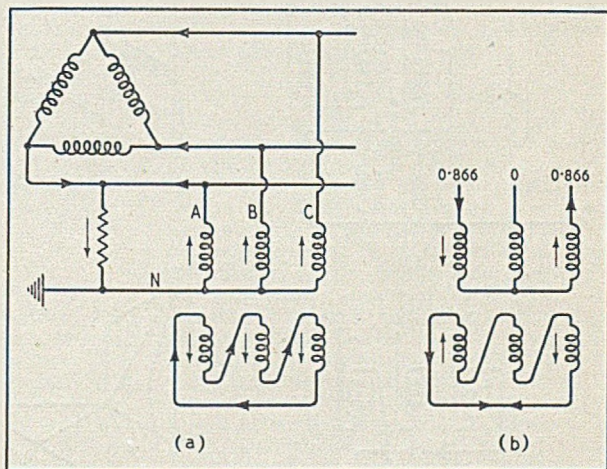


Fig. 5

earth currents, while not affecting the normal flux conditions, a very low impedance to earth fault conditions could be obtained and large fault currents could flow without causing appreciable neutral shift and thus affecting the symmetry of the system, neglecting the system's own impedance to this condition.

If an auxiliary winding is placed on each limb and these three windings are connected in series, as in Fig. 5a, the ampere turns due to the earth currents will create fluxes which will induce volt-

neutral shift and system distortion take place.

Fig. 6a is an alternative arrangement generally more economical to build than the star-delta connected reactor. At first sight it looks a mixture of the connections in Fig. 5a and that is, in effect, what it is. Fig. 6b is the winding diagram, referred to as the "zig-zag" or "interconnected star" connection. In construction it is one star winding in two equal parts, one connected in star with the "open" end connected to the half



winding of the next phase in reverse and then on to the line.

The arrangement works in exactly the same way as the double wound star-delta connection, as shown by the arrows on Fig. 6a, while Fig. 6c shows that the high impedance path is maintained for balanced conditions because the normal flux paths are also maintained. Again, there will be reactive drop between the two half windings on each limb, and as the current rises so the impedance drop will rise, causing neutral shift and system distortion, Fig. 6d showing the ultimate condition of a dead short on phase A.

The economy of the zig-zag connection is that it only requires 15 per cent more

of the star arrangement, and used to provide useful load, such as the "house services" of a substation, but the zig-zag can also be provided with an auxiliary winding to do the same thing and will probably still be more economical.

An earthing device is usually installed on a system to enable earth faults to be detected and cleared as quickly as possible. While it must always be ready to function in this emergency the duration of the fault conditions will be exceedingly short compared with the time the system is functioning normally. It is, therefore, usual to rate an earthing reactor on a 30-seconds basis, which is assumed to give ample margin for the protective devices

to operate. Moreover, there is no necessity for very large currents to flow on a fault, and they can be kept down to a figure which ensures positive tripping by keeping the impedance of the reactor low and inserting an external resistance in the earth circuit so that a maximum current of about full

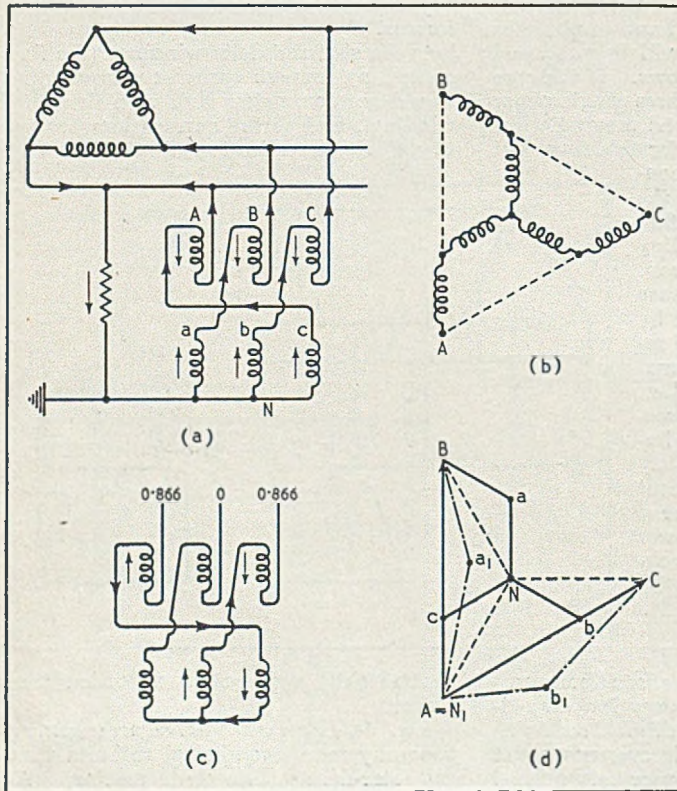


Fig. 6

total turns than a single star winding for the same voltage (the vector addition of  $N_a$  and  $aB$  in Fig. 6b giving the voltage  $BN$  from line to neutral), while a single star winding requires another complete winding. It may be said that a low voltage could be chosen for the delta winding

load of the line can flow on a dead short. This means the neutral shift will be definitely controlled.

The requirements of a satisfactory earthing equipment are therefore (a) high impedance for line-to-line voltages and a capacity to carry the resulting currents continuously, (b) low impedance to earth currents definitely controlled by suitable external resistance and capable of carrying these currents for a short period until the system can be "cleared."

No mention has been made of system troubles due to third harmonics; if the



third harmonic curve is drawn for each of three sine waves spaced 120 deg. apart it will not show any displacement of the third harmonic curves, i.e., any fluxes caused by these harmonics will be similar to the flux distribution caused by an earth fault already described. A satisfactory earthing device will therefore tend to eliminate troubles due to these harmonics.

Referring back to the opening statement and also to Fig. 2a, it appears that a star-star connected transformer is a useful arrangement in that it provides a suitable point for an earth connection on

either primary or secondary side, but it has a high impedance to zero phase sequence currents. It is, however, a simple matter to overcome this disadvantage by providing a closed winding which, if it has a low reactive drop to both windings, will allow these currents to flow. Finally, although it has nothing to do with "artificial neutrals," it may be appreciated from what has been said that the star-delta three-limbed core type transformer's popularity is no mere chance. It is a most satisfactory general purpose transformer for a number of very good reasons.

## I.E.E. South Midland Centre Dinner

### ACCOMPLISHMENTS IN RESEARCH

THERE was a large attendance at the annual dinner of the South Midland Centre of the Institution of Electrical Engineers at the Grand Hotel, Birmingham, on 4th February. Dr. W. G. Thompson (chairman, South Midland Centre) presided and proposed the toast of "The City of Birmingham." Responding, the Lord Mayor, Ald. J. C. Burman, said that great electrical industries had been housed in the city, bringing with them and producing very skilled craftsmen. To industry generally the electrical engineers had brought many new methods of the highest value. Perhaps one of the greatest achievements of electricity was the aid it had provided in the homes of the people.

### British Achievements

Sir Alexander Ramsay, president, Engineering and Allied Employers' National Federation, proposing the toast of "The Institution of Electrical Engineers," said that what had been done by the British people redounded to the credit of the country as a whole. When the war was over and people could talk, Americans were astonished by what had been accomplished in research here. He hoped that in the development of the new State machinery men would be allowed to express their personality and initiative and not be subdued by central, or any other, domination. This was essential to maintain the will and the spirit to work. Research was important in any industry, but perhaps even more important to-day would be research in international trade relationships. One of the things retarding the economic recovery of this country and the rest of the world was the great dollar issue. If the world was to be got back again to a stable foundation, the dollar countries might consider giving

us a chance in the interest of trade generally. Continuing, Sir Alexander said that the President of the I.E.E. had had a great deal to do with the shaping of the Scottish hydro-electric plan. They could look forward to the time when the scheme would make a great contribution to supplying power for industry.

### Service to the Public

Responding, Mr. T. G. Haldane said Birmingham was a great city in the history of the Institution. It produced men who contributed greatly to the Institution's status, knowledge and renown. He took part in Birmingham in the standardization of frequency, the value of which had been established. The Institution served the public in many ways. At present it was greatly concerned with the educational attainment of technicians—men who did not aspire to professional status, but were most valuable in and to the industry. It was significant that the increasing importance and recognition of the Institution had gone hand in hand with public duties. In the overseas and international field the Institution was doing a great deal. Those activities had been discussed with representatives of the Dominions and of the United States, and further discussions were to take place.

Mr. J. W. Donovan (senior vice-chairman) proposed the toast of "Guests and Kindred Societies." Responding, Sir Harry Railing said members of the Institution had a mission to fulfil; they had to stand foursquare to the world so that the nation's lead could be maintained. Sectional interests had to be sunk for the common good. Employers and employees had been taught to realize that maximum output at an economic price was essential.



# Views on the News

By REFLECTOR

WHERE can a power station be put to offend nobody? If it is proposed to erect it in or near a town there is an outcry against the probable suffocation or denigration of the population and property by grit and fumes. If a rural site is suggested objectors point to the destruction of amenities and malconversion of valuable agricultural land. Only the sea is left. Shall we yet see the creation of artificial islands some way off shore—far enough away to avoid the accusation of spoiling coastal amenities? But then I suppose there would be complaints from fishermen that their catches were being boiled. It really looks as though the B.E.A. will have to give up.

★ ★ ★

Another example of the extreme touchiness of the modern British workman is provided by the sixty electricians employed by the South Western Electricity Board who stopped work last week because a shop steward was suspended for swearing. The circumstances are a little obscure. According to the *Daily Telegraph* the suspension followed a remark he made about a workmate's moustache. Later he was reinstated and the men returned to work. If the shop steward was rude I can imagine the men approving his suspension, not striking against it. What did he actually say, I wonder?

★ ★ ★

Inspecting the various new houses now being completed on council estates one cannot help remarking on the high standard, quantitatively, of the electrical installations. It is nothing unusual for a living room nowadays to be provided with three power points, while a kitchen that has not a couple of lights and at least one power point in addition to the cooker and kettle points may be considered ill-equipped. Even so I doubt whether the occupants of the houses will find that their installations leave nothing to be desired. With the growing use of electrical appliances the need for even more outlets will undoubtedly reveal itself. My own experience is, I am sure, typical. When I had my house built ten years ago I thought I had "done myself

proud" in the matter of plug points. Since then, however, I have had eight more points fitted (including three subsidiary clock points) and I can think of at least three more places where additional outlets would be of immediate advantage.

★ ★ ★

There have been sufficient "pylon" fatalities among children to justify the special effort which the British Electricity Authorities is making to keep children away from the towers. A small poster has been prepared bearing an illustration of a tower and a three-sentence injunction to children not to climb towers or poles, not to fly kites or balloons near overhead lines and not to throw missiles at towers or wires. They are warned that if they do they are liable not only to cause a stoppage of supply but to be seriously injured or killed. It is proposed to distribute the poster, through the divisional controllers, to over 30,000 schools and they should have the desired effect.

★ ★ ★

A report has reached me of a new American tape recording system for music which, the manufacturers say, can reproduce 48 hours of recorded music in one hour. This seems to be a superb example of American hustle but what is the idea? Can it presage a speeding up of dance rhythm, or is it designed for accelerating production in factories through the "Music While You Work" loud speakers? Upon closer examination I find that the system is really intended for the mass-production of pre-recorded music.

★ ★ ★

The *Daily Mail*, which never fails to spot startling new inventions, reports that "watching a scrap of tinfoil glinting in the winter sunlight, 70-year-old white-bearded Sydney A. M. Rose, of Old Trafford, Manchester, got the idea for a radiant window. Now he has completed a model which consists of reflectors lodged between double glass. 'It's going to save millions of units of electricity,' he says, 'and banish daytime gloom.'"

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# Manufacturing Progress

## HOME AND EXPORT ORDERS FOR SWITCHGEAR

SWITCHGEAR erected during the past twelve months by Ferguson, Pailin, Ltd., has included nine VTRP.32 metalclad duplicate busbar units of 500 MVA at 33 kV rating at the Kingston power station, with control boards and ancillary equipment at Kingston, the first power station to be commissioned since vesting day. At Walsall, the first stage of which is nearing completion, two switchboards are being erected, totalling 31 units of VTRP.13/3 and VTLP.10 duplicate busbar metalclad types with control room equipment. One seven-unit 1,500 MVA and two nine-unit 750 MVA single busbar 33 kV boards will go to Portobello. One of the largest single industrial buyers is the Shell Refining Co. with 50 air-insulated BV.4 type 6,600V 150 MVA units.

An order for the Government of West Punjab hydro-electric project at Rasul includes an eight-panel 11kV 350 MVA duplicate busbar on-load selection switchboard for controlling generators, main transformers and feeders; also shipped or under construction for the same project are a large number of 11 kV single busbar switchboards and others for the Lyallpur steam station within the West Punjab scheme. Fourteen 33 kV 350 MVA outdoor circuit breakers are under construction for the Madras-Mettur interconnection scheme, while for the Bangalore receiving station (Government of Mysore) two switchboards of 4.4 kV 250 MVA comprise two 4,000 A incoming breakers and seventeen 800 A and 1,200 A metalclad outgoing feeders.

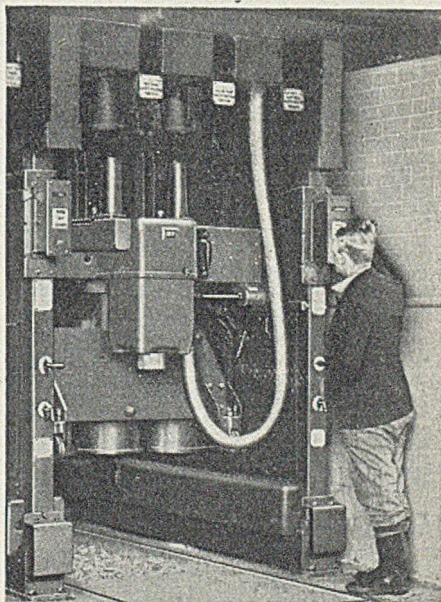
Under construction for the Government of Central Provinces and Berar are six 66 kV substations totalling 24 oil breakers with control boards and fifteen 11 kV air insulated boards. This scheme is approaching completion up to the 66 kV stage and when the 132 kV lines have been erected will represent a system comparable in area to that of Great Britain. For the Tata concern extensions have been completed. Thirteen 2 kV 500 MVA switchboards have porcelain insulation in air-filled chambers.

An order from South Africa for seventy-seven indoor circuit breakers for 40 kV 1,000 MVA service on the Rand has already been about half completed, while other boards are under construction for the observatory and Rossettenville substations of the Johannesburg Municipality. East London, Cape Province, is to receive single busbar air insulated gear, a repeat of a contract recently delivered.

Turning to Australia, an 11 kV 500 MVA solenoid-operated switchboard is under construction for the Victoria State Kiewa No. 4 power station; to Queensland State will go a number of 500 MVA breakers for outdoor service at 66 kV.

The Crown Colonies are represented by an order for the Kuala Lumpur distribution system, totalling 59 panels, while Malacca is to receive 23 panels.

Going to Brazil is a 24-panel arrangement for busbar selection by two indepen-



Type VTRP 13/3 oil breaker in isolated position at Walsall.

dent oil circuit breakers, suitable for operation on a 3,810 V three-phase 60 c/s system and in addition has an insulation level of 11 kV. The equipment has been delivered to the Sao Paulo Tramway, Light & Power Co., Ltd. In process of manufacture for the Hongkong system is a 17-panel low voltage substation switchboard of the double and single circuit back-to-back type.

**Tees-side Trolley-buses.** — Middlesbrough Town Council is supporting the plans of the Tees-side Railless Traction Board to operate trolley-buses in the Grangetown area to the south of the trunk road in view of the extensive housing developments now taking place.



## Hill Wootton Proposal

### B.E.A. Withdraws Application

AS we have reported, a suggestion that the British Electricity Authority was contemplating the erection of a power station at Hill Wootton, a scenic part of Warwickshire, aroused considerable opposition from local authorities in the vicinity. A protest meeting had been arranged for 21st February, but since then the matter has been settled by a letter addressed to the Clerk of the Warwickshire County Council by Mr. W. S. Burge, Controller of the East Midlands Division, B.E.A.

The letter refers to an application made in December for planning consent for a site at Hill Wootton, and explains that the B.E.A. is anxious to avoid the placing of power stations in localities where they may be harmful to the amenities of the countryside. Mr. Burge goes on to say:—

"You will, I am sure, appreciate that the British Electricity Authority have the statutory obligation to provide generating plant to meet the public demand for electricity and this necessitates planning for many years ahead. It is possible that we may be faced with the need for a new generating station in the South Warwickshire area in some years' time, but practicable extensions of existing stations will certainly avoid such necessity until after 1955. In the meantime we will proceed with the examination of all other practicable alternatives.

"In these circumstances, my application for planning consent dated 30th December, must be regarded as premature, and I shall be glad if you will return it and, at the same time, accept an assurance from me that we most certainly will do everything possible to avoid the necessity for constructing a power station in the neighbourhood of Hill Wootton."

## Station Superintendents

### Conferences at Buxton

ARRANGEMENTS have been made for a series of four conferences to be held at Haddon Hall Hydro, Buxton, during the next few weeks, when some 160 power station superintendents from the larger stations in the fourteen generating Divisions will assemble for discussions on subjects bearing upon their work and the broader activities of the industry.

Each of the meetings, which will be attended by about 40 superintendents, will last for five days. Topics for discussion, which will be introduced by members and chief officers of the British Electricity

Authority, will include the structure and economic aspects of the industry; wage negotiating machinery; trade unions; health, welfare and training facilities; safety and safety regulations; and the legal rights and obligations of employees. A number of divisional controllers and chief generation engineers will visit the conference and opportunities will be given for interchanging views on managerial problems, particularly in respect of human relations. It is also hoped to arrange visits to one of the larger engineering works in the neighbourhood.

The first meeting will open on Monday, 14th February, with an address by Lord Citrine, and on the following days the speakers will include Messrs. J. D. Peattie, J. O. E. Steele, Dr. P. Pringle, J. W. Thomas, E. J. Edgar, H. Midgley and E. W. Bussey. Other meetings will be held from 21st to 25th February; 28th February to 4th March; and 7th to 11th March.

## Technical Information

### Recent E.R.A. Publications

THREE new technical reports have just been published by the British Electrical and Allied Industries Research Association, 15, Savoy Street, London, W.C.2.

The first report, which is entitled "Synthetic Mica," reference D/T40, and is priced at 12s, deals with the process developed in Germany by the Siemens concern. The author, Dr. V. J. Middel, who was brought over from Germany by the Government under the Darwin Scheme, gives an account of the way in which synthetic mica is made and suggestions for building a small plant for research purposes.

The second report, "Short Time Phenomena in the Iron Welding Arc," section II, reference Z/T73, price 9s, by L. H. Orton, Ph.D., F.Inst.P., and J. C. Needham, B.Sc., sets out the results of a cathode-ray oscillographic analysis of certain aspects of the metal bridging and short-circuiting process in a d.c. welding arc. Short time phenomena are revealed in relation to this mechanism, the times involved being down to the order of  $10^{-5}$  sec.

In the third report, "Dielectric Constant and Polarization in Ionic Crystals," by B. Szigete, reference L/T203, price 6s, the difficulties often encountered in dielectric theory in attempts to establish polarizability and dielectric constant are discussed together with ways in which they may be overcome. A formula is also derived for the dielectric constant of ionic crystals which takes long range and short range interaction between atomic and electronic polarization separately into account.



# Two-Part Tariff Calculator

Determining Overall Cost to Consumer



WHATEVER unification of charges may result from nationalization, the two-part tariff, in one or more forms, is certain to remain, owing to the fundamental soundness of its conception.

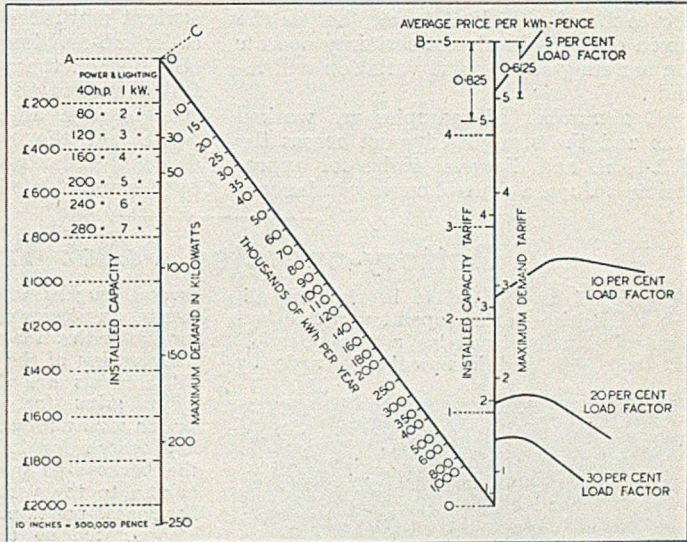
By G. W. LEE,  
A.M.I.E.E.

The remaining division of the diagonal can be constructed by joining suitable values on the outer scales and marking the intersection on the diagonal scale to make  $\frac{A}{C} = B$ .

As an alternative the divisions of this diminishing scale can be plotted from the

The prospective consumer or one who is considering a change of tariff is, however, chiefly interested in the resulting overall cost per kWh. This information is usually obtained from curves or schedules, the latter being probably the only strictly accurate method.

A quicker though less accurate assessment is often necessary during primary negotiations and, for this purpose, a nomogram is probably the most versatile device, as one diagram can be made to represent any number of types of two-part tariff. Such a diagram as here illustrated consists



Nomogram for calculating two-part tariff costs

of three straight lines forming a letter "N," the original having uprights 10in and the diagonal 12in long.

In their specialized form the scales can be developed at will. In the basic form both the upright lines are divided equally along their length, taking the point of junction with the diagonal as zero in each case. In the case here considered the left-hand scale "A" represented 50,000 pence per in, and the right-hand scale "B" a halfpenny per in. The exact centre of the diagonal scale "C" gives an annual consumption of 100,000 kWh. If a straight-edge is placed to pass through this point, the value of its intersection with scale "B" is a hundred-thousandth part of the value of its intersection of scale "A."

formula  $x = \frac{12a}{100+a}$ , where "x" is the distance from the left-hand end of the "c" scale measured along the scale in inches and "a" the value of kWh to be plotted in thousands.

For use as a two-part tariff calculator, the fixed charges for various conditions (installed load, maximum demand, floor area, etc.) are marked off against scale "A," while the corresponding pence-per-kWh scale against "B" is plotted with its zero point depressed below the point of intersection of scale "C" by the appropriate value of the kWh charge. All readings given on this scale, when a straight edge is made to join the fixed charge and annual kWh consumption,



will be made up of the fixed charge divided by the number of kWh consumed and added to the running charge per kWh, thus giving direct the actual overall kWh cost to the consumer. Two such displaced scales are shown, one for a kWh charge of 0.825d used in conjunction with an installed capacity tariff, the other for a kWh charge of 0.6185d, applicable to the maximum demand tariff.

The cost under a maximum demand tariff can sometimes be conveniently ascertained by reference to the probable demand and the load factor. If the fixed charge varied directly with the demand, the cost per kWh would remain constant for each value of load factor, but as the fixed charge will almost certainly operate on a sliding scale, some variation will result.

If a number of examples are worked out and the straight-edge set across the left-hand and diagonal scales for appropriate values, a control curve can be con-

structed on the right-hand side of the diagram to give the correct result for all intermediate values. Such a nest of control curves has been included in the illustration and, providing the straight-edge passes through the appropriate maximum demand and forms a tangent to the appropriate control curve, it will indicate the overall cost per kWh on the right-hand scale.

Additional information can be incorporated in the calculator, from which the annual cost of the supply can be readily obtained. The original basic scale on the right-hand upright is retained as a transfer scale and the scale on the left-hand upright marked with the full cash value of its sub-divisions. If the cost per kWh obtained on the appropriate scale is now transferred to the transfer scale and the straight-edge aligned to cut both this point and the kWh consumed on the diagonal scale, the total cost will be registered on the left-hand scale.

## Battery-operated Pallet Truck

**W**HAT is believed to be the first all-British battery-operated pedestrian-controlled pallet truck has a turning radius of only 48in and is now being made by

several lengths to suit individual requirements, an alternative model being available for use with stillages.

Operation of the vehicle is simple in that all controls are situated in the handle: twist grips for speed control, a finger switch giving forward or reverse and a small key switch for immobilization. To apply the brakes the operator merely raises the handle to the vertical or lowers it to the horizontal position. A safety device is also incorporated so that should the operator lose hold of the handle, it springs up to the vertical position, thus applying the brake and switching off the driving motor. Another feature of interest is that each vehicle is furnished with an automatically controlled built-in battery charger.



Lansing Bagnall battery-operated pallet truck.

Lansing Bagnall, Ltd., Worton Road, Isleworth, Middlesex. It has a maximum loading capacity of 4,500lb and weighs 10cwt, with forks 36in long and 27in wide. If so desired these can be supplied in

## Loans for Mexican Development

**A**N announcement by the International Bank, Washington, states that Mexican Government agencies have been granted two loans totalling \$34,100,000 to be used for electric power projects. One of these loans, \$10,000,000, will be passed on to the Mexican Light & Power Co., Ltd., for an expansion programme in the Mexico City area. The other (\$24,000,000) will be used by the Federal Electricity Commission to buy equipment for a number of steam and hydro-electric generating stations, transmission lines and distribution systems.



# Power Plant Position

## MINISTER'S REPLY TO MEMBERS' CRITICISM

**I**N the House of Commons last week Mr. A. M. F. Palmer said that a year ago he raised the question of the lack of sufficient progress in the generating station construction programme. He felt obliged once again to call the attention of the Minister to the matter. A year ago there was a gap of about 2,000 MW between the national demand and the capacity available to meet it. The staggering of working hours was estimated to reduce this gap to 1,000 MW, leaving a further 1,000 MW to be shed at times of maximum load if the weather was at all severe.

It was common ground that the difficulty was the result of the enforced neglect of new generating station construction during the war. Every country in Europe was meeting with the same trouble. Obviously, there was only one way of eliminating the gap, and that was by building a sufficient number of new power stations. The new generating capacity needed to fill the gap was over and above the extra capacity needed each year to cope with the normal increase of load. Since the siting and construction of power stations was a big and long job, the forward planning programme must aim at gradually reducing the gap and finally eliminating it.

### Failure to Reach Target

The sad story was that in 1948 they failed to get half way to the target of new capacity which it had been proposed to bring into service. For 1949 the Ministry had cut the estimate by about one-third. It should also be said that the 500 MW actually commissioned in 1948 was a gross figure, from which should be deducted plant taken out of service. Therefore, the net real increase in available generating capacity was just over 300 MW. If programmes were to be set in future, they should be set within the bounds of reality. He suggested that sober estimates for the next three or five years should be made, and that they should be based upon the actual manufacturing experience of the last year or so and related to what the country could afford in terms of labour, material and diversion from the export market.

Much of the plant now being used was out of date, and should be scrapped. They would be lucky to be free from load shedding by 1954, and even that assumed the annual commissioning of 1,500 MW of new plant on the average, or three times last year's reality. What was the reason for this failure to live up to expectation? It was true that there had been the perhaps unavoidable lack of co-ordination between the Central Electricity Board and the individual under-

takings; also there had been a very marked lack of steel and labour. The steel position had been greatly eased in recent months, but the labour position was still extremely difficult. He urged the Minister to look into this. The turnover of labour in the electrical plant manufacturing industries was far too high.

He wondered if the golden opportunities opened up by the 1947 Act were really being taken full advantage of. The door was open, but Lord Citrine and his worthy colleagues seemed to hesitate on the threshold. He believed that they were held back by an involved system of departmental checks and counter-checks left over from pre-nationalization days. Besides the Ministry of Fuel and Power, when any new power station had to be erected, the Ministries of Town and Country Planning, of Supply, of Works, and, of course, the Treasury, all came into it. It was not sound sense to have the Ministry of Works still looking after the civil engineering side and the Ministry of Supply looking after the manufacture of plant in the factory. Surely it would avoid such things as plant arriving on an unfinished site if the British Electricity Authority had full control of every aspect of new power station construction.

He believed in the complete electrification of this country; it was absolutely essential if we meant to be taken seriously as a modern, efficient power. The demand showed no sign at all of reaching saturation point, and therefore the Ministry of Fuel and Power and the Government should act as if they also believed in the complete electrification of the country. That meant, for the time being, the speedy construction of many new thermal power stations. The Severn Barrage scheme, atomic energy and all those things might come later.

### Widening Gap

Mr. Gaitskell, in reply, fully agreed with Mr. Palmer about the growth in demand for electricity which was probable, indeed, certain, for many years to come. In the calendar year 1938 the consumption of electricity in this country was 21,000 million kWh. In the calendar year 1948 the figure had precisely doubled. At the same time, peak demand, which was 6,700 MW in the winter of 1938-39 had increased to 10,020 MW in 1947-48, an increase of almost exactly 50 per cent. That in itself was not unsatisfactory, because it indicated that the load had become much more spread in the last ten years. However, the figure of 10,020 occurred in a mild winter and



was uninfluenced by load spreading. The estimate of peak demand for that year given in the Economic Survey of 1948 was 10,950 MW, and if that figure had been reached the increase in the 1938-39 demand would have been substantially above 50 per cent. At the same time, maximum capacity, which was 8,500 MW in 1938-39, had risen by 1947-48 in effect to only 9,380 MW. Thus the cause of the present gap was the increase of less than 1,000 MW in capacity against an increase of, perhaps, 4,000 MW in demand.

The position in regard to the reasons for the short-fall in commissioning in 1948 had not turned out to be quite so bad as had been thought. While it was true that the new commissioning in 1948 had been badly behind, the British Electricity Authority was able to keep in action a higher proportion of the plant than had been kept in action for some considerable time. The amount of plant taken out of service for repair and other reasons this winter was not 15 per cent, as they had expected, but only just over 11 per cent, and that 4 per cent improvement had made a very considerable difference to the whole situation. At the same time, of course, this year they had had not only very satisfactory methods of load spreading by industrial consumers, but also by commercial consumers as well. The net result of that was that they had had in fact rather less load shedding this winter than a year ago. The number of days on which load was shed this winter was very much the same as last winter—three or four days less, in fact—but the maximum amount shed this winter had never been more than 500 MW.

Turning to the future, he said, taking all things into account, he would expect, in 1949, a further growth of peak demand of something in the order of 700 to 800 MW. In reply to a question last December he had said that they hoped to get into commission something like 1,000 MW. It was true that when they had made allowances for deductions of the amount to be withdrawn for repairs, it did not look as if they would be able to do much more than balance the increase in the demand. The position next winter, therefore, given the same weather conditions, should be about the same as this winter, although it might be better if the British Electricity Authority could improve on the amount of plant out of service for repair even further. They hoped to begin to work off the deficit in the following year and contribute rather more to reducing the gap in 1951.

The British Electricity Authority would itself be taking over the progressing work in the next few months. The Ministries of Supply and Works would assist, as would his own department. But

they had to face the fact that the amount of new plant which they hoped to bring into commission in 1949 exceeded by at least one-third the highest figure ever achieved before the war and they would subsequently be going up to a figure which would be double the highest pre-war figure.

## Parliamentary News

### Utilities War Damage

THE War Damage (Public Utility Undertakings, etc.) Bill was read a second time in the House of Commons on 4th February. Mr. W. G. Hall, Financial Secretary to the Treasury, said that the payments to be made under the Bill would be about £91 million and the net charge on the Consolidated Fund would be about £62 million. The gross amount of the contributions to be paid would be 27½ per cent of the aggregate payments for damage suffered in each group, but the levy upon harbour undertakings would be only 10 per cent.

### Copper Stocks

Mr. Erroll asked the Minister of Supply what was the size of the present stocks of copper in Britain under his control; and if supplies to manufacturers would be assured at their present level during 1949.

Mr. G. Strauss said that the Ministry of Supply's stocks of virgin copper in the United Kingdom on 31st December last amounted to 98,000 tons. Contracts had been made to cover adequately consumers' estimated requirements for 1949.

### Export Guarantees

The Export Guarantees Bill was considered in Committee on Tuesday when an amendment by Mr. Eccles that a total sum in respect of which the Government could be given guarantees should be reduced from £100 million to £60 million was negatived. Mr. Harold Wilson (President of the Board of Trade) said that politics did not enter into our trade relations with Eastern Europe. We pursued a policy based on the test of economic advantage to this country.

The Committee stage of the Bill was concluded and on the third reading Mr. Wilson announced that the provisional January export figure was not only far and away the highest by value, but showed a big increase in volume over the 1938 level.

### Wireless Telegraphy Bill

On the second reading of the Wireless Telegraphy Bill in the House of Lords. Viscount Simon said the Government should consider whether the Bill should be given only a temporary period of operation. The Earl of Listowel said that he would consider the suggestion.



# Consultative Councils

## FURTHER INAUGURAL MEETINGS

ON Friday last the London Electricity Consultative Council held its first meeting under the chairmanship of Mr. I. J. Hayward, who explained the purposes and duties of the Council. He emphasized that it was the intention to deal with matters of policy and principles. Consumers should address their criticisms or complaints to the local office of the Electricity Board in the first instance. It was decided that the Council should hold periodical public meetings, the first to take place on 14th April.

At the first meeting of the Eastern Electricity Consultative Council on 28th January it was also decided that future meetings should be open to the public. The chair-

man as an "appeals committee," complaints having first been referred to the local or district offices of the Board. He looked forward to cultivating the happiest relations with the press as a means of ensuring that the public was kept well informed.

Mr. Perkins referred to the difficulties with which the electricity supply industry was faced. In this he was supported by Mr. W. S. Burge, divisional controller, East Midlands, who said that in the provision of new stations the main difficulty was not a technical one but the opposition of the public and local authorities to the erection of a new station anywhere. He hoped that the Council would be able to do something to place the matter in its true perspective.



At the inaugural meeting of the East Midlands Electricity Consultative Council. Seated (left to right): Mr. W. S. Burge (controller, East Midlands Division), Mr. J. Mould (deputy-chairman, East Midlands Board), Mr. C. R. King (chairman, East Midlands Board), Mr. L. L. Perkins (chairman, Consultative Council), Mrs. E. C. Groome (Earls Barton), Mr. K. King (vice-chairman of the Council) and Ald. A. C. Woodcock (Kettering). Other members of the Council are standing

man, Alderman W. J. Bennett, said that the Council would express its views fearlessly to the Electricity Board or the British Electricity Authority. It would deal with suggestions or complaints from all classes of consumers, but only after these complaints had first been referred to the Board's district officers.

The meeting was addressed by Mr. C. T. Melling, chairman of the Eastern Electricity Board, and Mr. L. A. Jackson was appointed secretary.

Speaking at the inaugural meeting in Nottingham of the East Midland Electricity Consultative Council on 2nd February, Mr. C. R. King, chairman of the East Midlands Electricity Board, said that the Council must hold a balance between the points of view of the consuming public and the Area Board. He reviewed the progress made in the area since vesting day.

Mr. L. L. Perkins, chairman of the Council, said that the Council could be regarded

At luncheon the Council members were joined by members of the Electricity Board. Mr. J. Mould, vice-chairman of the Board, proposed a toast to the Council to which Mr. K. King, vice-chairman of the Council, responded.

Addressing last week's meeting of the North - Eastern Electricity Consultative Council, Mr. W. S. Hall, chairman of the Council, said that to gain and maintain the confidence of the public, sympathetic and understanding treatment would be required. The Council provided the opportunity for indirect participation in the direction of the electrical service. The Council should seek to cultivate the position so that the public and industry would look upon it as trustees of their electrical requirements. They must not become a hyper-critical body for the mere sake of criticism, but should rather work for good relationships within the industry. While seeking for any improvement in the service that could be reasonably



secured they would also, from time to time, be required to place squarely before the public all factors known to them relating to the development of the service.

Mr. H. H. Mullens, chairman of the North-Eastern Electricity Board, said that the resumption of hire and hire-purchase, suspended in 1939, of electrical appliances by householders, was now being considered.

The members of the Merseyside and North Wales Area Electricity Consultative Council include Mr. E. J. Evans, M.Sc., M.I.E.E., M.I.Mech.E., A.M.I.C.E. (Port Sunlight).

## Television Standards

### Partial Adoption of British System

**D**ETAILS of the television standards agreed upon by leading manufacturers for use on the Continent of Europe were announced last week by the Radio Industry Council. It was stated that five concerns (Philips, of Eindhoven, E.M.I., G.E.C., Marconi and Pye) had agreed to standardize equipment for 625-line picture definition and what is known as "positive modulation" for the vision signal. The latter is already used in Britain with 405-line definition and in France where a 819-line system is projected, but negative modulation is used throughout the U.S.A. and the Dutch were proposing to use it before the present agreement was reached.

Other standards agreed are 25 frames per sec, interlace 2 to 1, vestigial side-band operation and 6 Mc total channel width. There is no recommendation for the method of modulating the sound signal.

A British radio industry representative who attended the negotiations in Holland has said that the agreement on positive modulation is very satisfactory from the point of view of the British manufacturer. It will avoid the manufacture of sets with different forms of modulation for use at home and abroad. An advantage of positive modulation is that receivers are cheaper than those made for negative modulation.

Some countries abroad might want to take advantage of Britain's unique experience of studio and transmission methods and receiver manufacture, while wanting a line definition nearer to, or higher than, the American one. It is now accepted by leading British manufacturers that uniformity on the Continent, especially with the British system of modulation, is of more value to them than the partial acceptance of 405 lines, although the latter system will continue to be used in Great Britain.

The choice of 625 lines, which is a higher definition than is used in the U.S.A., is already favoured by Sweden and Germany, where television development work is recommencing and it is believed that

As we have already reported, the chairman of the Council is Councillor A. O. Roberts, J.P. (Little Sutton, Cheshire).

The Minister of Fuel and Power has announced the names of those to serve on the Electricity Consultative Council for the Southern Area. The chairman is Major Sir Hubert Young, D.S.O., K.C.M.G. (Bradford-on-Avon), and deputy chairman, Lt. Col. C. Waley-Cohen, C.M.G. (Aldingbourne, near Chichester). The members of the Council include Mr. W. E. Brandreth, A.M.I.E.E., of Newbury.

other Scandinavian countries and Belgium and Switzerland may also favour it.

### E.M.I. Disclaimer

In a subsequent statement Sir Ernest Fisk, deputy chairman and managing director of Electrical and Musical Industries, Ltd., said that the report was incorrect. E.M.I. had not taken part in any joint consultation among a number of companies in connection with this matter and had not entered into any such agreement. It was able and willing to supply television transmitting equipment for any and all practicable standards including the B.B.C. standard of 405 lines, the American standard of 525 lines, the new E.M.I. standard of 605 lines and also for 625 lines and more if such were required.

Later, the Radio Industry Council announced that the inclusion of E.M.I. in its original statement arose out of a misunderstanding between firms.

## Queen Mary at Building Centre

**H**ER MAJESTY QUEEN MARY visited the Building Centre last Monday afternoon. On arrival she was received by Dame Caroline Haslett, director of the Electrical Association for Women, and Mr. F. R. Yerbury, manager of the Building Centre. Her Majesty visited the new electrical section of the Building Centre, over which she was conducted by Mr. V. W. Dale, general manager and secretary of E.D.A.

Upon entering the section Queen Mary showed great interest in the E.L.M.A. exhibit. A number of electrical home aids also engaged her attention.

Before leaving the Electrical Section Her Majesty was asked by Mr. Dale if she would care to accept a memento of her visit. Queen Mary graciously assented, and Dame Caroline presented her with a Premier electric coffee percolator.



# PERSONAL and SOCIAL

## News of Men and Women of the Industry

THE British Electricity Authority, in accordance with the duties imposed upon it by the Electricity Act, 1947, has appointed the following regional safety officers who will co-operate with the Divisions and Boards indicated in all matters concerning safety in the industry:—**Mr. T. G. Blofeld**, A.M.I.E.E., A.M.I.Mech.E., M.I.Mar.E. (Yorkshire); **Mr. L. A. Corney**, B.Sc. (Eng.), A.M.I.E.E. (North Western and Merseyside and North Wales); **Mr. E. P. Tomblin**, A.M.I.E.E. (Midlands and East Midlands); **Mr. A. A. Beckingsale**, A.M.I.E.E. (South Western, Southern and South Wales); **Mr. H. G. Frampton**, M.I.E.E. (London, Eastern and South Eastern); **Mr. J. L. Wood**, A.M.I.E.E. (South East Scotland, South West Scotland and North Eastern). Messrs. Blofeld, Corney, Tomblin and Beckingsale have already taken up their duties.

**Mr. E. F. Schofield**, A.M.I.E.E., A.M.I.I.A., assistant mains and distribution engineer, Luton, has been appointed planning and development engineer of the Glasgow Sub-Area of the South West Scotland Electricity Board. Mr. Schofield received his technical education at Leeds College of Technology and previously held positions at Harrogate and Blackburn. During the war he was employed by the Air Ministry Works Directorate.

**Mr. O. W. Humphreys**, B.Sc., F.Inst.P., A.M.I.E.E., whose appointment as manager of the research laboratories at Wembley of the General Electric Co., Ltd., we briefly announced in our last issue, joined the staff of the laboratories in 1925, and was appointed to the leading scientific staff in 1927, originally in charge of the heat group. During the war Mr. Humphreys was, *inter alia*, concerned with such



Mr. O. W. Humphreys

specialized problems as the heating of guns on warships to fit them for Arctic service, and the unique space-heating problems arising in the "Fido" installations for fog dispersal on aerodromes. In addition to his research work he became closely associated with the late Sir Clifford Paterson in the administration of the laboratories, which were then rapidly expanding under the leadership of their founder director to more

than double their pre-war strength. In the directing and co-ordination of the diverse activities of the laboratories Mr. Humphreys will be advised by a small advisory scientific panel of his colleagues. **Dr. B. P. Dudding**, who joined the staff as a founder member with Sir Clifford Paterson in 1919, has been appointed vice-chairman of this panel.

**Mr. J. A. Howie**, until recently works manager at the Ekco Works, Rutherglen, Scotland, of E. K. Cole, Ltd., left his wife and family last week for Bombay, where he will take up the post of general manager of the newly formed company, the National Ekco Radio & Engineering Co., Ltd. On 28th January, Mr. Howie was entertained at an informal farewell dinner party given by the directors of E. K. Cole, Ltd., and Ekco-Ensign, Electric, Ltd.



Mr. J. A. Howie

**Lt.-Col. R. V. Powditch**, O.B.E., A.M.I.E.E., has recently rejoined Crompton, Parkinson, Ltd., at Chelmsford. During the last war he served as an Ordnance Mechanical Engineer and subsequently with the R.E.M.E. Following this he was appointed an Assistant Director of the Engineering Industries Branch of the Control Commission in Germany, from which position he has recently resigned. He is continuing to serve with the Territorial Army.

**Mr. J. B. Fair**, of the Hungerford District of the Southern Electricity Board, has been appointed commercial officer (Finchley) in the Northmet Sub-Area of the Eastern Electricity Board.

**Mr. E. J. Robertson**, B.Sc. Tech., A.M.I.E.E., informs us that he is sailing for Canada next week to settle there. Mr. Robertson has been chief electrical engineer of the Manchester Corporation Transport Department since 1945. After education at the University of Manchester he spent a year with Mr. J. A. Robertson, consultant, and served a college apprenticeship with the Metropolitan-Vickers Electrical Co. He subsequently held positions with that company and with the Traction Department of the English Electric Co. and in 1939 went to Associated Vehicle Manufacturers, Ltd., as technical sales engineer. In the same year he joined the Air Ministry Works



Directorate, but left in 1941 to go to the Manchester Transport Department as assistant electrical engineer. From 1935 to 1939 Mr. Robertson was a visiting teacher at the L.C.C. School of Engineering and Navigation (evening classes).

**Mr. A. W. M. Somerville** A.M.I.E.E., F.Inst.F., at present boiler engineer at the London office of the Electricity Supply Commission of South Africa, is transferring to the Johannesburg office of the Commission, and will sail for South Africa on 24th February.

**Mr. R. B. Mitchell** has completed eleven years as hon. secretary and treasurer of the Scottish Centre of the Institution of Electrical Engineers, and it is proposed to present him with a token of appreciation at the annual meeting of the Centre, to be held in April. Members wishing to subscribe should send donations (not exceeding 10s) to Mr. C. S. Buyers, hon. secretary, Scottish Centre, Institution of Electrical Engineers, 154, West George Street, Glasgow, C.2, by 31st March.

**Mr. D. Rich**, managing director of Taylor Electrical Instruments, Ltd., and **Mr. H. E. Fleetham**, general sales manager, left this country recently on a European sales tour by air.

**Mr. W. K. B. Marshall**, B.Eng., A.I.M., has accepted the appointment of assistant director of research of the British Welding Research Association. Mr. Marshall was for some years works metallurgist at the Milton Works of the British Aluminium Co., and for the past eight years has been the chief metallurgist and later chief development engineer to the A.P.V. Co., Ltd. He is expected to take up his duties on 1st March.

**Mr. W. A. Endersby**, personnel manager with the Chesterfield Tube Co., Ltd., has been appointed welfare officer for the Yorkshire Division of the B.E.A. and the Yorkshire Electricity Board.

**Mr. F. Millington**, chief assistant to Mr. T. Wilkie, public lighting engineer, Leicester, has been appointed lighting engineer at Chesterfield. Mr. Millington has been with the Leicester Corporation for eleven years.

**Mr. C. W. Jackson**, M.I.E.E., senior executive officer, King's Lynn Unit, Norfolk Sub-Area, Eastern Electricity Board, retired on 31st January last. Mr. Jackson was borough electrical engineer and manager at King's Lynn from 1912 until vesting date when he became senior executive officer.

**Mr. Hugo Falk**, chairman and managing director of Falk, Stadelmann & Co., Ltd., sailed on the *Edinburgh Castle* on 3rd February for South Africa, where he will visit the company's branches in Johannesburg, Cape Town, and Durban.

**Mr. A. E. Ellis**, secretary of Berry's Electric, Ltd., has been appointed a director of

the company, and **Mr. W. O. Diggins**, who has been with the company since 1913, succeeds him as secretary.

**The Rt. Hon. C. R. Attlee**, Prime Minister, has accepted an invitation from Lord Citrine to attend the dinner to be held at the British Electrical Power Convention in June.

## Obituary

**Mr. W. Horsfall.** — The death is announced, at the age of sixty-seven, of Mr. William Horsfall,

a director of the General Electric Co., Ltd., and manager of the North Eastern Area, which embraces the Newcastle, Hull and Middlesbrough Branches of the company. Mr. Horsfall joined the G.E.C. in 1919 as assistant manager of the Cardiff Branch. In 1923 he was appointed manager of the Newcastle Branch, and subsequently became manager of the North Eastern Area.

**Mr. A. G. Watsham.** — The death occurred on 29th January of Mr. A. G. Watsham, a director of Progress Cables (Kent), Ltd.

**Mr. Tom Jones**, of FitzRoy Avenue, Harborne, Birmingham, who for the last twenty years was joint managing director of Southgate (Birmingham), Ltd., manufacturers of electric lighting fittings, died on 25th January at the age of sixty-seven.

**Mr. J. W. Garsden.** — The death occurred on 7th February of Mr. J. W. Garsden, manager of the Manchester depot of the Edison Swan Electric Co., Ltd.

**Mr. H. Leonard.** — The death occurred on 26th January of Mr. H. Leonard, who since 1919 had handled the sales of "Century" motors for Asea Electric, Ltd. Mr. Leonard was with the A.E.G. Co. at Cardiff before joining the Asea Co. in 1919.

## Wills

**Mr. D. B. Hoseason**, M.I.E.E., M.I.Mech.E., Director of Studies at the Administrative Staff College, Henley-on-Thames, late of the Brush Electrical Engineering Co., Ltd., who died on 16th July last, left £14,913 gross (£11,224 net).

**Mr. F. H. Horton**, late joint managing director of G. N. Haden & Sons, Ltd., who died on 27th October last, left £74,403 gross (£72,551 net).

**Mr. W. R. Rendell**, general manager of the Metropolitan Electric Supply Co., Ltd., 1916-22, who died on 6th October last, left £93,350 gross (£93,210 net).



Late Mr. W. Horsfall



# NEW BOOKS

## Radar—Electric Locomotives—Insulation

**A Textbook of Radar.** By Staff of the Radiophysics Laboratory, Council for Scientific and Industrial Research, Australia. Pp. 579; figs. 347; index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 50s. in U.K.

This book is intended to acquaint engineers and scientists who did not work on wartime radar, with the results of the intensive researches which have now been declassified. Radar differs from conventional radio in that the emphasis is entirely on pulse techniques and extremely short wavelengths, down to 1 cm. The book, therefore, opens with a discussion of magnetron and triode u.h.f. generators, modulators and waveguide transmission. Aerials and duplexers come next, then the receiver, local oscillators, mixers and i.f. amplifiers. The book closes with a description of delay and range circuits, the requirements of marine and airborne radar and radar navigation systems.

On the whole the treatment is non-mathematical and few developments are carried far enough to present design formulae.

The book is eminently readable and does give a very clear, qualitative account of radar. Moreover, since the equipments described are Australian in origin, they usually present interesting differences from Anglo-American designs, although the authors are very generous in acknowledging their debt to English and American radar research.

The book contains little that will be novel to anyone who has read the papers presented at the I.E.E. Radar Convention or any of the several American texts on the same subject. It is a pity that it could not have been produced earlier and much more cheaply.—A. H. B.

### **Electric and Diesel-Electric Locomotives.**

By D. W. and M. Hinde. Pp. 366; figs. 167; index. Macmillan & Co. Ltd., St. Martin's St., London, W.1. Price 36s.

In this comprehensive volume two fundamental types of electric locomotive are recognized, viz., those which are only capable of operating on electrified lines and those which produce their own current by means of a diesel engine-driven generator. The first type is further subdivided into three according to whether the supply is d.c. or a.c. or whether a converter is installed.

The subject is treated both from the theoretical and the practical aspects, the various types of track motor together with their

control gear being described, sectional drawings and wiring diagrams accompanying the text. A number of typical d.c. and a.c. locomotives are then described and illustrated. In dealing with the second fundamental type the authors give a brief survey of the theory of the diesel engine, both the four and the two-stroke cycles being considered. Typical diesel-electric locomotives are then described and illustrated, many of the drawings taking the form of folding plates.

This is followed by brief specifications, arranged in tabular form, of nearly 300 of the principal electric and diesel-electric locomotives in service on railways all over the world. I feel, however, that more attention might have been given to locomotives of British manufacture. Thus, no mention is made of the fine electric locomotives introduced on the Metropolitan Railway in 1924, and only the briefest reference is made to the famous CC type on what is now the Southern Region, British Railways. Nevertheless, the book should prove of great value both to the student and the railway engineer and, in view of the many interesting developments now taking place on British railways, these may be included in future editions.—A. R.

**The Inside of Electrical Machines.** By R. H. Robinson, B. Eng., A.M.I.E.E. Pp. 252; figs. 132; index. Ernest Benn, Ltd., Bouverie House, Fleet Street, London, E.C.4. Price 18s.

For many years practical engineers have felt the need for a comprehensive work on the subject of insulating materials and their uses in the construction of electrical machinery. Under a rather misleading title Mr. Robinson has supplied this need very ably, and his book on insulation can be commended as being not only up to date and authoritative but also admirably clear and concise.

After two preliminary chapters on the general characteristics of insulating materials, the author proceeds to a detailed study of the properties, requirements of relevant B.S. Specifications, and methods of testing materials of the fibrous class, varnishes, mica and mica compositions, and synthetic resin products. Here will be found a short but interesting account of the curious compounds of the silicone class, the future use of which may bring about important changes in the design of certain classes of electric motors.

The latter part of the book deals with the technique of electrical insulation, with par-



ticular reference to the design and construction of d.c. and a.c. machines, fractional h.p. motors and turbo-alternators. The reference to the earthing of three-phase systems on page 210 might be amended; the limitation of the line-to-earth voltage in ordinary low-pressure supplies depends upon the permanent earthing of the neutral of the distribution transformer, rather than on the

neutral earthing at the generating station.

The book is admirably illustrated, it embodies a large amount of tabulated information, and it is furnished with a copious index. Although its principal appeal will be to the specialist and the advanced student of electrical design, the book will be a useful work of reference for operation and maintenance engineers.—G. W. S.

## Correspondence

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

### Submersible Motors

WITH reference to Mr. T. E. Penlington's letter (21st January), I should like to point out (if the original author has not already done so) that your correspondent really cannot expect to have his cake *and* eat it. He claims on the one hand that the losses in the stainless steel stator sheath do not materially affect the machine efficiency and, by implication, on the other hand, that the same losses are large enough to improve the power factor.

It appears to me that the two points were accidentally transposed in the original article, since the author surely intended to say that the eddy losses in the sheath reduce the efficiency, while the increased magnetizing current taken by the effectively increased gap reduces the power factor (and, incidentally, the efficiency also). I know little about these very special submersible motors, but sufficient of the practical design of ordinary induction motors to know that the air gap is normally made the minimum consistent with adequate mechanical clearance.

J. GRIFFIN, Graduate I.E.E.

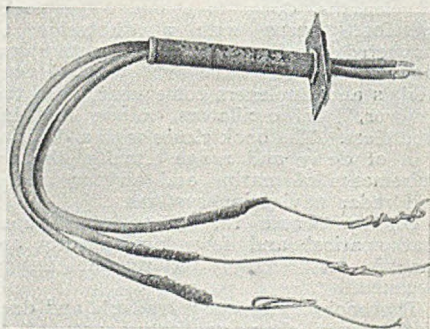
*Brentwood, Essex.*

### Is Compulsion Necessary?

FROM correspondence published in your journal it is obvious that many engineers favour the compulsory registration of electrical contractors, and in support of their claims we have pleasure in enclosing a photograph of the actual base and conduit sleeve complete with cables forming the connection between a 100A t.p. switch-fuse and the electricity supply authority's meter at a local works.

The cables connected to the switch-fuse terminals are of 19/072 sq in. section, these in turn being jointed to 7/029 sq in. section cables which terminated in the

meter; the load connected to the t.p. switch-fuse was 65 h.p.



Strange method of connecting up a 65 h.p. load

We understand that the person responsible does not favour compulsory registration.

W. SCOTT & Co.

*Mansfield.*

## Commonwealth Telecommunications

THE Commonwealth Telegraphs Agreement, resulting from decisions reached at the Commonwealth Telecommunications Conference in London, in July, 1945, which included the acquisition by the Government of Cable & Wireless, Ltd., was published last week. Under the agreement a Commonwealth Telecommunications Board is established, the Chairman of which will be paid £3,500 a year, the Vice-Chairman £1,500, and other members £1,000. The purpose of the Board is to promote the efficiency and development of the external telecommunications services of the Commonwealth and Empire. Britain, Canada, Australia, New Zealand, South Africa, India and Southern Rhodesia agreed to take over companies operating external telecommunications services in their respective countries. The Bill giving effect to these provisions has been presented to Parliament and given a first reading.

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# Electrical Research

SOME OF LAST YEAR'S ACTIVITIES OF E.R.A.

A RECORD number of eighty-six technical reports were issued by the British Electrical and Allied Industries Research Association during the twelve months ended September, 1948, compared with fifty during the previous year.

Most space in the report presented to the annual general meeting in London this week is, as usual, devoted to materials, which have always been a major preoccupation. Insulation ranks with switchgear as one of the two largest (in financial terms) groups of researches, and (as with switchgear) special contributions are received in aid of this work, in this instance from the Ministry of Supply. A feature has been the assistance rendered by the Universities and the National Physical Laboratory. The entry of the former is natural in a sphere of pure science, while the N.P.L. has both staff and facilities of a unique kind for the work required; the E.R.A. has been able to add to these facilities. The term "dielectrics" has tended to be associated with studies which are basic, while "insulation" refers to industrial uses and behaviour in service.

## Lightning Studies

The E.R.A. has made some of its most notable contributions in connection with lightning. Further confirmation of the Bruce theory accumulates; the theory of the "attractive range" and the predetermination of hazards is now being applied to more cases quantitatively, while its converse yields the protective effect of lightning conductors. A sample analysis of observations on conductors on 150 tall chimneys in the London area is now proceeding.

Work has continued on the investigation of glow-arc discharges and the transitions between the two states, which are in many cases independent of the phenomena occurring at the cathode. Part of this work is connected with circuit-breaker problems. An interesting outcome of the electrical discharge theory of astrophysical happenings is the suggestion that some terrestrial magnetic storms may be the direct "atmospherics" of solar lightning flashes. The current re-

quired in the discharge, some  $10^{14}$  A, is thought to be reasonable when considered in perspective against the background of solar phenomena.

Two provisional applications have been made in Britain in connection with circuit-breaking devices and the British case of the bridge-connected fuse has been accepted (British patent No. 604,102), while the manuscript of a comprehensive book which collates the main results of all E.R.A. work on fuses is in the printers' hands. The issue is beginning of a handbook on the electrical characteristics of overhead power lines, which will be of immediate practical use.

## Steam Properties

Study of the properties of steam are being extended up to 6,000 lb/sq in and about 1,400 deg F in co-operation with Prof. D. M. Newitt at the Imperial College of Science. The extension of the E.R.A. activities in respect of gas-turbine research is under consideration. Condenser tube investigations continue, and those into the grindability of coal have been extended to cover such ancillary aspects as suitable appliances for testing dust extraction plant efficiency.

Recent happenings are likely profoundly to modify the E.R.A. work on rural electrification. The Ministry of Agriculture and Fisheries has become a special contributor, up to 50 per cent of ascertained cost, to programmes approved by the Ministry for the purpose. Some proposals are new; others have been considered before, but deferred owing to lack of funds. A substantial sum of money is involved in the new arrangement; continuance of the Ministry's confidence in the E.R.A. must be earned, which means an expansion of staff and facilities.

The B.E.A. will probably pursue rural development more conveniently in direct liaison with its consumers while continuing to act in consort with the E.R.A. in respect of the more scientific aspects of this work. Transfer of staff from the E.R.A. to the B.E.A. is taking place in the agricultural sphere as well as that of consumers' load research. The total E.R.A. staff numbers 270.



Wind power experiments are being helped by theoretical studies at the N.P.L., plans and estimates have been prepared by a group of manufacturers, much information has been obtained from Electricité de France and other countries, while the general analysis of wind speeds and distribution is being helped by the Meteorological Office. Conditions at a

favourable site are being investigated in detail with support from the North of Scotland Hydro-electric Board. It is hoped that development contracts may be placed with manufacturers to enable moderate-sized aero-generators to be installed for gaining experience of their operation in connection with a public supply system.

# Electricity, Gas and Oil

## DIVERSION OF GAS INDUSTRY TO OIL SYNTHESIS

**I**N a paper presented before the Institution of Electrical Engineers (*I.E.E. Journal*, Vol. 94, Pt. 1, 1947) Mr. P. Schiller exposed the fallacy underlying a common method of comparing the overall thermal efficiency of gas production (i.e., ratio of heat in gas, coke and by-products to heat content of the coal) with that of electricity generation. This had led to such unwarranted comparisons as 73 per cent efficiency for gas and 18 per cent for electricity (Post-War Building Study No. 19), which ignored the need to regard coke as a residue.

In *Engineering* (7th January, 1949) he quotes Publication 278/111 of the Institution of Gas Engineers as stating that, allowing for the thermal value of by-products (the weight of which Mr. Schiller gives as 4cwt), two tons of coal produce 150 therms of gas and one ton of saleable coke. With a calorific value of 300 therms per ton of gas coal, this gives a gas-production efficiency of 50 per cent. Moreover, coke has a calorific value only about 90 per cent that of an equal weight of coal, and part of the breeze is unmarketable. After accounting for distribution losses, gas-production efficiency becomes about 45 per cent. With working efficiencies of 40 per cent for a gas fire (Simon Report) and 100 per cent for an electric fire, the "coal-economy efficiency" is therefore 18 per cent in each case.

The argument for the preservation of the gas industry, therefore, rests upon the need for coke and by-products and it is suggested that the gas produced at the same time should be employed for making synthetic hydrocarbons, which may be expected to replace natural petroleum products as the oil resources of the world decrease in course of time.

The two principal processes are the hydrogenation and the Fischer-Tropsch. Existing gas works are well equipped for synthesizing oil from gas by the latter method, the Koppers system (in which the hydrocarbons are cracked in gas by passing it and steam through heated vessels) being used to obtain the mixture of hydrogen and carbon monoxide required. About 290lb of synthetic products and 7½cwt of coke as well as the usual by-products are thus obtainable per ton of coal.

In 1944, 65 gas undertakings with individual annual outputs exceeding 5 million therms (corresponding to 70,000 tons of coal) supplied 70 per cent of the total amount sold, or 1,200 million therms. From the aggregate carbonizing capacity of 20 million tons of coal could be obtained, in millions of tons: condensable gas, 0.36; petrol, 1.22; middle oil (for diesels), 0.73; wax, 0.29; coke, 7.5; tar, 1.1. To replace gas by electricity (one therm=15 kWh) would entail burning 9½ million more tons of coal of doubtful export value in power stations. Automatic gas producers with a thermal efficiency of 80 per cent, compared with 45 per cent for "town's gas," could be used for industry. In conclusion, the author urges that consideration should be given to the erection of an experimental plant for oil synthesis from coal gas.

### Birmingham Electric Club

The annual dinner of the Birmingham Electric Club will be held on 4th March at the Grand Hotel, Birmingham. Applications for tickets (£1 1s each) should be made to Mr. H. M. Fricke, hon. social secretary, "Ravenswood," 56, Homer Road, Solihull, by 17th February.

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# Tidal Power

I.E.E. JOINT MEETING WITH "CIVILS"

**A**T a joint meeting last week of the Institutions of Civil and Electrical Engineers there was a large attendance to hear Mr. H. HEADLAND (Messrs. Kennedy and Donkin) present his paper on tidal power, with special reference to the proposal (first made in 1849) to build a barrage across the estuary of the River Severn.

The paper (a companion to another, *J. Inst. C.E.*, April, 1948) first summarized five technically feasible projects, one each in Britain, Canada and the United States, and two in France. It then outlined the principal proposals made in the 1933 report of the Brabazon Committee and the modifications recommended in the 1945 report of the Ministry of Fuel and Power.

Single basin ebb-tide working could produce 2,365 million kWh per year with 32 sets, each of 25 MW at 11 or 22 kV. They would operate in groups of four and have sufficient overload capacity to enable the full 800 MW output to be generated by 28 machines, if necessary, so avoiding the need for spare sets.

## Plant Costs

The engineering features of the project were described in order to emphasize the economic importance of plant costs. The latter indicated the necessity for examining every possible means of reducing the capital invested in water turbines and alternators.

The output of a tidal station would necessarily be variable and intermittent. Its value as a substitute for steam stations would be negligible. Consideration of methods of regulating the output led to the conclusion that 75 per cent of the energy should be transmitted at 220 kV to London and Birmingham, where the tidal output would be small relative to that of steam stations connected to the grid system. A transmission system for parallel operation with the grid was described.

The barrage scheme would provide more energy (kWh), but no more power (kW), although gas-turbine plant might (in the future) be usable to create the

necessary proportion of firm power to make the barrage economic. The future possibilities for tidal power development were not unfavourable. The project would effect an important saving of coal, but the annual fixed charges were the economic criterion on which the value of the project must be assessed. Therefore the constructional period would need to be shortened and the capital costs of plant and transmission system minimized.

The possibilities appeared to justify the construction of a pilot plant with one or two full-size units to provide (in conjunction with the model tests now proceeding) data on which to base design.

## DISCUSSION

SIR JOHN HACKING (B.E.A.) opened the discussion, saying that although much money had been expended on technical and economic investigations, so far no useful results had been produced; tidal schemes had always been found to be uneconomic at the time, though expected to be economic in the near future, usually on the assumption that the price of coal would rise. Unfortunately, when the price of coal rose the price of other things rose too. The Severn scheme was clearly one of the most favourable, so, if it were impracticable, it was doubtful whether any other scheme would be practicable.

He was glad the author did not support the proposal of the Brabazon Report in 1933 to add pumped storage to the Severn scheme. Only in exceptionally favourable circumstances could that economically come to the assistance of tidal power or steam stations.

The Severn scheme would not save the installation of a single kW of generating plant elsewhere, so that in these days of shortage of labour and materials it would be inadvisable to devote a part of our limited resources to it. It had, however, great value as a potential coal saver, and had it been proceeded with in the 'thirties would, at present coal prices, almost certainly have been a paying proposition. It was the type of scheme which should be kept back for a time of depression.



MR. B. D. RICHARDS said that ebb-tide working was the most favourable for the Severn. A double-basin scheme would be very costly and would interfere with the regime of the estuary. In view of the fact that the scheme would be situated close to Bristol and the South Wales towns, he saw no reason why any part of the cost of transmission should be charged to it.

SIR JOHN KENNEDY (Uganda Electricity Board) asked about the possibility of using geared alternators and so reducing the cost of the foundation work. The combination of a rail and road bridge with the barrage might be reconsidered. The figures of cost had been arrived at on the basis that the scheme would be operated by an *ad hoc* authority, the energy being then bought by the former C.E.B., which would naturally have offered only a bedrock price. To-day, however, the same authority, the B.E.A., would own both the barrage and all the steam stations and should be able to make very much better and more economical use of the Severn scheme than the author indicated.

### Interworking with Other Stations

The new power stations to be built in the next fifteen years would have to be a long way from London and would involve heavy transmission costs. The transmission system associated with the Severn barrage could be used by supplementary stations built near the South Wales coalfields. If the grid system which Mr. Haldane envisaged in his I.E.E. presidential address were constructed, at 275 kV throughout the British Isles, the interworking of the Severn barrage with steam stations and with the water-power stations in the North of Scotland would completely alter the economic position.

MR. H. R. LUPTON (M.W.B.) contended that the real cost to the nation of what was a national scheme was the value of the products which the nation might obtain by laying out the money which would have been spent on the barrage on some other productive scheme, so that the capital expenditure was no more immune from the rise and fall of prices than were the operating costs.

MR. S. B. DONKIN (Kennedy & Donkin) compared the Severn barrage ebb-tide scheme with the Menai Straits

scheme, pointing out that the length of the multiple dams in the latter case would be greater than the total length of the dam for the Severn scheme, although the maximum output from the Menai scheme would only be  $1\frac{1}{2}$  MW, compared with 800 MW from the Severn.

### Insurmountable Drawbacks

MR. H. NIMMO (Southern Electricity Board) said that power from the tides was "alluring but disappointing." Insurmountable drawbacks were the limited head and consequently the large quantities of water to be handled, and the intermittent or variable output, depending on whether it was a single-basin or two-basin scheme. At the Electricity Commission he had had to report on a number of schemes using two basins. For the Severn site a two-basin scheme would be very costly, but there was a much smaller scheme for a dam across the junction of the rivers Crouch and Roche which was very favourable. He still thought it might be possible to find a suitable site in or near the Severn estuary where a two-basin scheme could be tried out.

MR. E. L. E. WHEATCROFT (Merz & McLellan) suggested that the question of providing firm capacity had nothing to do with the Severn barrage and should be considered on its merits. For numbers of hydro-electric schemes pumped storage might properly be considered, but the Severn scheme did not fulfil the necessary conditions.

MR. E. M. JOHNSON (Metro-Vick) emphasized the prestige value of the Severn barrage scheme from the point of view of impressing foreign buyers. He compared three possible types of generator which might be employed and said that for 11 kV a rotor diameter of 48ft with a ratio of core length to pole pitch of 3 and self-ventilated, would be the most economical. The proposal to mount the thrust bearing on the turbine cover was eminently sound.

MR. G. R. F. NUTTALL called attention to the advantages to be gained by a combination of tidal stations in different parts of the country. There was, for instance, a difference of four hours between high tide on the Mersey and on the Severn, and a further difference of four hours on the Humber. On the question of the direct utilization of tidal energy, very

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great progress had been made recently in America on heat storage by a system known as "liquid heat." The fluid used did not evaporate under 800 deg F and would not freeze. In this way an intermittent source, such as tidal power, could be used and the heat drawn off as required.

MR. R. H. ABELL (London Electricity Board) described himself as a "tidal power addict" and suggested that, in order to provide firm kilowatts, gas turbines might be coupled through triple-reduction gearing to the alternators when no tidal water was available for driving the turbines. A ratio of 63/1 could be used, with gas turbines running at 2,600 r.p.m. and alternators running at 40 r.p.m.

MAJOR T. RICH contended that the great trouble with all water-power

schemes was that the power came at times when it was not required, which was not of much use to anybody.

MR. E. A. LOGAN emphasized the prestige value of the scheme and referred to a case in which foreign buyers had been lured by "glittering propaganda" to pay several visits to the T.V.A. scheme, although Scottish hydro-electric developments afforded a closer parallel with what they required.

MR. A. C. KAYE asked how the economics of the scheme would be affected by the introduction of atomic power and MR. J. GOGAN stressed the need for being prepared to undertake the work before the next depression arrived. MR. W. ARVON WALES (Sir Bruce White, Wolfe Barry & Partners) made suggestions regarding the construction of tidal models. The author briefly replied.

## New Double-Deck Coach

### Air Conditioning and Lighting

LONDON TRANSPORT has announced the production of an experimental double-deck coach, for use on Green Line routes, which incorporates a number of features of advanced experimental character in order that they may be tested under service conditions.

The vehicle has been designed and constructed in the Development Section of London Transport's Chiswick Works, is of standard 7ft 6in. width, and has a seating capacity for forty-six. The introduction of a high-speed dynamo with high output has been necessitated by the incorporation of fluorescent lighting and a large air circulating fan for the heating and ventilating system. The customary loading platform has given place to one of enclosed design with pneumatically operated double-leaf sliding doors of patent design and actuation operated by push buttons. Illumination of all signs and indicators is by fluorescent lighting.

The problem of adequately heating and ventilating a double-deck vehicle has received careful consideration, and a new arrangement is being provisionally patented. A sufficient degree of heating in winter weather with a suitable number of air changes, entailing the use of the whole of the heat available from the engine coolant, has been achieved by repositioning the engine radiator under the stairs, at which point connection is made to longitudinal ducts. The engine coolant is passed

through a heat exchanger over which air from the interior of the vehicle is blown by a fan operating at 1,800 r.p.m., driven by a  $\frac{1}{2}$  h.p. 24 V motor. During the winter air is drawn from the front of the vehicle through ducts in the intermediate roof to the heating unit by means of the fan, whence the heated air is passed through the ducts at floor level into both saloons. A total of 650 cu ft per minute is circulated, giving 17.5 air changes per hour. During summer conditions the flow is reversed and air is extracted from these ducts through the radiator. Maximum temperature of the air in the saloons is thermostatically controlled.

Fluorescent lighting has been incorporated with a view to obtaining general service experience and assessing the maintenance problems associated with it, and the layout consists of two parallel lines of lighting in each saloon, along the upper edge of the normal lighting panels on each side of the roof. Choke and starting equipment are concealed behind these panels. Each tube is housed in an open "Perspex" container, and the intervals between the tubes have been filled with a suitably shaped fairing to give a clean appearance. Nine 18in. 15W "warm white" tubes are used on each deck, supplied with current from the batteries via a converter which changes the current from 24 V d.c. to 110 V a.c. The whole of this equipment is mounted under the stairs.



# Report on Canada

## ENGINEERING MISSION'S CONCLUSIONS

LAST autumn an Engineering Mission toured Canada for the purpose of investigating the prospects for British manufacturers in the Dominion, particularly heavier industrial equipment, and to secure first-hand information on difficulties in the way of British exporters and means of overcoming them. The Mission was led by Mr. E. H. Gilpin (who has since been knighted), and the members included Mr. D. Maxwell Buist, export director of B.E.A.M.A., Mr. A. W. Berry, director of the British Engineers' Association, and Mr. E. Bruce Ball, director, Glenfield & Kennedy, Ltd.

The Mission's report was published by the Board of Trade this week (H.M. Stationery Office, 1s) and presented at a Press meeting on Tuesday attended by Mr. Harold Wilson, President of the Board of Trade, Mr. L. Silkin and members of the Mission.

The first section of the report deals with physical considerations, natural resources, capital investment, transportation, production, etc. As a result of its studies the Mission found that there exists in Canada a solid and expanding market for much United Kingdom engineering equipment. Although the Canadian engineering industry is powerful and versatile, it is not all-embracing. Foreign, particularly American, competition is keen and well entrenched, but United Kingdom firms which have expended serious effort on the market have been well rewarded, and others will find real scope if they make an informed and sustained effort.

### Large Hydro-electric Programme

Canada's tremendous hydro-electric development is reviewed in the second section of the report, and it is stated that, in addition to 3 million h.p. now under construction or to be proceeded with immediately, further developments planned or under survey for later construction amount to 2 million h.p. It is estimated that an expenditure of £100 for each h.p. is involved in capital costs of generating, switching, transforming, transmission and distribution plant and equipment during the next five years.

This enormous demand, coupled with the large Ontario frequency - standardization scheme (£50 million) will overtax the capacity of the Canadian electrical manufacturing industry. Lengthening delivery periods are causing more enquiries to be sent to the United Kingdom. Although the Mission received complaints regarding deliveries quoted from the United Kingdom, it was

found that deliveries in Canada were within the following bands: large generators, 2 to 3 years; switchgear, 1 to 2 years; large transformers, up to 50,000 kVA, 1½ to 2½ years, and small transformers (200-500 kVA), 12 to 15 months.

Prices quoted by United Kingdom manufacturers were severely criticized; the Canadian idea of the "right price" is one that is lower than, or at least level with, the lowest Canadian or United States' price. Some "fantastic" differences which were quoted could be accounted for only by technical differences in the bids or by a long interval between the dates of the bids. Generally speaking, however, criticism was justified to some extent, and the Mission took every opportunity of explaining that United Kingdom prices for electrical equipment were higher in some cases because of higher costs of non-ferrous and insulation materials and the Canadian import duties.

### Problems Facing British Manufacturers

It is pointed out in the report that the Canadian market presents many difficulties for the United Kingdom makers of electrical equipment. Rotating a.c. equipment has to be designed for a different frequency, and in many products Canadian standards and designs differ from those of the United Kingdom, and electrical goods and appliances have to comply with the regulations of the Canadian Standards Association.

The market possibilities for United Kingdom manufacturers vary widely according to the product. Some offer excellent prospects, subject to prices and deliveries being competitive and to reasonable service facilities being available.

The report describes the opportunities over the next five to fifteen years as limitless. The demand will be so great that, provided a concerted and sustained commercial policy is pursued, there are excellent opportunities for United Kingdom manufacturers.

In the course of some general advice in the third section of the report stress is laid on the importance of proper representation in Canada, both of individual concerns and sections of industry. It is emphasized that all publicity literature must give full details of weights, dimensions, performance, etc., and be attractively prepared. The post-graduate training of young Canadian engineers in British works should be pursued. Full use should be made of the United Kingdom Trade Commissioner service.



# COMMERCE and INDUSTRY

## C.W.S. Lamp Sales : Plumber Jointers' Wages

The Co-operative Wholesale Society has acquired a shareholding on equal terms with the Scottish C.W.S. and the Swedish C.W.S. in the British Luma Co-operative Electric Lamp Society, and also a substantial interest in a company manufacturing fluorescent lamps. Retail societies have been informed that the C.W.S. has cancelled its arrangement with the members of the Electric Lamp Manufacturers' Association.

The C.W.S. statement reads: "It is the intention of the C.W.S., in addition to offering British Luma lamps, to market 'Defiant' fluorescent lamps, which are manufactured by the company in which the C.W.S. is interested, and also the products of independent manufacturers in place of the brands made by members of the Association."

### Export Volumes and Values

In the *Board of Trade Journal* for 5th February an attempt is made to assess from the value of exports during 1948, with adjustment for price changes, the actual volume of the trade as compared with 1938. On the basis that the 1948 index number of average values for electrical goods and apparatus was 246 (1938=100) it is calculated that the volume of exports of this class was 217 per cent of the 1938 figure. The overall volume of exports of "goods wholly or mainly manufactured" was 155 per cent of 1938. Only two other items in this class increased to a greater extent than electrical goods and apparatus. Electrical machinery is not shown separately, but exports of the whole of the machinery class in 1948 are stated to have been 193 per cent of the 1938 volume.

In December electrical goods and apparatus did not quite attain the export "target" set for them. They were valued at £6.49 million; the end-1948 target was fixed at £7.07 million. Exports of wires and cables at £2.10 million were above the figure set for them—£1.95 million. Radio apparatus reached £0.99 million (target £1.20 million), telegraph and telephone apparatus £1.18 million (£1.25 million), lighting apparatus £0.58 million (£0.82 million), and other electrical goods and apparatus £1.64 million (£1.85 million).

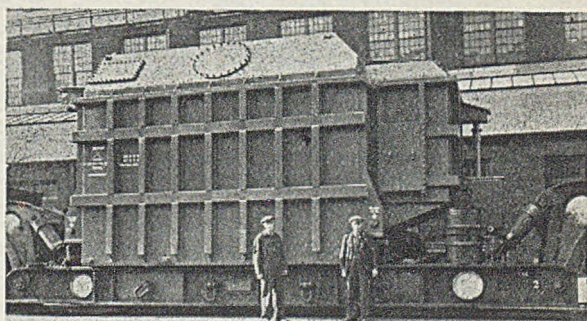
Exports of electrical machinery at £2.69 million were well above the target of £2.40 million.

### Census of Distribution

As recently announced by the President of the Board of Trade, the Census of Distribution has been postponed for one year and will be taken in 1951 covering the year 1950. An Order to this effect has now been made (S.I. 1949 No. 130). This postponement in no way affects the Census of Production which is now being taken in respect of the year 1948.

### British Transformers for Holland

The Metropolitan-Vickers Electrical Export Co., Ltd., is completing a contract for a three-phase bank of transformers rated at 100 MVA for the Directorate of Power Supply in the Netherlands. One of the transformers, which will form part of the three-phase bank, is shown in the accompanying picture leaving the Trafford Park Works for Holland via the Manchester Ship Canal and by sea to Amsterdam.



"Metrovick" transformer leaving Trafford Park for Holland

The 100 MVA bank has a no-load voltage ratio of 220/150/10.5 kV, connections star/star/delta. The neutral points of the star connected windings are fully insulated. The 150 kV windings are provided with adjusting tappings for a range of plus and minus 13 per cent, the tappings being connected to a "Metrovick" type H 18-step on-load tap-changer. This type of tap-changer is suitable for voltage classes between 66 kV and 275 kV. The transformers will be installed at Lutterade and will link the 220 kV Ruhr network to the Dutch 150 kV grid. The 10.5 kV windings on



the transformers will supply a local network at Lutterade.

Other transformer contracts in hand for the Netherlands include a number of 50 MVA three-phase transformers, voltage ratio 150/106 kV and 150/52.5 kV with h.v. windings star-connected and with adjusting tappings which are brought to three-phase type H on-load tap-changers. Four 20 MVA high-voltage transformers with on-load tap-changers have also been ordered for supply systems in the Netherlands.

### Plumber Jointers' Wages

The Standing Joint Committee on Plumber Jointers and Plumber Jointers' Mates of the J.I.C. for the Electrical Cable-Making Industry has decided that the rates of pay for plumber jointers both in London and in the country shall be increased by 1d per hour, with consequential increases to plumber jointers' mates and to youths and boys. Labourers giving additional assistance in a jointing team are to be paid 1d per hour above the civil engineering labourers' rate, provided that the team consists of three, viz., jointer, mate and labourer. The agreed addition will not prejudice the position of a labourer in a jointing team at present in receipt of a higher rate. The above decisions become operative on the third pay day in February in respect of the period for which payment is made on that pay day. With these increases the new rates of plumber jointers will be 3s 2d an hour (including war bonus) in the London area, and 2s 10½d an hour (including war bonus) throughout the rest of the country.

### Argentine Foreign Exchange Suspension

Last week the Argentine Government suspended all foreign exchange transactions pending the introduction of new regulations. It was announced that all applications for exchange permits in respect of imports which remained in the hands of the Central Bank would be returned to applicants for re-submission under the new regulations. Permits already granted but not used would be reconsidered, and in the case of import firms would have to be revaluated by the Central Bank. Foreign exchange is being granted in respect of imports which were cleared by the Customs before 30th November last.

### Ekco Radio in India

Following the recent agreement with the Tata organization for the manufacture of Ekco radio in India, E. K. Cole, Ltd., announce that the newly formed company will be known as the National Ekco Radio & Engineering Co., Ltd., with offices at Bom-

bay House, Bruce Street, Bombay. Products, on which manufacture is starting immediately will cover v.h.f. and electronic fields as well as domestic radio, and will be distributed by General Radio & Appliances, Ltd. (previously Fazalbhoy, Ltd.).

### Northern Ireland Electricity Board Sued

An unusual case was heard by Judge Belgley at Ballymoney (County Antrim) Quarter Sessions last week when James W. Erskine, farmer, sued the Northern Ireland Electricity Board for £75 18s loss and damage alleged to have been sustained by the cutting off of electricity on 14th April of last year, resulting in plaintiff losing a large number of day-old chicks, and eggs in process of incubation. Plaintiff said he specialized in poultry and on the date in question electricity had been cut off between 11.30 a.m. and 5.30 p.m. As a result, 832 day-old chicks were smothered, and 159 badly injured. The Board's representative should have consulted him. Someone had informed his wife, but Mrs. Erskine said she had not been told the length of time. His Honour gave a decree for the full amount.

### "Osram" Window Displays

Two new centre-pieces of attractive design and colouring have been introduced by the General Electric Co., Ltd., for "Osram" lamp window displays in the period from January to August. Both are in the form of linen screens with additional decorative effects, planned on similar lines to the material introduced at the beginning of the lighting campaign season last September. One of the designs shows a cascade of tungsten and fluorescent lamps issuing from the familiar carton, and is carried out on a blue background. The screen is accompanied by a red pennant bearing the word "Osram." In the second centre-piece, a yellow screen with a tungsten and fluorescent lamp design is surmounted by a red and white striped canopy, supported on two dowels. The use of the pennant and the canopy in these two designs give them a three-dimensional effect similar to the new centre-pieces of 1948.

### International Rubber Situation

Advance statistics received from the Secretariat of the Rubber Study Group show that the production of natural rubber during 1948 was 1,515,000 long tons, as compared with 1,255,000 tons in the preceding year. Consumption amounted to 1,407,000 tons (against 1,110,000 tons). Of this the United



States was responsible for 623,000 tons (562,000 tons) and the United Kingdom for 194,000 tons (153,000 tons). Stocks at the end of 1948 stood at 765,000 tons (760,000 tons).

Synthetic rubber production fell from 559,000 tons in 1947 to 533,000 tons in 1948, and consumption from 625,000 tons to 488,000 tons. Usage in the United States declined from 560,000 tons to 450,000 tons; in the United Kingdom it remained stationary at 3,000 tons. Stocks rose from 77,000 tons at the end of 1947 to 125,000 tons at 31st Dec. last.

### Trolley-buses for New Zealand

In our issue of 14th January (p. 55) we referred to the shipment to New Zealand of the first four single-deck trolley-buses out of a contract of fifty-five. We are informed that the British United Traction, Ltd., are sub-contractors to the Metropolitan-Vickers Electrical Co., Ltd., for the chassis of these vehicles, which comprise the underframe, transmission and running units, and compressed-air brake equipment. The company also provides the mounting details for electrical equipment and body, and carries out road tests before the vehicles are shipped.

### Indian Supply Commission

The Indian Supply Commission has removed to new offices at 55, Jermyn Street, London, S.W.1 (telephone: Regent 8250).

### "Motor Transport" Goods Guide

The January edition of the bi-annual *Motor Transport "Goods Guide"* is now available. In its 180 pages the Guide again provides exhaustive information on long-distance road transport services in England, Scotland and Wales. The main list of services between terminal towns gives the frequency, capacity and types of vehicle for each service, together with an index of intermediate towns and lists of clearing houses. Carriers specializing in the transport of machinery, liquids and similar heavy and awkward loads are listed separately and in considerable detail. Up-to-date data is also included on air charter companies, public warehouses and public wharfingers, etc.

The Guide is obtainable from the Publishing Department, Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1, price 1s 6d.

### G.E.C. Progress Sheet

With the January number of "The Osram Bulletin" there has been re-issued the "G.E.C. Progress Sheet" as a separate publication, thus ending the combination of the two which has existed since the first

wartime issue in November, 1939. The Sheet, which serves the useful purpose of keeping the electrical trade informed of progressive developments, price variations, etc., of the company's products, will in future continue to be published as a separate enclosure with each quarterly number of the Bulletin, thus reverting to the practice of pre-war years.

### E.D.A. Annual Meeting

The annual meeting of the British Electrical Development Association is to be held at the Connaught Rooms, London, W.C.2, on 18th March. It will, as usual, be preceded by the annual luncheon, at which Lord Citrine, President of the Association, will take the chair, and Mr. Hugh Gaitskell, Ministry of Fuel and Power, will be the principal guest.

### Sales Managers' Conference

A conference on "More Productivity Through More Sales Management," organized by the Incorporated Sales Managers' Association, was held on 3rd and 4th February at the Connaught Rooms, London, W.C.2. The conference was opened by Sir George Schuster, president of the Association, and the papers presented were: "The Customer is Your Employer," by Mr. F. C. Hooper; "Monopolies and Restrictive Practices," by Mr. B. S. Yamey; and "Sales Management and the Social Productive Unit," by Mr. M. Seaman. At the final session there was a discussion on "What Can Sales Managers Do About It?"

### Trade Announcements

**Northern Coachbuilders, Ltd.**, have secured a larger factory of over 25,000 sq ft on the Team Valley Trading Estate at Gateshead-on-Tyne. The new factory will allow for a considerable expansion in the activities of the Battery Electric Vehicle Division.

Allen & Pope, Ltd., have just opened new lighting fitting showrooms at 14, Shackleton Lane, Dalston, E. Mr. H. Stein is in charge of the sales organization.

The **Agro Electrical Co., Ltd.**, 7, Maddox Street, Regent Street, London, W.1, has appointed Mr. W. Fraser, 132, Renfrew Street, Glasgow, C.2, as agent for Scotland as from 1st February.

### Cable Plant for India

The United Kingdom Trade Commissioner at Bombay reports that C. B. Sutaria Bros., Cross Lane, Ahmedabad, importers and dealers in mill machinery, are interested in a scheme for the manufacture of electric cable and wires, and wish to contact United Kingdom manufacturers of suit-



able plant for this purpose, preferably those who are capable of undertaking the complete installation. Communications should be sent to Room 3089, Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, London, S.W.1, quoting reference E.P.D. 36599/48. Com/17680.

### Catalogues and Lists

**Wembley Electrical Appliances, Ltd.,** Exhibition Grounds, Wembley Park, Middlesex.—Four leaflets and price list on fluorescent lighting fittings.

**Sun Electrical Co., Ltd.,** 118-124, Charing Cross Road, London, W.C.2.—Priced catalogue of electric bells and allied equipment.

**Falco Electrical Appliances, Ltd.**—Coalbrookdale, Shropshire.—Four illustrated folders on electric cookers.

**Bowthorpe Electric Co., Ltd.,** Tinsley Lane, Crawley, Sussex.—Catalogue (BH15) of linesmen's tools.

**Nalder Bros. & Thompson, Ltd.,** Dalston Lane Works, London, E.8.—Catalogue of protective relays.

**Everett, Edgcombe & Co., Ltd.,** Colindale Lane, Hendon, London, N.W.9.—Illustrated reprint of a technical account of some of the many kinds of process timers

used for industrial control, with circuit diagrams.

**Hopkinson Electric Co., Ltd.,** Birchgrove, Cardiff.—Two leaflets on repulsion-induction motors of from  $\frac{1}{4}$  to 5 h.p.

**Falk, Stadelmann & Co., Ltd.,** Veritas House, 91, Farringdon Road, London, E.C.1.—Priced leaflet on "Efesca" industrial reflectors.

**Stability Radio Components, Ltd.,** 14, Norman's Buildings, Central Street, London, E.C.1.—Technical folder on silvered mica capacitors.

**Silvercrown, Ltd,** 178, Goswell Road, London, E.C.1.—Catalogue of electroplating equipment and accessories.

**L. G. Hawkins & Co., Ltd.,** 30/35, Drury Lane, London, W.C.2.—Priced leaflet of domestic appliances.

**The Edison Swan Electric Co., Ltd.,** Ponders End, Middlesex.—Folder describing the "Ensure-a-lite" emergency lighting system.

**R. A. Williams (Birmingham), Ltd.,** 447, Stratford Road, Birmingham, 11.—Priced folder on the "Sterofeed" heater and sterilizer for babies' bottles.

**Higgs Motors, Ltd.,** Birmingham, 6.—Priced catalogue of a.c. and d.c. motors and generators, voltage regulators and miscellaneous electrical machines.

### Trade Marks

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month of 2nd February:—

**ELGIN** (design).—No. B585,335. Class 6. Electric welding machines.—"Elgin" Aktien Gesellschaft für Elektrische Industrie, 1 to 5 Volksgartenstrasse, Vienna 1, Austria. Address for service, c/o H. A. L. Venner, 1, Gt. James Street, Bedford Row, London, W.C.1.

**KOLECTRIC**.—No. 659,212. Class 7. Machines for winding coils, reels and hanks of wire or thread; and small electric motors for driving such winding machines.—Armstrong Shock Absorbers, Ltd., Eastgate, Beverley, Yorks.

**PHOTOFUX**.—No. B658,510. Class 9. Photographic flash lamps.—Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

**FRIGIDARC**.—No. 663,260. Class 9. Electrodes for welding and brazing purposes.—Eutectic Welding Alloys Corporation, New York, U.S.A. Address for service, c/o Albert L. Mond & Thiemann, 14-18, Holborn, London, E.C.1.

**GROTUBE**.—No. 664,848, and **GROTUBE** (design). No. 664,846. Class 9. Electrically operated measuring apparatus, recording meters, electrically operated controlling apparatus included in Class 9 for heating installations, checking (supervision) apparatus, indicating apparatus for inspectional control, coin-feed apparatus and calculating apparatus.—Landis & Gyr A.-G., Switzerland. Address for service,

**D. Young & Co.,** 29, Southampton Buildings, Chancery Lane, London, W.C.2.

**ASTRA**.—No. 666,726, and **ASTRA** (design). No. 666,803. Class 9. Radio-gramophones, electric gramophones, electric record reproducers included in Class 9, electric record-players, sound amplifiers, radio receiving sets (complete) and loudspeakers.—The Gramophone Exchange, Ltd., Astra House, 121 and 123, Shaftesbury Avenue, London, W.C.2.

**DRIVEX**.—No. 666,999. Class 9. Electric cables.—British Driver-Harris Co., Ltd., Gaythorn Mill, Albion Street, Manchester, 15.

**APPINCO** (design).—No. 667,805. Class 9. Electrical apparatus included in Class 9; and scientific and checking (supervision) apparatus and instruments.—Apparatus & Instrument Co., Ltd., 16, Alexandra Gardens, Hounslow, Middx, and 15, Sheen Lane, Mortlake, London, S.W.14.

**PYROTENAX**.—No. 668,777. Class 9. Terminal plates and boxes for electric cables.—Pyrottenax, Ltd., Hedgeley Road, Hebburn-on-Tyne.

**AUTOPHONE, LTD.** (design).—No. 666,106. Class 9. Internal telephonic apparatus, electric intercommunication apparatus and electric internal signalling apparatus.—Autophone, Ltd., 73, Great Peter Street, Westminster, London, S.W.1.

**GADABOUT**.—No. 669,024. Class 9. Wireless apparatus.—E. J. C. S. St. John Chesney, trading as the Motovia Co., Francis Works, Attenbury Lane, Park Road, Timperley, Ches.



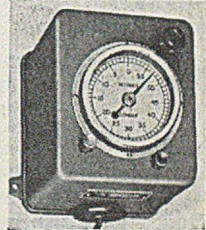
# RECENT INTRODUCTIONS

## NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

### Fast Charger

**A** HEAVY-DUTY mobile battery charger, incorporating metal rectifiers, which has been designed to fast charge 6 V or 12 V vehicle batteries *in situ* is introduced by F. C. HEAYBERD & Co., LTD., 28, Russell Square, London, W.C.1. The charging current, which can be set to 80 A at the commencement of charge, is made to taper at such a rate that the electrolyte temperature does not exceed the safe value (approximately 110 deg F), 85 per cent of full charge being possible in one hour. Alternatively, up to a dozen 6 V or 12 V batteries may be charged in parallel at a total current of 65 A. Provision is also made for testing batteries before the charging operation. The equipment is housed in a neat case of angle iron and sheet steel construc-

tion, a further button being provided to stop the timer before the end of a period should the necessity arise. The unit is designed for operation on 200/250 V 50 c/s mains and the internal switch will break 2 A at up to 400 V a.c. The old method of connection by means of a terminal block has been discontinued and re-



Londex process timer

placed by a six-way socket and plug. The casing is of cast aluminium and can be supplied for wall or flush mounting, the dimensions being 5.375in. by 6in. by 5.125in.

### Food Conveyors

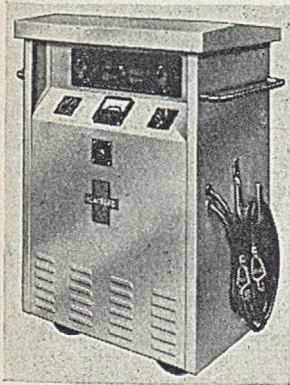
Two types of electrically heated food conveyors are now available from GARDINER & GULLAND, LTD., Garland Works, Hither Green Station, London, S.E.13. The two units are similar except that the hot closet is 4in. higher in the "Garland No. 1" than

in the "No. 2" model, which also incorporates a cold compartment at the bottom. Heating is by steel-jacketed thermostatically controlled 2 kW elements in the bottom, heat loss being minimized by the use of aluminium foil insulation, which incidentally also greatly reduces the weight.

Both inside and outside are finished in "Birmabright" aluminium alloy finish. The cast aluminium containers, which are in two sizes, have rounded corners to facilitate cleaning. Shock-absorbing castors ensure smooth running.

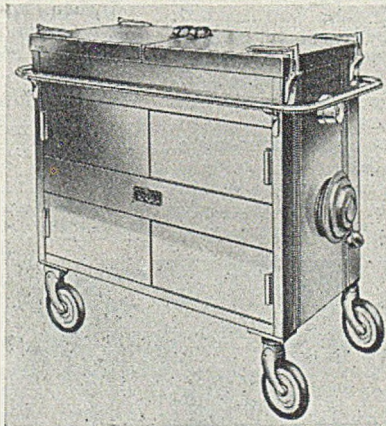
### Cold Cathode Lighting

To meet the demand for cold cathode lighting in increasingly varied types of commercial and industrial installations, the



Heayberd "one-hour" fast battery charger

(Below) "Garland" No. 2 food conveyor



tion, mounted on large rubber wheels and is complete with tough rubber cables for input and output connections.

### Process Timer

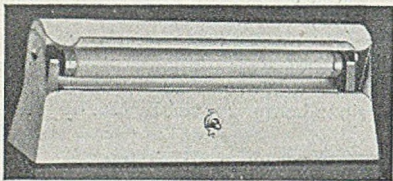
An addition to the products of LONDEX, LTD., 207, Anerley Road, London, S.E.20, is in the form of a small, compact and automatically self-resetting synchronous process timer which will find a wide variety of uses in the field of industrial control. It is fitted with a self-starting synchronous motor which runs continuously, the clutch being operated mechanically. Timing is accurate to within 0.5 per cent of the maximum period and is started by means of a push-button on the



GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, London, W.C.2, has introduced equipment for operating pairs of white tubes at the same current as the standard triple-tube fittings. Two tubes can be run at 120 mA each with this gear to provide satisfactory illumination for machinery or in situations where, by reason of low ceiling height, better light distribution is obtained from several fittings with two lamps than from a smaller number of the more usual fittings.

### Fluorescent Desk Lamp

A desk lamp incorporating a 10 W fluorescent lamp is a new product of the MERCURY DISCHARGE LIGHTING Co., LTD., 186, Seven Sisters Rd., London, N.7. It is finished in crackle ivory, green, brown and black. An adjustable reflector is incorporated and



"Mercury" fluorescent desk lamp

the glare-free light emitted surpasses in intensity that of a 40 W incandescent lamp.

### Electrolytic Capacitors

A range of electrolytic capacitors introduced by the PLESSEY Co., LTD., Ilford, Essex, and manufactured by the BRITISH ELECTROLYTIC CONDENSER Co., LTD., an associated company, has been designed primarily for capacitor start induction motors, but may be used for any other purpose involving the intermittent application of a.c. within the ratings specified.

Two main types are available, one with capacitances between 100  $\mu$ F and 260  $\mu$ F for use with 110 V 50 c/s motors and the other,

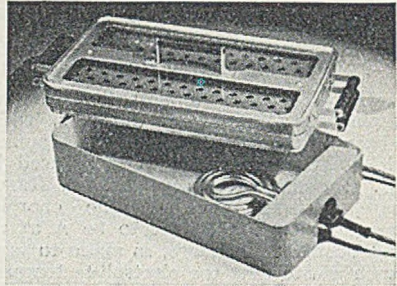
Plessey electrolytic capacitor with spring-clip fixing bracket

for use with 230 V 50 c/s machines, with capacitances of from 20  $\mu$ F to 80  $\mu$ F. They are housed in robust moulded casings, only three sizes being used for the entire range, incorporating a removable cap to provide easy access to the terminals.

### Sausage Reheater

A sausage reheater manufactured by RUMERE, LTD., 312, Chiswick High Rd., London, W.4, has a bottom tray approxi-

mately 20in. by 8in. by 4in. fitted with a 1 kW immersion-heater incorporating a



Rumere sausage reheater

safety device. Two intermediate trays with perforated bottoms are provided for reheating and keeping sausages and other food of a similar nature hot by the steam from the bottom tray. Intermediate trays with solid bottoms can be provided where direct contact with steam would be detrimental. The lid is fitted with two transparent panels.

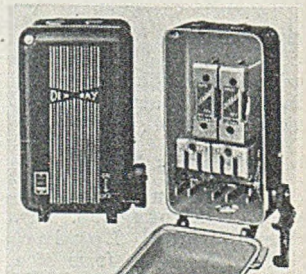
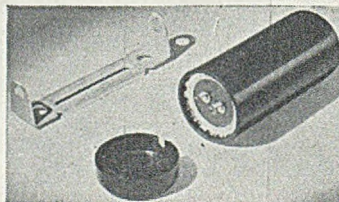
### Door Light

The battery-operated "Door Light," made by OLIVER PELL CONTROL, LTD., Cambridge Row, Burrage Road, Woolwich, London, S.E.18, is useful for the cupboard, garage, shed, cellar, etc. It is automatically switched on when the door is opened and off when closed. Special models are available for fixing under the bonnets or boots of cars. The price is 9s 9d plus 2s 1d purchase tax.

### Metalclad Switchgear

It is announced that a wide range of metalclad switch and fuse gear is now being

Dexray fused switch



manufactured by the DEXRAY ENGINEERING Co., LTD., Brock Street, Lees Street, Manchester, 1. At present 15 A and 30 A 250 V and 500 V double-pole, triple-pole and neutral switches, switched fuses and switched splitters are available, together with distribution boards using rewirable or h.r.c. fuses.



### Reports and Dividends

**Scophony, Ltd.**—At an extraordinary meeting held on 2nd February resolutions were passed changing the name of the company to Scophony-Baird, Ltd., and approving new articles of association. Mr. J. Diamond (chairman), who presided, said that as a result of the purchase of the assets of John Logie Baird, Ltd., and W. Andrew Bryce and Co., Ltd., they had acquired an extensive freehold factory in Wembley, a business which was already making television sets, and a subsidiary business producing transformers and electrical components generally. Referring to the company's present position, Mr. Diamond said that nothing had happened in the recent proceedings which had altered the position of the company in the United States. There was the greatest interest in television and in particular in their company, shown in the United States, and one-fifth of all their shares were held there, and, of course, the discount on sterling made it possible for them to be bought in the United States at approximately half the price ruling in Great Britain. Regarding the position in this country, time would be needed to secure the complete integration of Scophony, Baird and Bryce, and in the meantime it was inevitable that a loss would be incurred, as the board clearly envisaged from the start of the negotiations. Certainly there was no possibility of a dividend being declared this year. On the question of cinema television, Mr. Diamond said that the managing director had prepared a nation-wide plan which would shortly be put forward in the right quarters, under which the cinema and television industries could not only exist side by side, but would be of real benefit to one another.

**Scottish Cables, Ltd.**, announces that the board has given further consideration to its proposal to end the company's financial year on 31st March, and has decided that it would not be in the interests of the company to effect the change at the present time. It has consequently resolved to defer making any alteration until a later date and the company's financial year will therefore terminate on 30th April, 1949. The company has declared an interim dividend on the ordinary stock at the rate of 10 per cent (less tax).

**Bylock Electric, Ltd.**, reports a loss for the past year of £12,162, after directors' fees and depreciation, but before taxation. Against this, income tax recoverable will

amount to £4,868. No interim ordinary dividend was paid, and it is not proposed to pay a final dividend. For 1946-47 the profit, before tax, was £86,330, and the total dividend for the year was 300 per cent.

Mr. C. A. Mathes (chairman of the company) states that the reasons for the drop in turnover were those common to manufacturers of domestic electrical appliances and radio, the most important being variations in the rates of purchase tax. Everything was done to speed up production of new lines, and a spray unit introduced in June last has met with considerable success. A new model floor polisher has been successful overseas. The turnover during the six months ended 31st January, 1949, has shown a considerable increase on that of the previous six months.

**George Kent, Ltd.**—The subscription lists open to-day (Friday) for an issue of 360,175  $\frac{1}{2}$  per cent cumulative preference shares of £1 each at par and 285,700 ordinary shares of 10s each at 14s per share. In 1945 a programme was started of re-equipping the factories for peace-time production, and the proceeds of the issue, which will produce £524,165, will be used to repay a bank overdraft incurred by this programme. On 31st January last the bank overdraft amounted to £443,155, and the directors are satisfied that the balance of the proceeds of the issue, together with the normal banking facilities which are available, will provide the company with sufficient working capital for its needs. It is stated that the total orders in hand amount to over one year's production at the current rate, and that the company should be able to maintain in the current and future years a dividend on the increased ordinary share capital of at least the present rate of 10 per cent per annum.

### New Companies

**Procter & Sharpe, Ltd.**—Registered 31st January. Capital £500. To acquire the business of electrical and mechanical engineers now carried on by J. H. Procter and E. W. Sharpe at 12, Halifax Drive, Leicester, as Procter & Sharpe. Directors: J. H. Procter and E. W. Sharpe. Regd. office: 12, Halifax Drive, Leicester.

**E. V. Barnes Designs & Patents, Ltd.**—Registered 29th January. Capital £100. Manufacturers and repairers of and dealers in electric accumulators, batteries, acids and containers, electrical plant and fittings, wireless, etc. Directors: E. V. Barnes and



L. A. Barnes. Regd. office: Windyridge, Pear Tree Hill, Brighton Road, Salfords, nr. Horley, Surrey.

**Electrical Trades Service (Derby), Ltd.**—Registered 29th January. Capital £100. Manufacturers of and dealers in electrical and mechanical apparatus, particularly radio sets, valves, television sets, etc. Directors: G. Dixon and R. W. Watkins. Regd. office: 40a, Corn Market, Derby.

**Campbell Bros. (Dingwall), Ltd.**—Registered in Edinburgh 22nd January. Capital £10,000. Electrical engineers and contractors, installers and mechanical engineers, etc. Directors: J. F. Campbell, H. Campbell and A. Anderson. Regd. office: Park House, Dingwall.

**"Home" Electrical Repair Service, Ltd.**—Registered in Edinburgh 24th January. Capital £1,000. Installation, service and repair of refrigerators, washing machines, etc. Directors: B. W. Sopp and J. P. Struthers. Regd. office: 203, Hope Street, Glasgow.

**Pierce Brothers (Fleet), Ltd.**—Registered 28th January. Capital £2,500. Electrical engineers and contractors, lighting specialists, wireless and television engineers and service agents, etc. Directors: T. Pierce (first chairman) and R. Pierce, both of 176, Clarence Road, Fleet, Hants, and E. W. Carslake.

**Chas. Ford (Electrical Contractors), Ltd.**—Registered 28th January. Capital £2,000. Directors: C. F. Ford and G. H. T. Barker. Regd. office: 14, Northwood Road, Thornorton Heath.

**Denco Distributors, Ltd.**—Registered 27th January. Capital £1,000. Distributors of and manufacturers of and dealers in wireless and television transmitters and receivers, etc. Directors: A. Waygood, G. R. Waygood and C. Waygood-Cox. Regd. office: 115, Fleet Street, E.C.4.

### Increases of Capital

**Cuttriss, Ltd.**—Increased by £3,000, in £1 ordinary shares, beyond the registered capital of £2,000.

**Mayor Smith, Ltd.**—Increased by £1,000, in £1 5 per cent non-redeemable cumulative preference shares, beyond the registered capital of £1,000.

### Companies to be Struck Off the Register

The names of the following companies will be struck off the Register at the expiration of three months from 1st February, unless cause is shown to the contrary: London Radio Engineers, Ltd.; Radioactive Products, Ltd.; Radionic Products (London), Ltd.; Radio Teleception, Ltd.

### Companies Struck Off the Register

The names of the following companies have been struck off the Register and they are thereby dissolved: B. H. Radio Service & Television, Ltd.; Commercial Telephone Co., Ltd.; Newmans (Electrical Services), Ltd.

### Liquidation

**Crowne Electronic Engineering Laboratories, Ltd.**—In voluntary liquidation. Meetings of creditors and members on 16th March at Lloyds Bank Chambers, Penzance, to receive an account of the winding-up by the liquidator, Mr. K. C. Robins.

### Bankruptcies

**H. J. F. Scanes**, "The Outlook," Arley Road, Parkstone, Poole, Dorset, radio and electrical engineer, formerly residing and carrying on business at 98, Sandbanks Road, Parkstone, Poole, under the style of Finch's—First meeting 15th February, at the Official Receiver's Office, 10, Rockstone Place, Southampton. Public examination, 21st February, at the Law Courts, Stafford Road, Bournemouth.

**W. H. Tordoff**, residing and carrying on business at 10, Burnett Avenue, Manchester Road, Bradford, electrical engineer.—Supplemental dividend of 3s 1½d in the £1, payable 16th February at the Official Receiver's Office, Hallfield Chambers, 71, Manningham Lane, Bradford.

### B.I.F. Catalogue

THREE months before the opening of the British Industries Fair nearly 10,000 copies of the catalogue were despatched for the use of trade buyers throughout the world. This edition is six weeks earlier than in any previous year, and is expected to play an important part in attracting buyers to the Fair. The catalogue, which will be presented free of charge by United Kingdom Government officials overseas, is in two parts totalling more than two thousand pages.

Three thousand manufacturers will exhibit at the Fair from 2nd to 13th May at Castle Bromwich, Birmingham, and at Earls Court and Olympia in London. The two London buildings are covered by one catalogue in which nearly 2,000 manufacturers are listed and cross-indexed alphabetically, in classified trade groups, or under schedules of products. This is accompanied by a separately bound general index in nine languages. The overseas demand for this advance edition is far in excess of the number permitted by paper supplies. No copies of the catalogue will therefore be issued in the United Kingdom until the final edition is on sale at the Fair Buildings.



# STOCKS and SHARES

THAT there is no lack of money awaiting employment in Stock Exchange securities is evidenced by the strength shown by prices in the various markets which deal with permanent investment. The speculative interest is more or less dormant for the time being, held in check largely by the expense involved by the 2 per cent stamp duty and other charges. Investment, however, pours capital into such shares as General Electrics and others in the same, and similar groups, with the result that prices are well maintained. Any stock which comes to market through the channel of deceased accounts is promptly taken. The long delay which frequently occurs in the matter of buyers obtaining delivery of their purchases shows how sparsely supplied with stock are many of the markets at the present time.

A Stock Exchange jobber will make a price in the ordinary course of business, and having sold shares he hopes to replace them, at all events, within a week or two from selling orders that come in to the market. Yet experience shows that there may be a wide gap between the date of purchase and the actual delivery of the stock. The rights of the buyer to dividends and other benefits are, of course, fully protected; he suffers no disability through the delay.

## Gilt-Edged Firmness

Medium and long-dated stocks, including the British Transport and Electricity issues, are showing to good advantage in the generally steady gilt-edged market. Electricity "threes" are over 103, and Transport stock is 101½. Strength of the market is attributed to the persistent weight of money (bank deposits keep near record levels) which continues to come down heavily on the side of safety-first investments. In May, the British Gas stock is to be launched. Later in the year, the Treasury will have opportunities to deal with large amounts of stock approaching maturity. From this it is inferred that the authorities will discourage, for the time being at least, any tendency for interest rates to rise, and thereby disturb the market in Government securities.

## Debenture Stocks

By way of relief to the chronic shortage of first-class debentures, the electrical market can occasionally offer Ericsson Telephone 3½ per cents at around 104½. The yield of £3 7s per cent, without allowing for capital loss on redemption, witnesses to the gilt-edged character of the security. Issued last year at par, the stock will be repaid at 101 between 1965 and 1975. A half-year's interest is due on the last day of June and

December. British Aluminium's new 3 per cent debentures are quoted 2 points above the issue price of 95, and yield £3 1s 9d per cent with useful appreciation on repayment between 1952 and 1988 at prices declining from 102½ at the earliest date to 100 at the latest.

## Preference Shares

Reyrolle 4 per cent preference shares have come on offer at 21s 9d to yield £3 13s 6d per cent, which, although modest enough, ranks as a relatively good return in the company of first-class industrial prior charges. Comparable yields are fairly common among the less popular high-priced shares such as G.E.C. 7½ per cents at 40s and A.E.I. "eights" at 42s, which pay £3 15s and £3 16s 3d per cent respectively. In the lower-price range, however, it is still difficult to achieve much more than the yield of, for instance, £3 12s 6d per cent on English Electric 3½ per cents at 20s 9d. Siemens "fours" at 22s 9d return only a few pence over 3½ per cent, the redemption terms lending added attraction to the security. Hackbridge Cable 5 per cent preference can be bought at 25s to give a round 4 per cent.

## Electrical Equipment Shares

Quiet conditions have again prevailed this week in the industrial sections. With the gilt-edged market consolidating on a yield basis under 3 per cent, the returns of less than 4 per cent on leading electrical equipment and other equities, acquire firmer foundations. In terms of yield, Henley's at 26s 6d and B.I.C. at 35s 6d have come roughly into line on the 3½ per cent mark. Siemens and Enfields are on offer at the common price of 36s 6d, paying £4 2s 3d per cent on the money. That trading conditions have varied sharply between the heavy and some of the lighter branches of electrical engineering, is pointed again by the loss shown in Bylock Electric's accounts. The 15 shares issued about eighteen months ago at 30s are now about 5s; and no dividend is declared, against 300 per cent last time.

## Week's Price Changes

Cable & Wireless ordinary stock stands out amongst the week's price movements with a gain of 4 points to 220, though the preference at 123½ is 2 lower. Anglo-American Telegraph deferred, at 24½, has risen a couple of points. Pye deferred at 32s 6d and De La Rue at 41s 3d are both 1s 3d higher, and Plessey at 18s 6d show a 1s gain. Chloride remain at 101s 3d. Among the falls, Tube Investments at 6½ are 2s 6d down, and declines of 1s left Corsor at 10s and Crabtree at 41s. E.M.I. at 18s 9d are 1s 3d lower. The volatile Vactric at 17s 6d have gone back 6d.



# Next Week's Events

## Monday, 14th February

BIRMINGHAM.—Imperial Hotel, 6 p.m. I.E.E. South Midland Supply and Utilization Group. "Centralized Ripple Control on High-Voltage Networks," by T. W. Ross and R. M. A. Smith.

BRISTOL.—Grand Spa Hotel, 6.30 for 7 p.m. I.E.E. Western Centre. Annual dinner-dance and visit of President.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "Tidal Power and the Severn Barrage," by H. Headland.

## Tuesday, 15th February

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. Discussion on "Water-Cooling versus Air-Cooling for High Power Valves." Opened by J. Bell.

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6.15 p.m. Association of Supervising Electrical Engineers. "Electrical Installation Practice," by W. F. Parker.

LUTON.—Girls' High School, Alexandra Avenue, 7.30 p.m. Luton Electrical Society. "Special Protective Means for Portable Electric Appliances," by F. E. Butcher.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Measurements Group. "The Theory and Design of Magnetic Amplifiers," by H. M. Gale and P. D. Atkinson.

## Wednesday, 16th February

BRIGHTON.—Technical College, 6.30 p.m. I.E.E. Southern Centre. "Railway Traction Control Equipment on Suburban London Transport," by E. Webster.

EDINBURGH.—Heriot-Watt College, 7 p.m. I.E.E. Scottish Centre. "Corrosion of Heating Surfaces in Boiler Plants," by J. R. Rylands and J. R. Jenkinson.

LONDON.—Central Hall, Westminster, S.W.1, 6.30 p.m. Institution of Electrical Engineers. Faraday Lecture on "Television," by Sir Noel Ashbridge and H. Bishop.

I.E.E. London Students' Section, 2.15 p.m. Visit to Johnson Matthey & Co., Ltd., E.C.1.

SHEFFIELD.—Royal Victoria Station Hotel, 6.15 p.m. I.E.E. Sheffield Sub-Centre. "Transformer Economic Efficiency," by B. Calvert, and "A New Method of Determining the Regulation of Alternators at Unity and Lagging Power Factors," by D. Harrison and C. V. Jones.

## Thursday, 17th February

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "Modern Lighting," by J. Lillis.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. "Railway Traction Control Equipment on Suburban London Transport," by E. Webster.

I.E.E. London Students' Section, 9.30 a.m. Visit to Associated Newspapers, Ltd., E.C.4.

L.C.C. School of Engineering and Navigation, Poplar, E.14, 7.30 p.m. Institute of Marine Engineers. "Steam Generation for Power Stations," by W. R. Harvey.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 7 p.m. Joint meeting of the Students'

Sections of the I.E.E. North-Eastern Centre and the North-East Coast Institution. "The Design of Plastic Mouldings," by C. T. Graham.

RUGBY.—Electricity Showrooms, 6.30 p.m. I.E.E. Rugby Sub-Centre. Short papers on "Industrial Electric Heating," by Dr. W. Wilson, P. G. H. Burbridge, J. E. Gamage and R. Abbot.

## Friday, 18th February

LONDON.—I.E.E. London Students' Section, 9.30 a.m. Further visit to Associated Newspapers, Ltd., E.C.4.

39, Victoria Street, S.W.1, 6.30 p.m. Junior Institution of Engineers. Informal meeting. "Review of Scientific and Technological Developments since the 17th Century," by C. Hunnikin.

## Saturday, 19th February

MANCHESTER.—At the Geological Society, 16, St. Mary's Parsonage, 2.30 p.m. Junior Institution of Engineers (North-Western Section). "A Brief Survey of some Gas Turbine Applications," by H. Farrington.

SUNDERLAND.—I.E.E. North-Eastern Students' Section, 2.30 p.m. Visit to Sunderland power station.

## B.S.I. Publications

### Code for Private Telephone Services.—

There has been issued in draft form for comment a Code of Practice (CP327.102, price 5s) concerned with telephones and telegraphs for private services, other than those connected to the public service or supplied by the G.P.O. The proposed recommendations refer mainly to installations in new buildings.

### Asbestos-covered Copper Conductors.—

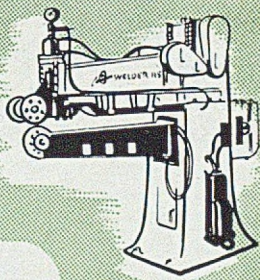
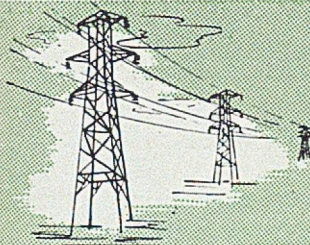
Impregnated asbestos-covered solid copper conductors used for the windings of electrical apparatus is the subject of BS.1497 (price 2s), which is based on data supplied by the E.R.A. The properties of the conductor and its covering are specified as well as the thickness of the latter; ageing and other tests are prescribed.

### Specifying Metallic Finishes.—

The designations of metallic finishes of such accessories as switchbox covers have been completely defined in BS.1448 (price 2s 6d), which should assist purchasers to avoid confusion when matching fittings. Differentiation is by a series of symbols chosen to represent the nature of the surface, its colour and the way in which the latter is relieved. For example, in BS/P/C8 the meaning of the letter "P" is polished surface, and "C8" means coinage bronze.

Copies of the above publications are obtainable from the British Standards Institution, 24, Victoria Street, London, S.W.1.

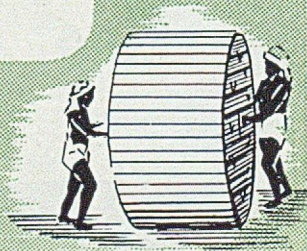
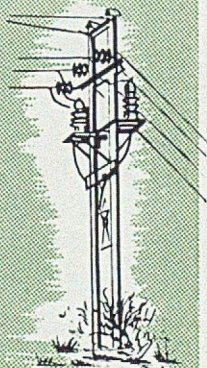




## ELECTRICAL EQUIPMENT FOR INDUSTRY

B.I.C.C. is the World's largest organization concerned with the manufacture, marketing and contracting of electrical transmission, radio and telecommunication equipment.

All types of cable for working pressures up to 264,000 volts are made by B.I.C.C. Other products include overhead transmission lines, electrification equipment for railways and trolley-buses; electric welders, magnetic moulding machines and meters. The Company also supplies and erects transmission towers, radio masts, hangars and steel bridges. Write for publication No. 215P, giving complete list of B.I.C.C. products.



**BRITISH INSULATED CALLENDER'S CABLES LIMITED**  
**NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2**

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A glance at this sample of 11 kV

Aberdare cable tells you

the whole story. Here, in the

geometrical precision and  
even tensioning of the  
paper tapes, is the secret of

Aberdare's transmission

reliability. Only the

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lapping machines, together with

the latest 'closed system'

impregnating plant

and 'Super Tension' impreg-

nating compounds, can

ensure the transmission

efficiency you expect—and get

—with Aberdare cables.

# UNIFORMITY

the

secret

is

precision

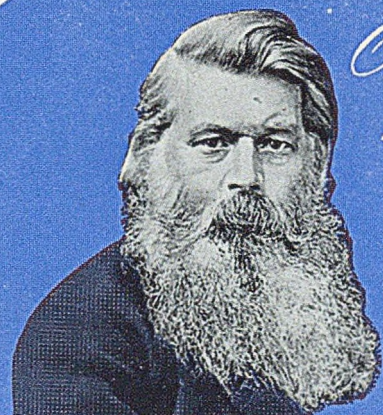
lapping



*Aberdare Cables*

Aberdare Cables Ltd., Aberdare, Glam. London Office: Nineteen Woburn Place, London, W.C.1.  
Associated Company: Aberdare Cables of South Africa Ltd.  
Works: Stanford Road, Neave Township, Port Elizabeth, P.O. Box 494.  
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*The Enfield Grid Suspension system is a new and simplified method of installing electricity by overhead distribution using catenary cables and connection boxes. The steel-cored cables can be clipped to or suspended from existing steelwork and considerable distances can be spanned between supports. No conduit is necessary. The system effects great saving in time, labour and money*

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# GRID SUSPENSION SYSTEM

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**AGENTS IN:**—Southern Rhodesia, Northern Rhodesia, Portuguese East Africa, India, Pakistan, Ceylon, Burma, Malaya, Cyprus, Kenya, Iran, Iraq, Jamaica, Palestine, Syria and Lebanon, Hong Kong, Iceland, Finland, Portugal, Spain, Norway, Sweden, Denmark, Holland, Belgium, Switzerland, Greece, Turkey, Malta and Egypt.

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# The Modern Trolley-bus

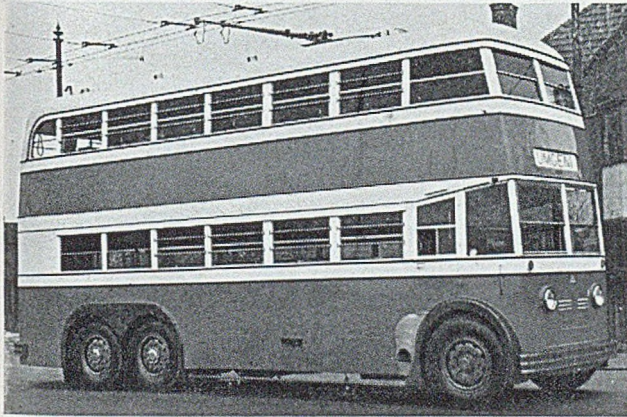
**I**N London, in 1909, the first British-built trolley-bus was tried out, and the trolley-bus of to-day embodies forty years' experience in the design and operation of these vehicles. In Great Britain they began to come into prominence as public service vehicles in the

**A GENERAL SURVEY  
OF BRITISH DESIGN  
By J. H. CANSDALE\*  
M.I.E.E.**

quieter than any other public service vehicle and does not emit any fumes.

The public likes it because it gives a swift smooth ride; the operator finds that it is economical to run, its maintenance is small and its life long.

The double deck vehicle has been developed primarily for use in Great Britain, where 95 per cent of the trolley-buses are of

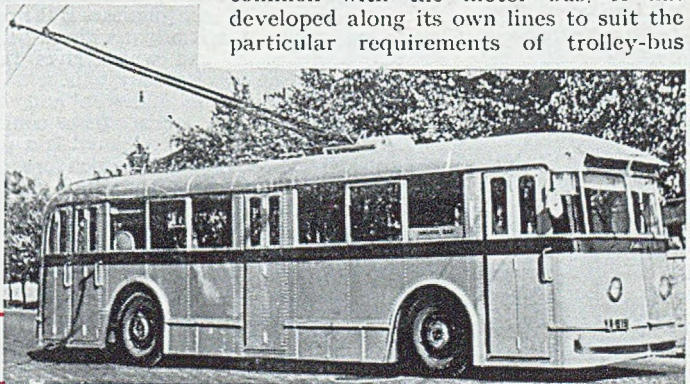


**Sunbeam trolley-bus fitted with B.T.H. equipment for Durban, 52 in service on order**

early 1920s and about 4,800 vehicles are now in service or on order. In the United States they have become popular only during the last ten years and numbers have increased rapidly; the total now slightly exceeds the number in Great Britain. In other parts of the world, notably in Australia and South Africa, there are a number of installations. The trolley-bus is now widely recognized as the premier electric road vehicle. It combines the best qualities of the tram-car and the motor

this type. South Africa also prefers double-deck vehicles, but elsewhere single-deck vehicles are most commonly used and form the large majority of trolley-buses shipped overseas.

Although the chassis has much in common with the motor bus, it has developed along its own lines to suit the particular requirements of trolley-bus



**Norwegian-built chassis with Metro-Vickers electrical equipment at Oslo**

bus; it can accelerate rapidly due to its immense reserve of power; it is flexible in traffic and permits kerb loading; it is

operation. A typical two-axle chassis, of a kind frequently supplied for overseas service, has a wheel base of 16 ft. 3 in. and is suitable for a single deck body up to 33 ft. long and 8 ft. wide, giving a capacity up to 38 seats. Where greater

\*Deputy manager, Traction Sales Dept., British Thomson-Houston Co., Ltd.





## THROWING NEW LIGHT ON AN OLD PROBLEM . . .

One of the weightiest problems that faces the people who value the appearance of their premises is the problem of lighting. How to get lighting that is bright without being harsh, practical without being plain—and which gives full illumination without running up heavy electricity bills.

The new Crompton 'Aldwych' and 'Albany' fluorescent lighting units more than satisfy these conditions. The 'Aldwych' is a ceiling unit; the 'Albany' is a pendant unit. Both have reeded plastic side panels which provide pleasant diffusion of the bright fluorescent light. Both are light on electricity consumption and easy to maintain.

Crompton can offer a wide range of 2 ft., 4 ft. and 5 ft. fluorescent units of many types and in many styles to anyone who would like to end their lighting problems.

The 'Aldwych' and 'Albany,' catalogue No. AL 2431, house two 80 watt fluorescent tubes and auxiliaries. Besides providing diffused light through the side panels, they give a strong concentration of light below through lattice louvers which also screen the tubes from direct view from normal angles. All equipment is easy to get at and metal-work is corrosion-proof.

# Crompton

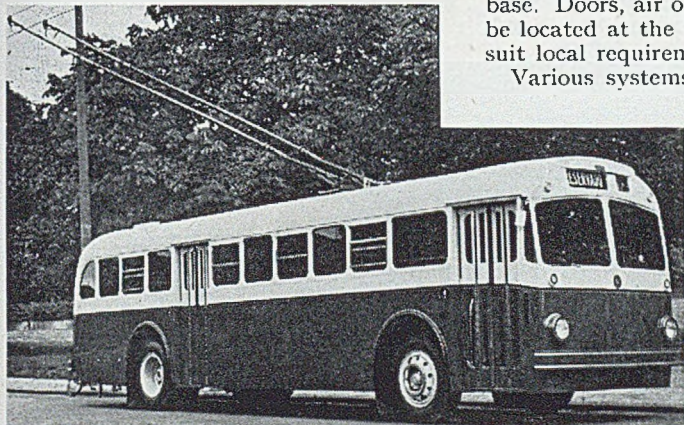
## FOR THE LATEST IN FLUORESCENT LIGHTING

CROMPTON PARKINSON LIMITED

Sales Office: CROMPTON HOUSE, ALDWYCH, LONDON, ENGLAND  
BRANCHES AND AGENTS IN MOST PRINCIPAL COUNTRIES OF THE WORLD



capacity is required, up to 44 seats, a larger vehicle with a wheel base of 18 ft. 6 in. and suitable for a body with a maximum length of 35 ft. can be supplied.



Various systems of lighting are available, using either metal filament or fluorescent lamps. As compared with the metal filament, the fluorescent lamp gives a much higher lighting intensity for the same amount of power and this type

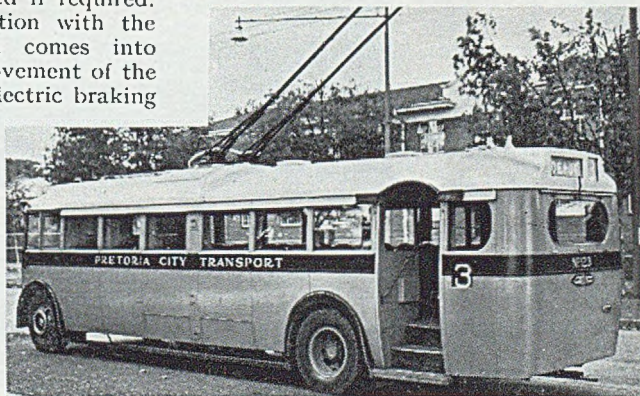
**British United Traction chassis with English Electric 150 h.p. equipment for Sao Paulo, Brazil—one of four vehicles**

Such a vehicle provides ample standing room so that a total load of up to 75 passengers can be carried. The largest three-axle chassis is suitable for taking a double-deck body having a seating capacity up to a total of 72.

The rear axle is of the underslung worm type with fully floating axle shafts and the ratio varies from  $9\frac{3}{4}$  to  $10\frac{1}{2}$ , depending on service requirements. Air-operated brakes are normally supplied, but hydraulic brakes can be fitted if required. These operate in conjunction with the rheostatic braking which comes into operation on the initial movement of the brake pedal. The use of electric braking which is effective to give adequate service braking down to about 4 m.p.h. greatly reduces brake shoe wear.

British manufacturers have had a long experience in motor vehicle

**Leyland chassis with G.E.C. electrical gear at Pretoria**



bodywork and various designs of all-metal and composite bodies are available. The all-metal construction, which provides a light but very strong body, is very popular. The space between the inner

and outer skins can be packed with aluminium foil, or similar material, to provide both heat and noise insulation. The roof frame is specially strengthened to carry the resiliently mounted trolley base. Doors, air operated if required, can be located at the front, centre or rear to suit local requirements.

of lamp lends itself well to use with either direct or indirect lighting fittings. With both types of lamp the supply can be taken directly from the line or, alternatively, from a battery and low voltage generator or motor-alternator set.

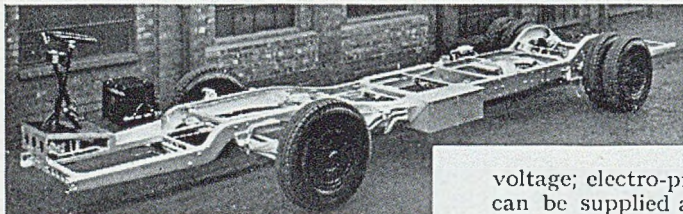
The type of trolley-bus control now generally favoured uses a compound wound non-regenerative motor with rheostatic braking. The motor has a strong series field and the shunt field is used

primarily to provide an easily controlled electric brake. By means of a special connection of this shunt field, or by using the bucking action of the series field, the braking torque is maintained substantially



constant over the greater part of the range.

The latest motor is of floodproof design so arranged that it can pass through flood waters up to its centre point without damage. Class B insulation is used throughout and the armature is wound

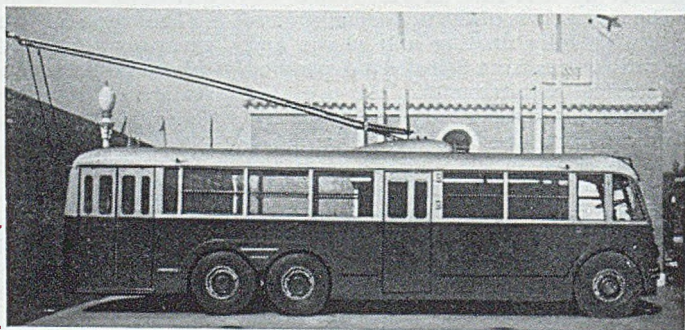


Sunbeam MF 2.B chassis for single deck body of large seating capacity

with single turn coils. The motor is capable of accelerating the largest vehicle at a rate of 3 m/h s and ample overload capacity is provided to meet all conditions of operation. Horse-power ratings range from 95 to 140 (one hour) in accordance with operating requirements.

The control equipment consists essentially of two circuit breakers, a master controller and reverser, a set of contactors and starting resistors. In the case of single deck vehicles it is usual to mount the circuit breakers and the master controller and reverser in the driver's cab with the contactors in boxes alongside the chassis frame, or at the rear of the vehicle. The

Crompton Parkinson 135 h.p. vehicle with pre-assembled Allen West control gear at Zaragoza, Spain



resistors are preferably roof mounted, but they may be accommodated on the underframe; this is the usual position in the case of double deck vehicles. A recent development is the assembly of all control equipment, with the exception of circuit breakers and resistors, in a cab control unit which is mounted alongside the driver. The use of this unit simplifies installation and maintenance, but it is only possible when a full cab is available.

The master controller, which has two separate portions, one for accelerating

and one for braking, uses silver-tipped contacts, and operation is either on the scissors principle or by means of cams. It is interlocked mechanically with the reverser, which can only be operated when the controller is in the off position.

The contactors are usually of the electro-magnetic type, with the coils operating at line

voltage; electro-pneumatic contactors can be supplied as an alternative. Small choke coils are connected in the control circuit to prevent radio interference and a condenser unit fitted in the roof of the vehicle and connected between poles and to earth minimizes any interference arising from the main circuit.

An additional feature now frequently incorporated is battery manœuvring. This uses a parallel-series battery arrangement which for normal conditions has the two halves of the battery connected in parallel across the charging generator. To enable the vehicle to be moved for a

short distance under its own power a special switch connects the battery sections in series across the motor. This feature is very useful for manœuvring in the garage or for by-passing an obstruction on the road.

Automatic acceleration is a feature which is now becoming very popular. Various means are employed, but they all set the maximum rate at which an equipment can notch up; the driver merely has to put his control pedal right down and the equipment looks after





**UNOBTRUSIVE**  
*efficiency....*

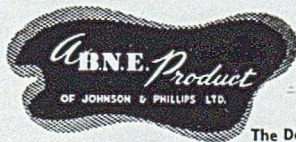


## **THE *Charlton* 'TWIN'**

**DUAL-PURPOSE ELECTRIC WATER HEATER**

Provides a complete Hot Water Service from an easily-installed compact unit. It has been designed for installation under the draining board for four reasons: (1) This space, in the modern kitchen, is rarely used efficiently. (2) Gives the shortest pipe run to supply point. (3) Allows simple floor mounting. (4) Unit can be enclosed.

The "Charlton" Twin is the most effective water-heating system for the medium-sized home. Ask for leaflet HD 20 now!



**BRITISH NATIONAL  
ELECTRICS LTD.**

The Domestic Appliances section of Johnson & Phillips Ltd

**NEWARTHILL · MOTHERWELL · SCOTLAND**



itself. The arrangement is such that the driver can notch up step by step if required, the control taking over only if he tries to accelerate faster than the maximum setting. Automatic control improves performance since it is no longer dependent on the skill of the driver; it prevents jerky starting and so increases passenger comfort; and it minimizes driving fatigue.

A low voltage supply for lighting and, if required, for door control, can be provided by means of a battery and motor generator set or a generator driven from the main motor. A popular method is to use an overhung generator mounted on the extension of the main motor shaft.

### COMBINED MEASURING INSTRUMENT

**A**N instrument recently introduced by Nalder Bros. & Thompson, Ltd., London, E.8, is already being well received abroad. The "Vectormeter," as it is called, is a new indicating type measuring instrument which enables simultaneous readings of kilowatts, kVA, power-factor and amperes to be taken at a glance on one dial. It comprises in combination a wattmeter element with a pointer movable in a straight line and a reactive kVA element with a pointer movable in a straight line at right angles to and over the same area traversed by the pointer of the wattmeter.

The measuring elements are generally of the centre-zero type thus indicating export or import power and export or import reactive power, respectively. The dial comprises a series of concentric circles which represent a scale of current. The line which passes through the centre

The latest type is rated at 1,800 W and cuts in at about 4 m.p.h.

A "dewirement" indicator, which gives audible and visible indication of a trolley dewirement, is a normal fitment, as also is a leakage testing socket which enables the insulation resistance of the electrical circuits to be checked readily before the vehicle goes into service.

The trolley collector is now invariably of the slipper type with carbon insert and this not only reduces wear of the overhead wire but is also less prone to dewirement. Automatic trolley retrievers are not normally used on trolley-buses in Great Britain, but they can be supplied if required.

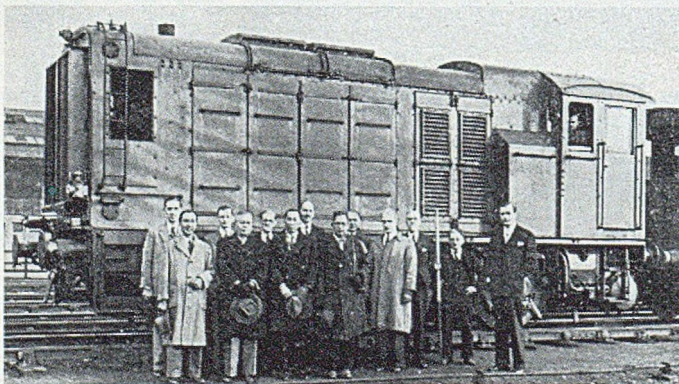
of the circles and through the point of intersection of the two pointers indicates the power factor of the system which may be read off the outer circle. The length of line from the centre of the circles to the point of intersection of the pointers indicates the value of amperes. The "Vectormeter" is eminently suitable for use in the control room of large power stations.

### SIAMESE PURCHASING MISSION VISITS BRUSH WORKS

**M**EMBERS of a Siamese Purchasing Mission recently visited the works of the Brush Electrical Engineering Co., Ltd., at Loughborough. Photographed alongside a "Petter-Brush" diesel-electric shunting locomotive are Luang Charan Snidvongs, Permanent Under Secretary to the Ministry of Communications, who

headed the Mission, Luang Thavil Sretha Panichkarn, Luang Vithoon Vithikol and Luang Vithes Yontrakit. The main purpose of the Mission's visit to this country was to buy rolling stock for the Siam State Railways.

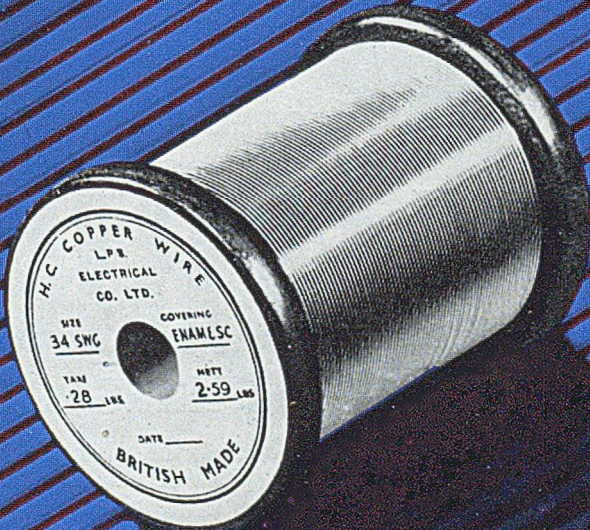
Siamese visitors to the Brush works alongside a Diesel-electric shunting locomotive







MAGNET WIRES IN EVERY COMBINATION  
OF COVERING  
STRANDS CORDS AND CABLES



FIBRE GLASS INSULATED CONDUCTORS

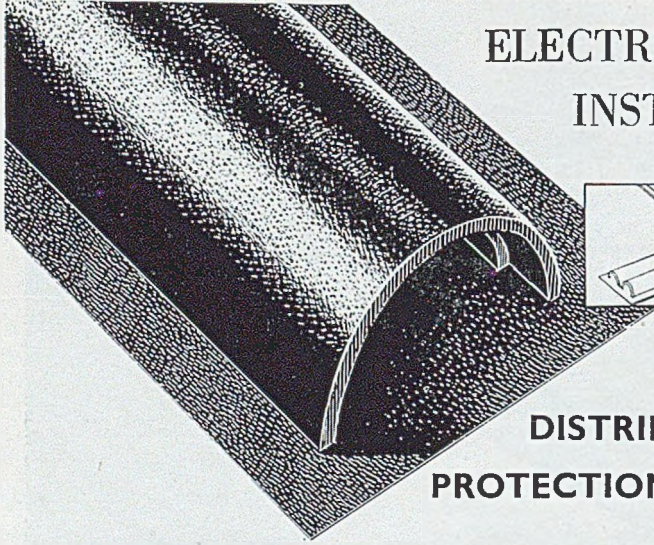
**LPS**

ELECTRICAL CO. LTD.

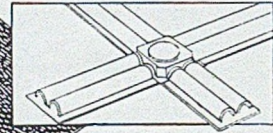
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## ELECTRICAL INSTALLATIONS



**EFFICIENT  
DISTRIBUTION AND  
PROTECTION OF CABLES**

# KEY FIBRE

## UNDERFLOOR DUCT WIRING SYSTEM

In this post-war period of reconstruction and expansion the Key Fibre Duct is playing a major part in the installation of electric cables in office buildings and factory premises with the minimum use of steel conduit. Designed for maximum flexibility, Key Fibre Ducts can be tapped where and when required, enabling all present and future electrical requirements to be provided for. Manufactured from Cellulose Fibres and thoroughly impregnated with Bituminous Pitch, Key Fibre is non-condensing and non-corrodible and is therefore ideal for use in all climates.

*Other "KEY" products include:—*

**KEY FIBRE CONDUIT** (for underground cables)  
and **KEY ALUMINIUM ALLOY CONDUITS**  
in sizes up to B.S. 31, for domestic wiring

**THE**

# KEY

## ENGINEERING COMPANY LTD.

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### ★ EXPORT

Agents' names for European, African and Middle East countries will be supplied on application.

TRAFFORD PARK,  
MANCHESTER

"KEYPOINT," MANCHESTER



# Rural Transformers

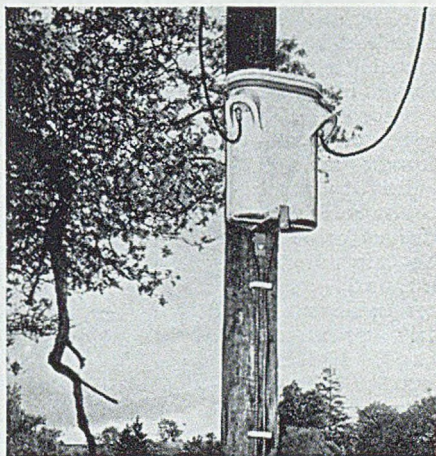
HERMETICALLY SEALED IN STONEWARE CONTAINERS

FOR rural distribution work transformers hermetically sealed in stoneware containers have very many advantages. In the first place the use of porcelain instead of steel for the containers makes it possible to reduce the size of the units considerably, since, porcelain being an insulator, it is not necessary to worry about clearances. The hermetic sealing prevents the ingress of oxygen and so minimizes the tendency of the oil to acidity,

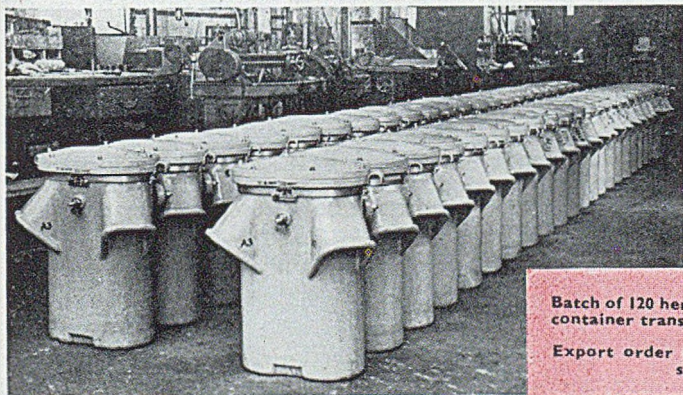
In any case, even if acidity should develop, it is of no great moment since the stoneware container is acid resisting: thus one of the chief causes of failure due to acidity, namely the corrosion of the tank, is eliminated. As yet another safe-

operate, even in the tropics. In normal circumstances no pressure will be generated inside the tank.

Of especial advantage for service in rural areas, where the load though normally low is liable to heavy peak demands, is the high overload capacity; a 10-kVA single-phase unit is capable of dealing with peak overloads of 15 kVA for five hours, starting cold with ambient temperature not exceeding 25 deg C. Iron and copper losses are claimed to



10-kVA pole-mounted transformer in position



Batch of 120 hermetically sealed stoneware container transformers ready for despatch

Export order for transformers ready for shipping (below)

guard against the possibility of acidity development the windings are impregnated with thermosetting synthetic varnish which is highly resistant to hot transformer oil. The containers are sealed at 95 deg C, far above any temperature at which they will be expected to

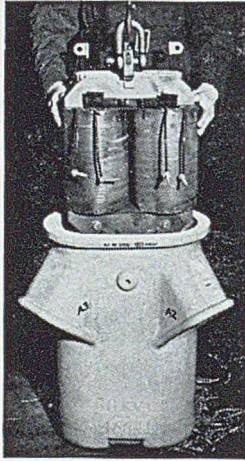




be 30 and 40 per cent respectively below the figures usually associated with a standard 10-kVA transformer of conventional design. The reduced copper loss results in low inherent voltage regulation.

Because this type of transformer is well suited to meet the arduous conditions liable to be encountered abroad the manufacturers and patentees, the British Power Transformer Co., Ltd., Queensway, Ponders End,

Lowering a transformer into its stoneware container



Middlesex, are at present sending the whole of their output overseas. Orders have recently been received for 150 transformers for South Africa, 900 for Eire, 60 for Australia, 50 for Barbados and

10 for Abyssinia. They are proving particularly satisfactory in Barbados, where the life of a steel tank may be as short as twelve months.

By standardizing their design to a large extent the makers have not only considerably reduced costs but also facilitated service and maintenance. Two tank sizes only are made—one for 2½-kVA units and one for 5-, 7½- and 10- kVA types, all single phase only. Actually the very small difference in the relative costs has resulted in the 10- kVA model being almost always adopted. The transformers are wound for 6.6 or 11 kV and an output of 240 V, tappings being provided to compensate for variations in the supply pressure of plus 3 per cent, minus 3 per cent and minus 6 per cent. The windings are insulated for impulse tests at 95 kV on the h.v. side and at 30 kV on the l.v. side.

Supports are provided for pole mounting, and to assist installation the cradle housing the stoneware container is fitted with lifting hooks and a fixing lug which engages the top of a specially-designed anti-rocking steel bracket bolted to the pole. A bottom support carries the weight of the transformer.

### CONTROL EQUIPMENT FOR DREDGERS

THE Brookhirst control panels illustrated are part of the specially designed electric motor control gear supplied for use on five electrified dredging equipments on dredgers which are to be employed in cutting the new canal between Donjere and Mondragon in the

South of France. The contract for the supply of the complete a.c. electrical equipment was obtained by the British Thomson-Houston Co., Ltd., Rugby, who sub-let the contract for the motor control equipment to Brookhirst Switchgear, Ltd., Chester.

Part of the specially designed Brookhirst electric motor control equipment for dredgers to be used in cutting a new French canal

The control gear includes automatic starters for seventeen main motors, ranging from 3 h.p. to 350 h.p. on each dredging equipment. The starters are arranged to work in sequence to ensure correct starting and control of the complete equipment.





# FINE

## *Resistance Wires*

### NICKEL-CHROMIUM 80 20

Used almost without exception for all high value wire-wound fixed and variable resistors. It possesses a very high resistance to corrosion, is non-magnetic and combines a high resistivity with a low temperature co-efficient.

### COPPER-NICKEL 56 44

Well known as Constantan or Ferry, is characterised by a moderately high resistivity together with a very low temperature co-efficient and is widely used in measuring instruments.

### MINALPHA

A manganese-nickel-copper alloy superior to the older Manganin alloy in respect of both temperature co-efficient and thermo-electric effect. Employed in standard resistances and for coils in measuring apparatus where resistance must remain constant despite fluctuating temperatures.

### MANCOLOY 10

A copper alloy with a low resistance combined with a relatively low temperature co-efficient. Its use is advantageous when a low but practically constant resistance is required in instruments and radio apparatus.

Specialised Products of

**Johnson**  
  
**Matthey**  
& CO., LIMITED

Hatton Garden, London, E.C.1, Eng.

*Comprehensive information on these and other materials, together with tables of resistance per yard, and tolerances, are given in an illustrated booklet, "Electrical Resistance Materials," available as publication 1440.*

*Agents in all parts of the world*



# Tucker

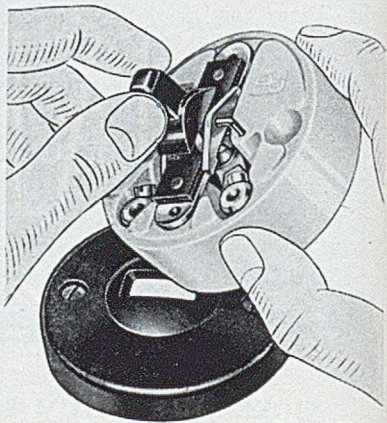
## FLASHPROOF

### 5 amp. A.C. SWITCHES

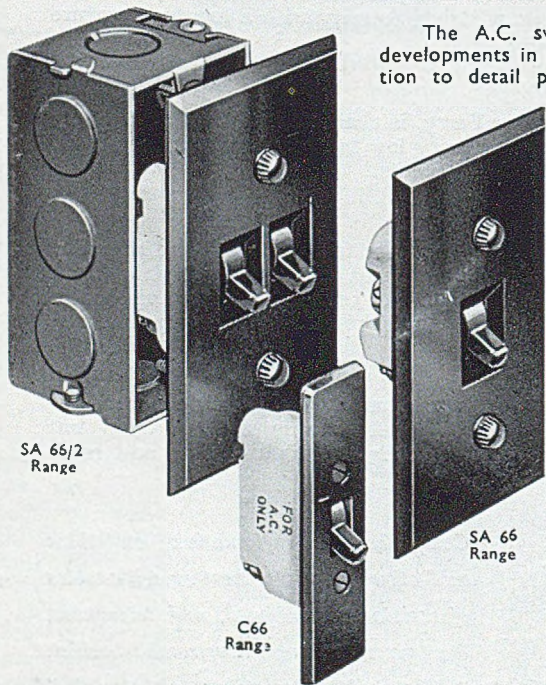
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## Quality

## INSTALLATIONS



B66 range



SA 66/2  
Range

SA 66  
Range

C66  
Range

The A.C. switch range which includes the latest developments in research combined with TUCKER devotion to detail producing switches of outstanding performance and refined appearance.

The arc-eliminating mechanism incorporates conical type contacts giving maximum contact area.

All Tucker switches embody vitreous porcelain bases, unsurpassed for insulating qualities.

Surface type (B.66 range) with 2" (51 mm) base, 1-way and 2-way.

Flush type (SA66 range) for mounting in boxes with lugs at 3'281" (83 mm) centres.

In various combinations of one-way and two-way types.

Architrave type (C66 range) with small plate, for flush mounting in panels, door frames, etc.

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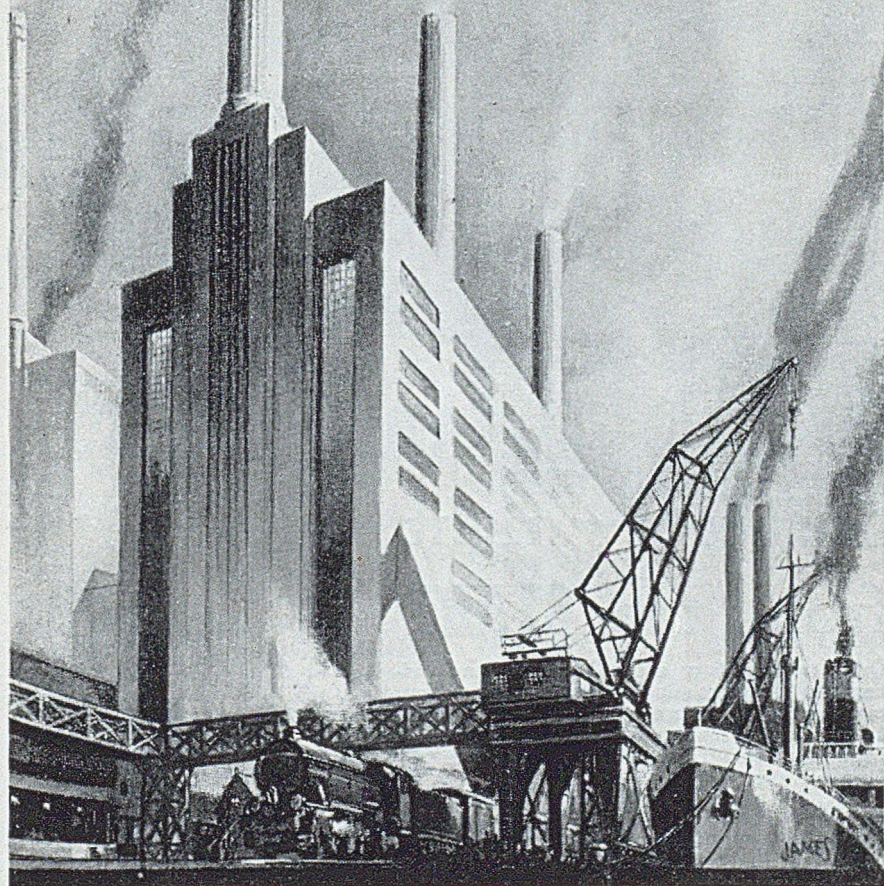
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# High-Frequency Heating

## MANY NEW APPLICATIONS

THE number of new applications of high-frequency heating is continually being added to. Apart from the preheaters now in general use in plastic moulding factories, equipments are now supplied for such purposes as medical diathermy; soldering, brazing and hardening; accelerating setting of synthetic glues for the woodworking industry; the setting of rayon yarn twist; the continuous pre-heating of raw materials for resin-bonded sawdust board; and the production from p.v.c. leather cloth of wallets, garments, inflatable toys, beach cushions, etc.

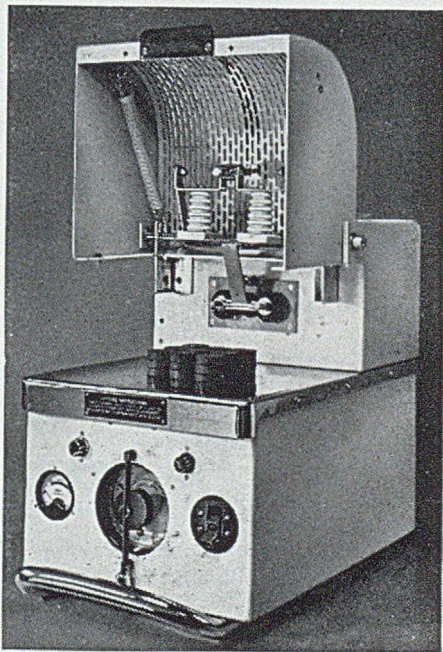
"Radyme" plastic preheaters are claimed to be in use in half the plastic moulding factories in Great Britain; the smallest equipments are capable of plasticizing 2 oz of powder per minute, the largest dealing with 3 to 4 lb per minute. In co-operation with a number of plastic moulding companies, the manufacturers of the apparatus, Radio Heaters, Ltd., Toutley Works, Wokingham, Berkshire, have produced a special brochure to acquaint overseas moulders with the actual production improvements which have been obtained in this country.

For the welding of p.v.c. and other plastic sheeting a range of five equipments is available capable of undertaking welds from 1 in. long up to 12 ft. in total profile length. Two high-frequency induction heaters of 1 kW and 5 kW loading are finding extensive applications in the engineering and metallurgical industries, and larger equipments up to 50 kW output have been designed. Moisture testers, employing dielectric heating, incorporate a balance, the pan of which hangs freely between the high-frequency electrodes, thus permitting the sample to be weighed continuously during the drying process.

### Moisture Testers

In addition to direct exports to a number of countries, British firms have themselves taken out equipments to their factories overseas. A leading firm of manufacturing chemists is shipping out moisture testers for its new factories in India. Amongst the various equipments

exported are considerable numbers of high-frequency plastic sheet welders, small induction heating equipments, plastic powder pre-heaters and many



"Radyme" high-frequency oven

equipments specially built to customers' requirements.

### TRANSFORMERS FOR AUSTRALIA

AN outstanding feature of the English Electric Company's recent export transformer business has been the large number of big transformers for which the orders have been received from Australia. One interesting application is a 68/34 kV 35 MVA regulating transformer equipment for the Electricity Trust of South Australia. Other orders include five 30 MVA 110 kV transformers for Tasmania and a number of 30 MVA, 20 MVA and 15 MVA 110 kV transformers for Brisbane. The New South Wales Railways have ordered two 44 MVA and two 55 MVA transformers for service on their 132 kV system.



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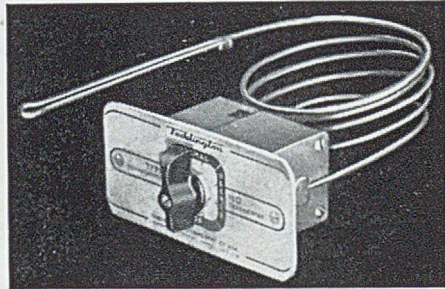


# Temperature Control

**A**UTOMATIC control of temperature has perhaps even greater scope abroad than at home, where in general the more temperate conditions do not emphasize to the same extent the need for the control. Instruments for automatically regulating the degree of heating or refrigeration are available for all industrial, commercial and domestic purposes, and one of the largest manufacturers, the British Thermostat Co., Ltd., Sunbury-on-Thames, is sending abroad considerable quantities of all types, together with its other products, which include pressure controls and gauges; thermostatic, magnetic and motorized valves; gas pressure switches and relays.

Normally standard instruments as supplied to the home market are sent abroad, but sometimes, where orders are sufficiently large to make it economical, the company modifies its products to some extent to suit overseas demands or standards. In any case the standard

instruments are available with scales in either Fahrenheit or Centigrade and with nameplates in foreign languages according to the customers' requirements. In most

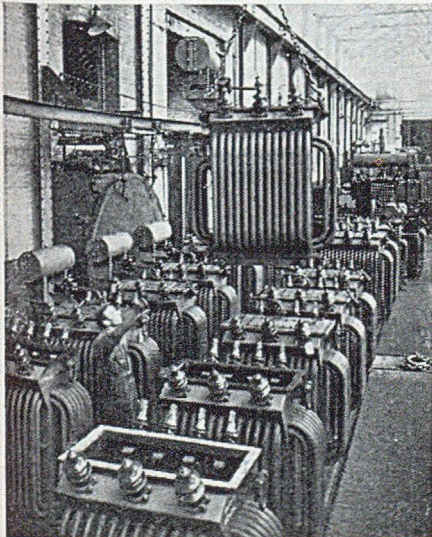


Type "NQ" refrigeration thermostat is available with nameplates in English, French or Spanish

overseas countries the company has exclusive agents and in others it exports direct to distributors. Both agents and distributors are able to give advice on technical matters.

## POWER TRANSFORMERS FOR COLOMBIA

**I**N April we reported that in competition with United States firms, the British Electric Transformer Co., Ltd., had ob-



Ready for delivery to South America: part of a consignment of 200 kVA, 300 kVA, and 400-kVA outdoor distribution transformers manufactured by the British Electric Transformer Co., Ltd.

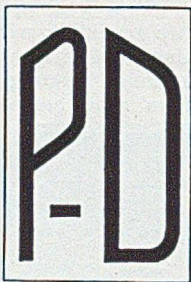
tained a \$120,000 order for forty-five power transformers for a public supply company in Colombia, South America. By reorganizing a production schedule, and with the co-operation of the employees, the manufacturing time was reduced to a minimum and the transformers are now being delivered. The order comprises ten 400 kVA, fifteen 300 kVA, and twenty 200 kVA, three-phase, 60 cycle, double-wound transformers, totalling 12,500 kVA.

Other export orders recently received by the Company, which is associated with Crompton Parkinson, Ltd., include thirteen 750 kVA transformers for Egypt and two 5,000 kVA transformers for the Government of Uganda.

## MOTORS FOR INDIAN MILLS

Mr. K. M. Modi, of the Modi Spinning and Weaving Mills Co., Ltd., Modinager, Meerut, India, recently placed an order with the Hopkinson Electric Co., Ltd., for a considerable number of drip-proof and totally enclosed, fan cooled motors in sizes ranging from 2 h.p. to 50 h.p. The despatch of these motors has now been completed well within the stipulated time.





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### Photoelectric Cells in Industry

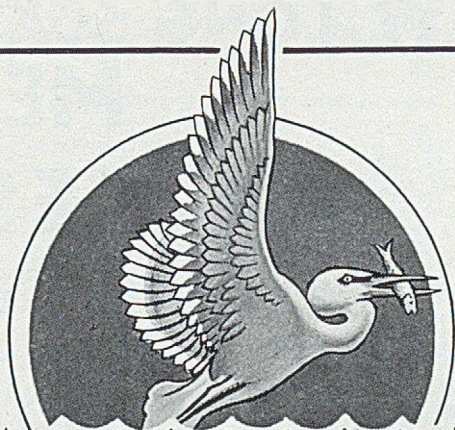
By R. C. Walker, B.Sc.(Lond.), A.M.I.Mech.E., A.M.I.E.E. A comprehensive treatise for all electrical and mechanical engineers whose work demands a knowledge of some of the industrial uses of these cells. Profusely illustrated. 517 pages. 40/- net.

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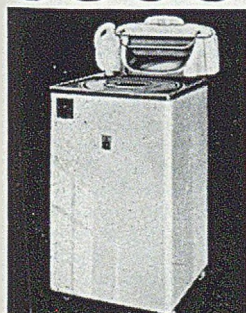
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# THE FISHER WAY

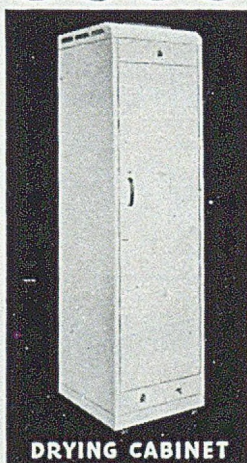
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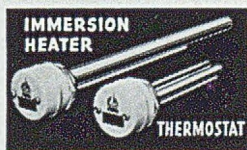
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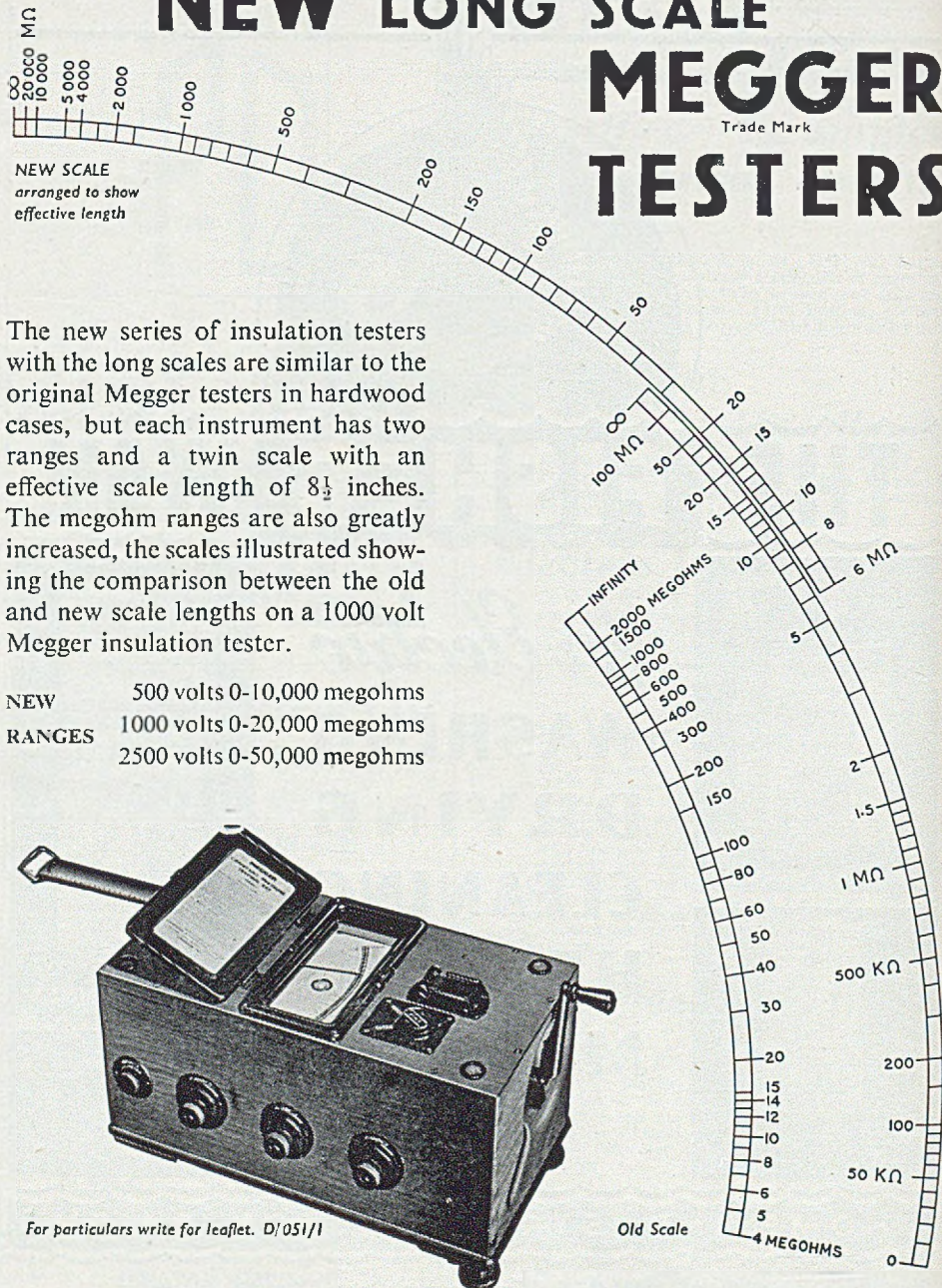
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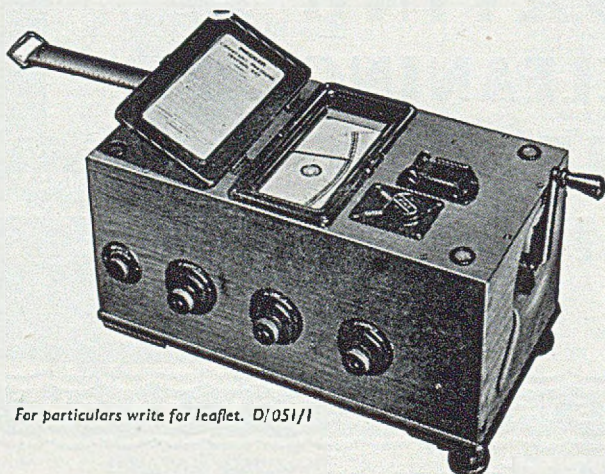


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The new series of insulation testers with the long scales are similar to the original Megger testers in hardwood cases, but each instrument has two ranges and a twin scale with an effective scale length of  $8\frac{1}{2}$  inches. The megohm ranges are also greatly increased, the scales illustrated showing the comparison between the old and new scale lengths on a 1000 volt Megger insulation tester.

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# Electricity Supply

## Wimbledon and the Surcharge

THE Wimbledon Corporation recently announced its intention of securing Counsel's opinion upon the legality or otherwise of the Electricity Board's decision to impose a surcharge of 0.35d per kWh in respect of electricity consumed during three winter months under two-part tariffs and in the heating and cooking rates for domestic premises.

This opinion has now been received and accepted by the Corporation. The Corporation asked Counsel to say whether in his view there had been undue discrimination between consumers in the application of the increase. Counsel held that there had not; he did not think that it could justly be contended that when once a flat rate, a domestic rate and an all-in tariff had been put into force, any variation in price must be in the same proportion in the case of each tariff.

### Mr. Robens at Bristol

Mr. A. Robens, Parliamentary Secretary to the Ministry of Fuel and Power, who was the chief speaker at a domestic fuel appliance conference in Bristol last Friday, visited Electricity House, Colston Avenue, the head office of the South Western Electricity Board. After being received by the chairman, Mr. S. F. Steward, C.B.E., and the deputy chairman, Mr. H. Midgley, Mr. Robens was introduced to the chief officers of the Board, with whom he discussed the Board's policy and plans.

### Street Lighting Conversion

A recommendation for the progressive installation of electric street lighting in the area of the Swadlincote Urban District Council was approved last week. The chairman of the Finance Committee said that the cost of maintenance would be much less than with gas lighting. There had been many complaints about the existing lighting.

Skipton Rural District Council has received proposals from the Yorkshire Electricity Board in respect of the change-over of street lighting in Glusburn from gas to electricity, involving 54 street standards.

### Farmers and Electricity

Representatives of the National Farmers' Union have met officials of the North-Eastern Electricity Board to discuss the Union's request for higher priority for rural areas in the Board's electrification scheme. Although appreciating the present difficult

position, the farmers contended that first preferred should be given to farms. Electrification schemes for rural areas should not be carried out piecemeal but on a planned basis having regard to agricultural production.

### Electricity Output

The Ministry of Fuel and Power statement for the week ended 28th January last shows that 971.2 million kWh was sent out for public supply from solid fuel-fired stations, as compared with 973.3 million kWh in the preceding week and 959.8 million for the week ended 30th January, 1948. Stocks of coal at electricity undertakings at 29th January totalled 3,482,400 tons.

### Large American Sets

The first of two 100,000 kW units at the Pacific Gas & Electric Co.'s new "Station P" steam plant at Hunter's Point, San Francisco, went into service in December and a second similar unit was scheduled for commissioning at the end of last month. The machines, manufactured by the American G.E., are hydrogen cooled and operate at 3,600 r.p.m., 1,300 lb/sq in gauge and 950 deg. Steam is furnished by four 475,000 lb/hr B. & W. boilers. All operating controls, steam, mechanical and electrical, are grouped in a control centre from which the boiler firing aisle can be seen in one direction and the turbine room in the opposite direction. Operating manpower is expected to be only 50 to 60 per cent that of a conventional plant.

A new 110,000 kW generator is planned by the Union Electric Co. of Missouri for installation in 1952, either in the Venice, Illinois, plant or in a new station.

### Development in South Australia

The Electricity Trust of South Australia, in its second annual report (for the year to 30th June last) states that a record number of appliances were installed under the "Adelect" hiring scheme, including 2,137 ranges, 2,567 water heaters, 1,127 wash boilers and 1,111 bath heaters. These numbers would have been greater but for the general shortage of materials and labour, and there were approximately 3,500 applicants still awaiting delivery of various types of hired apparatus. The demand for electricity for all industrial and heating purposes also continued to grow, and total sales of electricity during the year, at 318.9



million kWh, showed an increase of very nearly 20 per cent. Revenue aggregated £2,153,171, the average price per kWh sold being 1.62d (against 1.59d). After providing for all operating expenses and two small non-recurring charges in connection with redemption of Adelaide Electric Supply Co. stock, there was a deficit on the year of £11,963. An increase in tariffs came into force during the year. On the Leigh Creek coalfield, which passed into the control of the Trust on 6th February, 1948, there was an accumulated deficit at 30th June of £77,226.

Plant extensions comprised a 30,000 kW Parsons turbo-alternator placed on load at Osborne "B" station in November, 1947, while two further sets and five 150,000 lb/hr boilers capable of burning Leigh Creek coal are on order. Plans are in hand for building a new power station at Port Augusta, with transmission lines to the Metropolitan area, at an estimated cost of £5,102,000; two 30,000 kW sets are proposed initially, with provision for two similar machines later.

### Conditions in Sydney

In a foreword to the 1947 report of the Sydney County Council, N.S.W., Mr. G. S. Boyd, the general manager, tells of the precarious position which then existed in fuel supplies. For the most part stocks did not exceed a few days' needs, and frequently operation depended upon the daily supplies coming to hand in time. Load shedding and loss of efficiency were inevitable consequences. Owing to heavily increased expenditure an upward revision of charges became necessary for the first time in the Council's history.

Sales of electricity, despite the restrictions, were 148.5 million kWh higher than in 1946, the total being 1,107.6 million kWh, and at the end of 1947 consumers numbered 286,601, a net addition of 4,481.

Among major plant extensions in hand was the construction of Pymont "B" station, for which four 50,000 kW sets were on order, and a 50,000 kW addition at Bunnerong "A," while possible sites for a new station needed by 1954 were investigated. At Pymont it is now anticipated that the first unit, manufacture of which was delayed by conditions in England, will be in operation early in 1950. The N.S.W. Rail-

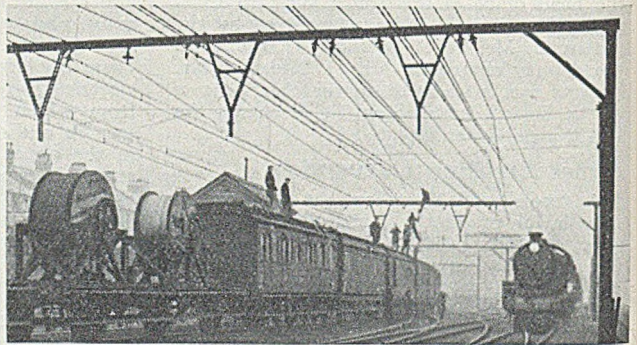
ways also have a scheme in hand for a new station, at Lake Macquarie, power from which will be transmitted to Sydney by 132 kV lines; it is expected to be ready in 1953.

At Bunnerong "A" 511.5 million kWh was generated in 1947 and at the "B" station 615.9 million, the respective thermal efficiencies on kWh sent out being 15.72 and 22.70 per cent, against 16.93 and 23.29 per cent in 1946.

The accounts of the undertaking show a deficit of £227,369 on a gross revenue of £5,119,294. Average price per kWh sold advanced from 1.099d to 1.100d, while the cost rose from 1.116d to 1.158d.

### Christchurch Results

Commenting on the figures in the 1947-48 report of the Christchurch, New Zealand, Electricity Department, Mr. E. Hitchcock, the general manager, says that they are a dreary reflection of the effect of the power shortage on electrical progress. Domestic consumption was held at the previous year's rate, commercial supplies were reduced and industrial usage showed only a slight increase. Total sales (177.9 million kWh) were nearly 5 per cent less than in 1946-47. Referring to future prospects, Mr. Hitchcock says that it has been a story of continually adjusted and receding dates,



Work in progress on the electrification of the railway from Liverpool Street to Shenfield, for which the overhead system is employed. It is expected that the electrified line will be in full use by the end of the year.

and of human endeavour thwarted by lack of materials. There were in the South Island two known major possible developments, each of approximately 300,000 kW.

### Sunderland Tramway Extension

An extension to the Sunderland Corporation's tram system on the Durham Road route, covering three-quarters of a mile, has been completed.



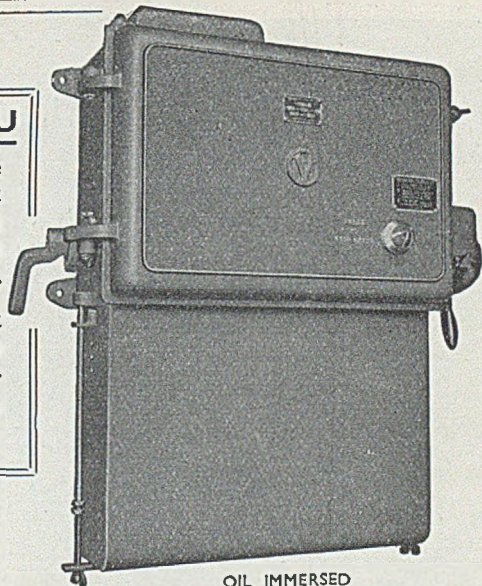
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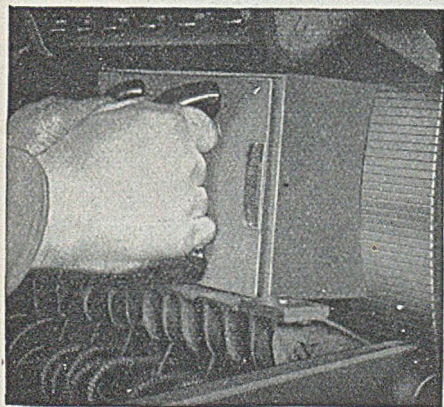
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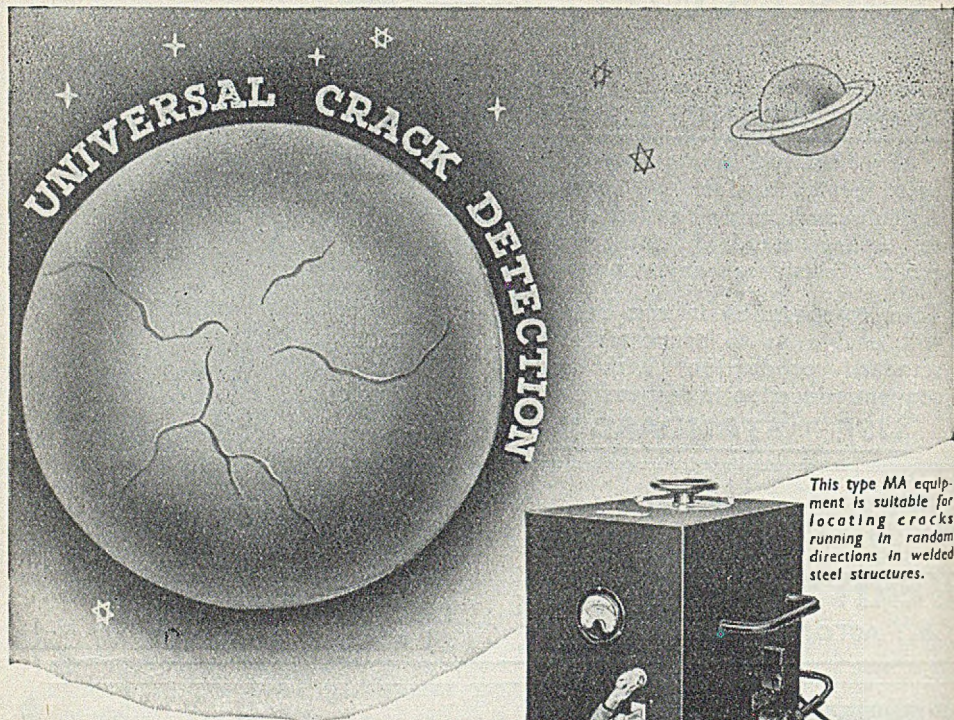
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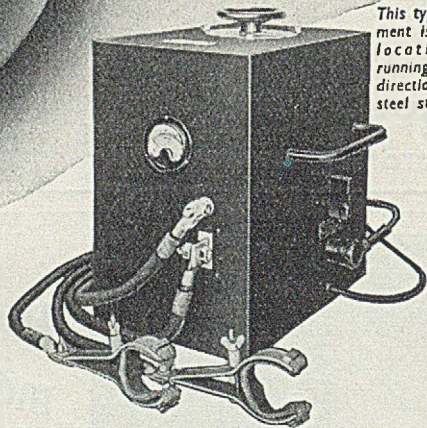




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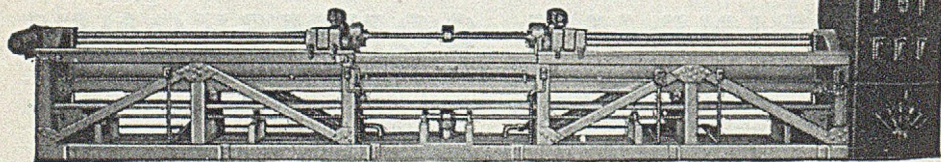
This type MA equipment is suitable for locating cracks running in random directions in welded steel structures.

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TRAFFORD PARK ... MANCHESTER 17.

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# NEW PATENTS

## Electrical Specifications Already Published

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

1942

**METROPOLITAN-VICKERS** Electrical Co., Ltd., A. Tustin, D. G. O. Morris, R. C. Braithwaite, T. B. Somerville and J. D. Simmons.—“Control systems for power-driven movable objects.” 332. 8th January, 1942. (Cognate applications 1104/42 and 16486/42.) (616516.)

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Lapco Soc. Anon.—“Electrical connecting means.” 1973. 9th January, 1942. (616335.)

Sperry Gyroscope Co., Inc.—“Systems employing waves for locating or viewing objects.” 14839. 12th September, 1942. (616520.)

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J. W. Rowell.—“Mechanical scanning devices for television facsimile transmission and remote control.” 4932. 16th March, 1944. (616246.)

British Thomson-Houston Co., Ltd., and D. Gabor.—“Transmission, recording and reproduction of sound.” 24642. 8th December, 1944. (616156.)

Communication Engineering Pty., Ltd.—“Plastic and adhesive metal composition having electromagnetic properties.” 25167. 12th November, 1943. (616249.)

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General Electric Co., Ltd., M. W. Peirce and L. E. A. Phillips.—“Lighting fittings.” 4768. 26th February, 1945. (616528.)

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British Thomson-Houston Co., Ltd.—“Pulse generating circuits.” 15650. 19th June, 1944. (616261.)

Maschinenfabrik Oerlikon.—“Combined furnace and gas turbine.” 17964. 18th August, 1944. (616343.)

Automatic Signal Corporation.—“Traffic detection apparatus.” 18645. 29th June, 1944. (616534.)

Standard Telephones & Cables, Ltd., and D. E. Skelton.—“Electro-acoustic devices.” 21942. 27th August, 1945. (616158.)

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Le Carbone Lorraine Soc. Anon.—“Electrodes and brushes for electric machines.” 24228. 22nd June, 1944. (616537.)

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B. Ljungstrom.—“Power plant.” 24541. 21st September, 1945. (Convention date not granted.) (616269.)

Marconi's Wireless Telegraph Co., Ltd.—“Means for indicating the reception of mutilated signals in a printing telegraph system.” 26206. 7th October, 1944. (616426.)

Liquidometer Corporation.—“Electrically operated indicating devices.” 28525. 1st February, 1945. (616272.)

N. W. Robinson, J. F. Spilling and C. S. Wright.—“Electron-discharge devices and their manufacture.” 31016. 19th November, 1945. (616275.)

1946

Standard Telephones & Cables, Ltd.—“Electric dry rectifier unit.” 1826. 19th February, 1945. (616165.)

Welding Supplies, Ltd. (Elektriska Svetsningsaktiebolaget)—“Surface welding.” 2249. 23rd January, 1946. (616284.)

British Thomson-Houston Co., Ltd.—“Electric transformers.” 2720. 1st February, 1945. (616428.)

Marconi's Wireless Telegraph Co., Ltd.—“Deflecting coils for cathode-ray tubes.” 3091. 31st January, 1945. (616353.)

Foster Transformers & Switchgear, Ltd., and R. E. Jennings.—“Electrical voltage regulating arrangements.” 5047. 18th February, 1946. (616286.)

Allmänna Svenska Elektriska Aktiebolaget.—“Arrangements in voltage transformers fed from capacitive voltage dividers.” 5544. 21st March, 1945. (616288.)

Westinghouse Electric International Co.—“Metal supported vacuum-tight vitreous seals.” 5585. 29th March, 1943. (616169.)

Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—“Alternators and circuits therefor.” 6240. 2nd July, 1941. (616545.)

Standard Telephones & Cables, Ltd., and R. S. Hope.—“Radio transmission systems.” 8191. 15th March, 1946. (616356.)

C. V. Stilger Liften.—“Electric elevators.” 8563. 13th April, 1944. (616357.)

Philips Lamps, Ltd.—“Superheterodyne receivers with automatic frequency control.” 8921. 16th August, 1941. (616358.) “Electric-discharge tubes.” 8925. 14th October, 1941. (616359.)

Decca Record Co., Ltd., and W. J. O'Brien.—“Indicating systems for electrical signals particularly for use with radio beacons.” 11557. 15th April, 1946. (616295.)

Western Electric Co., Inc.—“Microwave modulators and power dividers.” 11663. 26th April, 1945. (616296.)

Compagnie Générale d'Electricité.—“Device for receiving and re-transmitting impulses particularly for telephonic line systems.” 12535. 2nd June, 1944. (616297.)

Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—“System for facsimile communication by electro-optical means.” 12996. 2nd May, 1945. (616360.)

Benjamin Electric, Ltd., and E. J. Sherwood.—“Starting switches for fluorescent lamps and like devices.” 14186. 10th May, 1946. (616361.)

Electroflo Meters Co., Ltd., and H. Tabor.—“Electrical measuring and controlling systems.” 14514. 14th May, 1946. (616551.)

Western Electric Co., Inc.—“Systems for controlling the supply of power to load devices, for example electric motors.” 14549. 16th May, 1945. (616301.)

“Electrical control systems for intermittently energized loads.” 14550. 16th May, 1945. (616302.)

Telegraph Construction & Maintenance Co., Ltd., and R. C. Mildner.—“Electric cables.” 14576. 14th May, 1946. (616303.)

Scophony, Ltd., and G. Wikkenhauser.—“Picture transmission systems.” 15040. 17th May, 1946. (616306.)

R. H. Brown.—“Radio beacon and like equipment.” 15216. 20th June, 1947. (616364.)

Autoflight Corporation.—“Electric telemetric system.” 15401. 4th June, 1945. (616552.)



Turton, Willis & Co., Ltd., and A. E. Willis.—“Thermostats for electrical apparatus or appliances.” 16529. 31st May, 1946. (616181.)

Standard Telephones & Cables, Ltd.—“Radio direction finder.” 16623. 27th June, 1945. (616369.)

Venner Time Switches, Ltd., and W. F. Horgan.—“Electrically-operated buzzers.” 17118. 5th June, 1946. (616183.)

F. J. Allen.—“Dynamo electrical machines.” 17132. 5th June, 1946. (616371.)

Metropolitan-Vickers Electrical Co., Ltd., and T. W. Ross, and W. S. Wade (legal representative of D. R. Price (deceased), and S. J. Eidsforth.—“Electrical remote-control equipment.” 17602. 12th June, 1946. (616372.)

Bush Radio, Ltd., and W. H. Harrison.—“Television receivers and the like.” 18132. (616555.)

Philips Lamps, Ltd.—“Heat exchangers.” 18441. 21st June, 1945. (616184.)

E. L. P. Mounes.—“Winder for electric wires.” 18614. 21st December, 1945. (616555.)

Standard Telephones & Cables, Ltd.—“Electric pulse time modulators.” 20251. 11th September, 1945. (Addition to 603188.) (616317.)

British Thomson-Houston Co., Ltd.—“Tetra-allyl silane and polymers thereof.” 20371. 10th July, 1945. (616320.)

K. R. Halvorsen.—“Controllers for electric motor-driven cranes, elevators and the like.” 20883. 22nd December, 1943. (616561.)

General Electric Co., Ltd., and N. C. Smart.—“Electromagnetic relays.” 21079. 15th July, 1946. (616562.)

Philips Lamps, Ltd.—“Circuits for the measurement or control of direct voltage.” 22008. 3rd October, 1942. (616564.)

Philips Lamps, Ltd.—“Manufacturing of electric resistors.” 23357. 4th August, 1945. (616381.)

General Electric Co., Ltd., and E. P. Fairbairn.—“Radio communication systems. 23917. 13th August, 1946. (616324.)

Elliott Bros. (London), Ltd., and H. D. Hawkes.—“Measurement of frequency variations in alternating-current circuits.” 24039. 13th August, 1946. (616325.)

M. V. G. B. de Montigny.—“Inductances for radio apparatus and other applications.” 25726. 11th January, 1943. (616568.)

Rotax, Ltd., and E. E. Robinson.—“Magneto-electric machines.” 25769. 28th August, 1946. (616384.)

British Thomson-Houston Co., Ltd.—“Heading dies and extrusion dies and method of making the same.” 25998. 30th August, 1945. (616199.) “Insulation of electric inductive apparatus.” 26000. 29th October, 1943. (616200.)

L. G. Hawkins & Co., Ltd., and G. A. Absalom.—“Automatic thermal cut-out for an electric heating element.” 26057. 29th August, 1946. (616208.)

J. Campbell.—“Device for indicating acid level in accumulators and the like.” 26060. 29th August, 1946. (616209.)

J. Lucas, Ltd., and H. E. Whitehouse.—“Electrical condensers.” 26089. 30th August, 1946. (616214.)

British Thomson-Houston Co., Ltd.—“Electric circuit-breaker operating means.” 26094. 30th August, 1945. (616217.) “Operating mechanisms for electric switchgear and the like.” 26095. 30th August, 1945. (616218.)

Philips Lamps, Ltd.—“Attenuators.” 26166. 28th November, 1942. (616226.)

Western Electric Co., Inc.—“Electron-discharge devices.” 26181. 24th September, 1945. (616229.)

A. Von Ingenieursfirma Bromssen Aktiebolag.—“Dish-washing machines.” 26203. 4th September, 1945. (616431.)

Pye, Ltd., W. M. Pannell and A. H. Shilling.—“Electric coils and more especially variable inductors for permeability tuning.” 26278. 31st August, 1946. (616240.)

Pye, Ltd., and D. Jackson.—“Apparatus for radio frequency heating.” 26279. 31st August, 1946. (616436.)

Westinghouse Electric International Co.—“High temperature electric furnaces.” 26337. 8th September, 1945. (616439.)

Philips Lamps, Ltd.—“Thermionic valve amplifiers.” 26444. 3rd September, 1945. (616447.)

Motins Machine Co., Ltd., and G. F. W. Powell.—“Lever-operated electric switches.” 26457. 3rd September, 1946. (616393.)

Westinghouse Brake & Signal Co., Ltd.—“Electro-pneumatic braking systems.” 26469. 30th December, 1944. (616569.)

Standard Telephones & Cables, Ltd., and A. M. Thornton.—“Open-wire carrier current transmission system.” 26555. 4th September, 1946. (616459.)

General Electric Co., Ltd., G. G. Isaacs and E. H. Neison.—“High-pressure metal vapour electric-discharge lamps.” 26557. 4th September, 1946. (616404.)

Brown, Boveri & Cie, Akt.-Ges.—“Drum rotor, particularly for multi-stage axial compressors and turbines.” 26620. 21st September, 1945. (616407.)

R. C. B. Johnson.—“Electric smoothing irons.” 26657. 15th March, 1946. (616571.)

D. O. Smith and J. A. Goddard.—“Electric fire alarms.” 26686. 5th September, 1946. (616416.)

Standard Telephones & Cables, Ltd., and H. Wolfson.—“Electron emission filaments.” 26832. 6th September, 1946. (616487.)

Philips Lamps, Ltd.—“Inductance coils.” 26855. 1st March, 1943. (616422.) “Electron-discharge tubes of the velocity-modulation type.” 26856. 6th April, 1943. (616489.) “Radio receivers.” 26862. 10th March, 1943. (616573.) “Disc anodes for X-ray tubes.” 26864. 25th November, 1942. (616490.) “X-ray apparatus.” 26868. 3rd March, 1943. (616491.)

J. A. C. Malchus.—“Vacuum cleaners.” 26875. 16th March, 1945. (616492.)

J. A. C. Malchus.—“Holders for the carbon brushes of rotary electrical machines.” 26876. 6th April, 1945. (616493.)

British Thomson-Houston Co., Ltd.—“Electric motor control systems.” 26891. 2nd January, 1945. (616494.)

F. R. Shenton, H. Moore, F. Spriggs and G. H. P. Clowes.—“Alternating-current control apparatus.” 26899. 6th September, 1946. (616496.)

M. P. Stainless Products, Ltd., and J. F. Thompson.—“Snap-action electric switches.” 26945. 7th September, 1946. (616502.)

Electro Methods, Ltd., and S. E. Tweedy.—“Arrangements for controlling electric alternating-current motors.” 26987. 9th September, 1946. (616504.)

L. Blum and V. Aber.—“Electric plug-and-socket couplings.” 27246. 11th September, 1946. (616510.)

Radio Corporation of America.—“Modulator circuit arrangements.” 27490. 10th May, 1945. (616512.)

Philips Lamps, Ltd.—“Electron beam discharge tubes.” 27538. 15th September, 1945. (616585.)

Hassett & Harper, Ltd., and J. B. Hassett.—“Portable electric fires or radiators.” 27941. 18th September, 1946. (616597.)

G. E. Duke and C. H. Nicholson.—“Electrical plug-and-socket couplings.” 27965. 18th September, 1946. (616515.)

## 1947

Metropolitan-Vickers Electrical Co., Ltd., A. Tustin, D. G. O. Morris, R. C. Braithwaite, T. B. Somerville and J. D. Simmons.—“Control systems for power-driven movable objects.” 17928. 8th January, 1942. (Cognate applications 17929/47 and 17930/47.) (Divided out of 616516.) (616602.)

Metropolitan-Vickers Electrical Co., Ltd., A. Tustin, D. G. O. Morris, R. C. Braithwaite, T. B. Somerville and J. D. Simmons.—“Electrical control systems and control devices.” 17931. 8th January, 1942. (Cognate application 17932/47.) (Divided on 616516.) (616603.)

## Welding Research Prize

The British Welding Research Association has announced that no award has been made for 1948-49 of the British Oxygen Co.'s welding prize of £100, but it is intended to offer the prize again this year. Conditions governing the prize can be obtained from Mr. A. Barker, secretary of the Association, at 29, Park Crescent, London, W.1.



# 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.

**Argentina.**—BUENOS AIRES.—Directorate-General of Water and Electric Power. Tender No. 357/48 (closing date 3rd June). Electro-mechanical installations for the hydro-electric power station and transformer station at Los Molinos, Nos. 1 and 2. (50,000 and 9,000 kW respectively). No. 356/48 (closing date 10th June). Pressure tubing, electro-mechanical installations and transformer station at Rio Corralito hydro-electric station (13,000 kW). Plans, etc., may be purchased from the Departamento de Talleres y Suministros, Libertad 1126, Capital, Argentina; copies are not available at the Commercial Relations and Exports Department, London.

**Australia.**—18th May. State Electricity Commission of Victoria. Indoor wall-mounting current transformers. (4th February.)

**Bristol.**—28th February. Southmead General Hospital Group Management Committee. Supply of batteries, lamps and sundries for the year commencing 1st April next. (See this issue.)

**Coventry.**—17th March. Education Committee. Electrical installation in Radford Primary School. (See this issue.)

**Derby.**—26th February. County Architect's Department. Electrical materials for the year ending 31st March, 1950. (See this issue.)

**Devizes.**—7th March. Corporation. Erection, installation and maintenance of electric street lamps. (See this issue.)

**Durham.**—County Council. Electrical installation at the new Stockton-on-Tees Grammar School. County architect, Court Lane, Durham.

**Eton.**—28th February. Baldwin's Bridge Trust. Re-wiring and improvement to the electrical installation at the Institute Building, High Street. (See this issue.)

**Ilford.**—22nd February. Borough Council. Alteration and improvement of lighting installations, &c., at Christchurch and Downshall Schools. (See this issue.)

**Irlam.**—19th February. U.D.C. Electric lamps for one year to 31st March, 1950. Surveyor, Council Offices.

**Jarrow-on-Tyne.**—Town Council. Electrical installations in 100 houses to be built by direct labour. Borough Engineer.

**Litherland.**—28th February. Urban District Council. Electric street lighting equipment. (4th February.)

**Luton.**—2nd March. Corporation. Electrical installations in Council houses. (See this issue.)

**New Zealand.**—WELLINGTON.—10th May. State Hydro-Electric Department. Supply of 5 MVA transformer bank. (C.R.E. (I.B.) 1705/1949. Ten/182.)\*

**Newport (Mon).**—21st February. Education Committee. Electrical installations at Maesglas senior and Maesglas junior and infants' schools. (4th February.)

**North Walsham.**—28th February. U.D.C. Provision and installation of one 10,000 gallon per hour capacity electrically driven submersible type borehole pump. J. C. Mellis & Co., 110, Horseferry Road, Westminster, S.W.1.

**Poole.**—Borough Engineer's Department. Electrical stores for the year ending 31st March, 1950. (4th February.)

**Ryton-on-Tyne.**—U.D.C. Installation of electric lighting and heating in fifty houses being built at Greenside. U.D.C. surveyor, Council Offices.

**Sleaford.**—12th March. Kesteven County Council. Electrical work at Kesteven Training College, Stoke Rochford Hall. (See this issue.)

14th March. Electrical installation at new school, Waddington. (See this issue.)

**Southport.**—2nd March. Borough Council. Electrical installations in 42 permanent houses to be erected at Rufford Road, Crossens. Borough engineer, Town Hall.

**Uruguay.**—MONTEVIDEO.—11th March. Usinas Electricas y Telefonos del Estado. Rubber-insulated cable for interior installation. (C.R.E. (I.B.) 2004/49. Ten/181.)\*

7th March. Rubber-insulated wire. (C.R.E. (I.B.) 2174. Ten/184.)\*

\* Specifications may be inspected at the Commercial Relations and Exports Department, Thames House North, Millbank, S.W.1.

## Orders Placed

**Newcastle-on-Tyne.**—City Council. Supply of about ten miles of copper trolley wire (£2,406).—Thomas Bolton & Sons.

**Smethwick.**—F. H. Wheeler & Co., Ltd., have received an order from C. Green & Sons, Ltd., building contractors, for the sum of £1,826 for electrical work at the Town Council's garage, workshops and canteen.

**West Hartlepool.**—Town Council. Electrical installations in 96 houses under construction.—Illuminating Installations.

## 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.*

**Billingham-on-Tees.**—Houses (150) for key workers at the North Tees power station; Kitching & Co., architects, 21, Albert Road, Middlesbrough.

**Birkenhead.**—Extensions to works (£300,000); Mersey Chemicals, Ltd., Bromborough.

**Birmingham.**—Development of Perry Barr Maternity Hospital (£426,000); staff architect, Birmingham Regional Hospital Board, 14, Edmund Street.

**Braintree.**—Extensions to works; Lake & Elliott, Ltd., Chapel Hill.

**Brentford.**—Factory; Trico-Folberth, Ltd., engineers, Great West Road.



**Brighton.**—Factory and offices, Hollingbury Industrial Estate; South Coast Bottling Co., Ltd., Trafalgar Street.

**Broomhill.**—Pithead baths; Miners' Welfare Department, 42, Gt. Portland Street, W.I.

**Cambridge.**—Primary school, Newmarket Road; T. V. Burrows, architect, The Guildhall.

**Cardiff.**—Houses (400), North Crystals estate; city engineer, City Hall.

**Chapel-en-le-Frith.**—Houses (34); W. Hodgkinson, builder, Folds Lane, Fernilee, Chapel-en-le-Frith.

**Chester.**—Large works., Neston, for Morgan Crucible Co., Ltd.; A. Monk & Co., builders, Padgate, Warrington.

**Chesterton.**—Permanent houses (79), Girton, Swavesey and Coton; H. Jackson, architect to R.D.C., 93, Hartington Grove, Cambridge.

**Crawley.**—Offices, Broadfield, for Development Corporation; chief architect, Broadfield.

**Croydon.**—Bakery and stores, Milner Road; Hooker & Rogers, architects, 29, George Street.

**Cumberland.**—Canteens at nine schools, and additions to the Newton Rigg Farm School and Bootle (Hycemoor) voluntary school; county architect, 15, Portland Square, Carlisle.

**Darlington.**—Houses (200); E. A. Tornbohm, borough architect, Central Buildings.

**Daventry.**—Permanent houses (52), Woodford-cum-Membris; H. Bonsor, R.D.C. surveyor, 44, High Street.

**Dudley.**—Scheme for pithead baths at various collieries (£546,000); National Coal Board, West Midlands Division, Hindley Hall.

**Durham.**—Completion of new buildings, Crook County School (£37,000); G. Stephenson, builder, Bishop Auckland.

**Eastbourne.**—Flats (21), Blackwater Road; Benz & Williams, architects, 53, Gildredge Road.

**Enfield.**—Factory and offices, Bilton Way; Percy Bilton, Ltd., 111, Park Street, W.I.

**Eton.**—Houses (88) and block of four flats for R.D.C.; Sir John Brown, A. E. Henson & Partners, architects, 117, Sloane Street, S.W.1.

**Exeter.**—Biological buildings for University College of South-West of England; E. Vincent Harris, architect, 19, West Eaton Place, S.W.1.

**Frome.**—Police headquarters and courts (£80,000) for Somerset C.C.; R. O. Harris, county architect, Park Street, Taunton.

**Glasgow.**—Church Hall, Oatlands; J. W. B. Park, architect, 203, West George Street.

**Glendale.**—Houses (44) for the R.D.C.; Reavell & Cahill, architects, Lloyds Bank Chambers, Alnwick.

**Greenford.**—Factory premises, Oldfield Lane; J. Lyons & Co., Ltd., Cadby Hall, Kensington, W.14.

**Grimsby.**—Rebuilding factory, Riley Street; British Isinglass Co., Ltd., Hope Street.

**Hounslow.**—Factory premises, Great West Road; M. B. Foster & Sons, Ltd., 242, Marylebone Road, N.W.1.

**Lancashire.**—Infants' school, Davyhulme (£70,000); county architect, Preston.

**Ledbury.**—Police station and court room (£30,000), Standing Joint Committee; county architect, Bath Street, Hereford.

**Lincolnshire.**—Infants' school, Priory Lane, Scunthorpe (£48,000); county architect, Lincoln.

**Loughborough.**—Five-year plan (£1,000,000) for development of Loughborough College; Leicestershire Education Committee.

**London.**—FULHAM.—Flats (274), Hurlingham; director of housing, Town Hall, S.W.6.

CHISWICK.—Shops and offices, 241/247, High Road; Times Furnishing Co., Ltd., 8, Gate Street, W.C.2.

HAMMERSMITH.—Flats (32), Frithville Gardens; borough engineer.

SHOREDITCH.—Flats (75), Goldsmith Row site; C. Lovett Gill, architect, 41, Russell Square, W.C.1.

**Manchester.**—Extensions to Monsall Mills, Newton Heath, for William Hall & Co. (Monsall), Ltd.; Wm. Gornall & Sons, Ltd., builders, Gore Street, Salford, 3.

**Newcastle (Staffs).**—Works, Chesterton, for New High Carr Colliery Co., Ltd.; W. J. & C. P. Bates, mining engineers, Midland Bank Chambers.

**Oxford.**—Nurses' hostel, Radcliffe Infirmary; J. F. Watkins, architect, 7/8, Queen Street, High Wycombe.

Secondary school, North Oxford; E. G. Chandler, architect, Town Hall.

**Peebles.**—Dental clinics at High School and Innerleithen (£4,150 and £3,175); county clerk, Peebles.

**Pitlochry.**—Houses (31) for North of Scotland Hydro-Electric Board; Tarbolton & Ochterlony, architects, 4, St. Colme Street, Edinburgh.

**Plymouth.**—Shops and flats for T.C.; Louis de Soissons & Partners, architects, 11, The Crescent.

**Reading.**—Reconstruction of business premises for Welsteeds, Ltd.; George Baines & Sons, architects, 121, Victoria Street, London, S.W.1.

Primary school, East Caversham; E. G. V. Hives, architect, 3, Cork Street.

**Rotherham.**—Technical school, Oakwood; borough engineer, Town Hall.

**South Shields.**—Factory; Eskimo Slippers, Ltd.

**Stockton-on-Tees.**—Factory, Church Road, for Rembrandt Brothers, Ltd.; C. Solomon, architect, St. Mary's Place, Newcastle-on-Tyne.

Branch library at Norton (£8,000); G. Cowan, borough surveyor.

**Stretford.**—Extensions to works, Ashburton Road, for British Oxygen Co., Ltd.; A. Hodgkinson, Ltd., builders, 62, Greenhill Street, Manchester, 15.

Alterations and additions to works, Textilose Road, for Courtaulds, Ltd.; D. Walton & Co., Ltd., builders, Clarendon Road, Salford, 5.

**Stroud.**—Houses (92), Stonehouses, for R.D.C.; Stockford, Carless & Ashford, architects, 20, High Street.

**Surbiton.**—Houses (25), Balaclava Road, for Metropolitan Water Board; Ranson (Hook), Ltd., builders, 436, Hook Road.

**Swansea.**—Warehouse and store, Picton Place; Macowards, Ltd., 235, Oxford Street.

Branch library (Brynhyfryd), flats and shops (West Cross estate), and further stage of new grammar school; borough architect.

Mineral water factory, Pontardulais Road; C.W.S., Ltd., 94, St. Mary Street, Cardiff.

**Tynemouth.**—Factory, Bird Street, North Shields, for Manleys Food Products, Ltd.; Tasker & Child, architects, Trinity Buildings, New Bridge Street, Newcastle-on-Tyne.

**Worksop.**—Factory and offices for Bains-Wear, Ltd., Nottingham; T. Cecil Howitt & Partners, architects, St. Andrew's House, Mansfield Road, Nottingham.

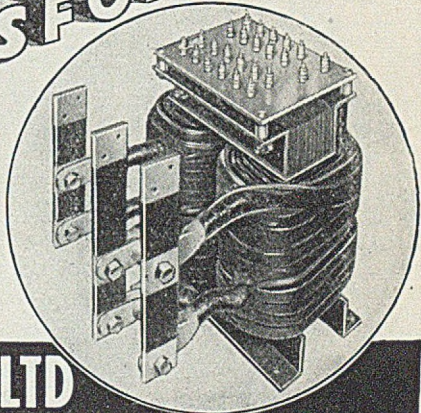


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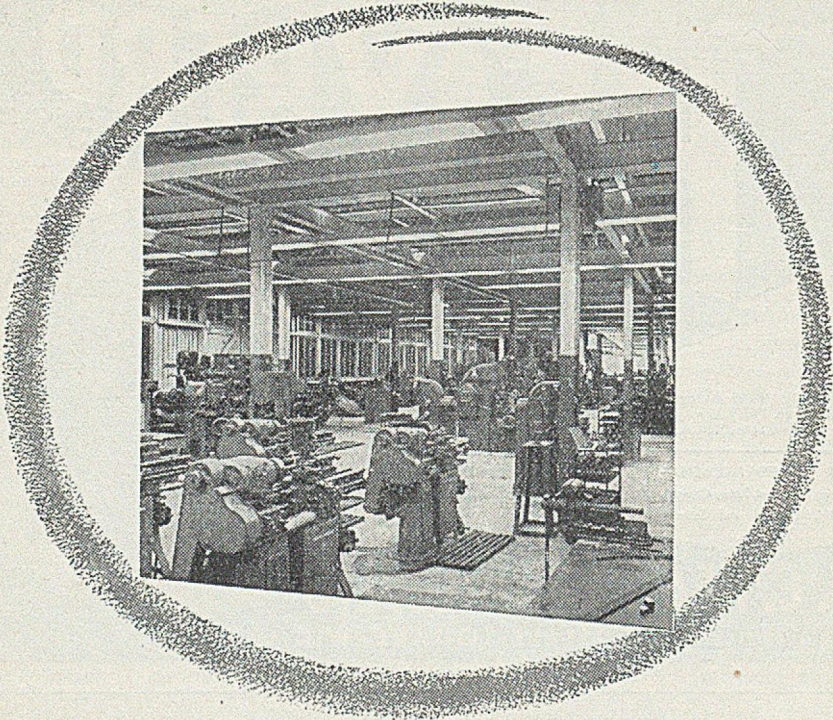


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# CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS for insertion in the following Friday's issue are accepted up to First Post on Monday, subject to space being available, and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1. CLASSIFIED advertisements are PREPAID at 3/- per line (approx. 7 words) per insertion; ONLY OFFICIAL AND GOVERNMENT ANNOUNCEMENTS CAN NOW BE DISPLAYED.—12/- per inch. Where the advertisement includes a Box Number this counts as two words and there is an additional charge of 1/-. CHEQUES AND POSTAL ORDERS should be crossed and made payable to ELECTRICAL REVIEW.

Original testimonials should not be sent with applications for employment.

## OFFICIAL NOTICES, TENDERS, ETC.

### SOUTHMEAD GENERAL HOSPITAL GROUP MANAGEMENT COMMITTEE

THE Management Committee invite quotations for the supply of the following for delivery to the Hospitals within the Group, for the twelve months commencing 1st April, 1949:—

ELECTRIC BATTERIES, LAMPS AND SUNDRIES.

Forms of tender may be obtained from the undersigned, and should be returned in a plain sealed envelope not later than 10 a.m. on 26th February, 1949, superscribed to show the goods tendered for, but without any name or mark indicating the sender.

The lowest or any tender will not necessarily be accepted.

C. C. HANCOCK, Secretary.

Southmead General Hospital  
Group Management Committee,  
11, Upper Belgrave Road, Bristol, S. 3038

### BOROUGH OF DEVIZES

Permanent Housing Programme—Brickley Lane Estate

#### Installation of Electric Street Lamps

TENDERS are invited for the erection, installation and maintenance of 24 Street Lighting columns, lanterns and incidental appurtenant works on the above Estate.

Specification and Form of Tender may be obtained from, and the General Conditions of Contract and Plan inspected at, the offices of the undersigned during the usual hours of business, upon payment of a deposit of one guinea which will be refunded upon the receipt of a bona fide tender and the return of all bonded documents.

Sealed tenders endorsed "Street Lighting—Brickley Lane Estate," and addressed to the Town Clerk, Midland Bank Chambers, Devizes, should be delivered by not later than noon on Monday, 7th March, 1949.

The Council does not bind itself to accept the lowest or any tender and the provisional acceptance of any tender is subject to the approval of the Ministry of Transport.

J. D. SHEASBY, A.M.I.C.E., M.I.Mun.E., A.M.T.P.I.,  
Borough Surveyor.

Town Hall, Devizes, Wilts.  
1st February, 1949. 3013

### CITY OF COVENTRY

#### Radford Primary School

#### To Electrical Contractors

THE Education Committee invites tenders from established Electrical Contractors for the Electrical installation in the above school. The successful tenderer will be a Sub-contractor.

Applications for plans, specification, schedule and form of tender should be made to the undersigned by Saturday, 19th February, 1949, together with a cheque made payable to the Corporation of Coventry for the £1 Is. deposit which will be returned upon receipt of a bona fide tender or notification of inability to tender provided such is received on or before the latest date of tendering.

Applicants should be members of the National Register of Electrical Installation Contractors and/or the Electrical Contractors' Association.

Sealed tenders endorsed "Radford School" are to be delivered to the undersigned by 5.30 p.m., Thursday, 17th March, 1949. The lowest or any tender will not necessarily be accepted, and contractors tendering must do so at their own expense.

D. E. E. GIBSON, City Architect.

1a, Warwick Row,  
Coventry. 3078

SITUATIONS WANTED.—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion. REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

### COUNTY OF LINCOLN—PARTS OF KESTIVEN

#### Junior and Infants' School, Waddington

THE County Council is proposing to erect a new JUNIOR AND INFANTS' SCHOOL at WADDINGTON, Lincoln, and invite reputable Electrical Engineers to indicate their willingness to submit tenders for the Electrical Installation if selected to do so.

Applications in connection with the above should be submitted to the County Architect (C. B. McEale, Esq., F.R.I.B.A.), County Offices, Seaforth, not later than the 21st February, 1949. Selected Contractors will be supplied with Form of Tender and Specification.

Tenders must be delivered not later than the 14th March, 1949, and should be addressed to the undersigned in plain, sealed envelopes endorsed—"Electrical Installation—New School, Waddington." The envelopes must not bear any mark or name indicating the sender.

Conditions of Contract may be inspected at the County Offices, Seaforth. Any Contract entered into shall comply with the Standard Orders of the County Council and the Council does not bind itself to accept the lowest or any tender.

J. E. BLOW, Clerk of the County Council.

County Offices, Seaforth.  
4th February, 1949. 3095

### DERBYSHIRE COUNTY COUNCIL

#### County Architect's Department Annual Contracts

TENDERS are invited for supplies of the following items for the year ending 31st March, 1950:—

A. CABLES.

B. CONDUIT.

C. LAMPS.

D. ELECTRICAL ACCESSORIES.

Applications to tender, stating clearly for which item (A to D) the application is made, must be forwarded to the County Architect, St. Mary's Gate, Derby, before 16th February, 1949.

Tenders to be forwarded to the undersigned in a sealed envelope by 10 a.m. on 26th February, 1949.

The Council do not bind themselves to accept the lowest or any tender, and reserve the right to accept the whole or such portion of any tender as they may think fit to select.

H. WILFRID SKINNER, Clerk of the Council.  
County Offices, St. Mary's Gate, Derby.  
February, 1949. 3052

### STATE ELECTRICITY COMMISSION OF VICTORIA AUSTRALIA

TENDERS are invited for Indoor Wall Mounting Current Transformers in accordance with Specification 48-49/12. Full particulars are available from the Agent-General for Victoria, Victoria House, Melbourne Place, The Strand, London, W.C.2.

Tenders accompanied by a preliminary deposit of £10 are returnable at the Commission's Head Office, 22, William Street, Melbourne, Victoria, Australia, by 11 a.m., Wednesday, 18th May, 1949.

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

W. J. PRICE, Secretary. 2892

### BALDWIN'S BRIDGE TRUST

THE Management Committee of the Austen Leigh and Baldwin's Institute, High St., Eton, invite tenders from Electrical Contractors for the re-wiring of and improvement to the electrical installation at the Institute Building, High Street, Eton. Specification of work to be done and form of tender can be obtained from the undersigned, to whom tenders should be returned on or before noon on Monday, the 28th February, 1949.

J. W. SMITH, Surveyor to the Bridge Trust.  
138, High St., Eton, Bucks. 3053



## ILFORD BOROUGH COUNCIL

### Electrical Installations

THE Corporation invites tenders for the alteration and improvement of the lighting installations, etc., at the following Schools:—

Christchurch School, Christchurch Road, Ilford.  
Downhall School, Aldborough Road, Seven Kings.  
Copies of the Form of Tender and Specification may be obtained from the Borough Engineer, Town Hall, Ilford, on payment of £2 2s., which will be returned on receipt of a bona fide tender. The plans and Conditions of Contract may be inspected at the office of the Borough Engineer during the normal office hours.  
Sealed tenders on the form supplied and in the official envelope provided must be delivered to the undersigned not later than noon on Tuesday, the 22nd February, 1949.

The Corporation do not bind themselves to accept the lowest or any tender.

K. F. B. NICHOLLS, Town Clerk.

Town Hall, Ilford, 3039  
1st February, 1949.

## BOROUGH OF LUTON

### Electrical Installations in Council Houses at the Farley Hill Housing Estate

TENDERS are invited for the installation of electrical services, wiring and equipment, in the houses being erected on the Farley Hill Housing Estate.

The Form of Tender, Specification of points and drawings can be obtained from the Borough Engineer, Town Hall, Luton, on payment of £2/2 deposit, which will be returnable on the receipt of a bona-fide tender which is not subsequently withdrawn. Cheques must be made payable to "Luton Corporation."

Tenders, enclosed in the official envelope provided, must be delivered to the undersigned not later than noon on Wednesday, 2nd March, 1948. The Council do not bind themselves to accept the lowest or any tender.

W. H. ROBINSON, Town Clerk.

Town Hall, Luton, 3079  
3rd February, 1949.

## COUNTY OF LINCOLN—PARTS OF KESTEVEN

### Kesteven Training College—Stoke Rochford Hall

THE County Council is proposing to carry out ELECTRICAL WORKS at the proposed new Hostel and Gymnasium Block at Stoke Rochford Hall in connection with their use as a Teachers' Training College, and invite reputable Electrical Contractors to indicate their willingness to submit tenders for such work if selected to do so. Applications in connection with the above should be submitted to the Council's Consulting Engineers, Messrs. E. G. Phillips, Son and Norfolk, of Arkus House, Annesley Grove, Nottingham, not later than the 19th February, 1949.

Selected firms will be supplied with forms of tender, specifications and drawings.

Tenders must be delivered not later than the 12th March, 1949, and should be addressed to the undersigned in plain sealed envelopes endorsed "Tender—Electricity—Stoke Rochford Hostel." The envelope must not bear any mark or name indicating the sender.

Conditions of contract may be inspected at the County Offices, Skeaford. Any contract entered into shall comply with the Standing Orders of the County Council, and the Council does not bind itself to accept the lowest or any tender.

J. E. BLOW, Clerk of the County Council.  
County Offices, Skeaford, 3051  
1st February, 1949.

## SITUATIONS VACANT

Vacancies advertised are restricted to persons or employments excepted from the provisions of the Control of Engagements Order, 1947.

## BRITISH ELECTRICITY AUTHORITY

### North Western Division

APPLICATIONS are invited for the position of ASSISTANT CHARGE ENGINEER at the Generating Station, Lancaster.

The salary is in accordance with the N.J.B. Schedule, Class H, Grade 9, £437/£453 per annum. Experience in operating large boilers and general Power Station experience essential.

Applications stating age, education, experience and present appointment should be addressed to the Establishment Officer, British Electricity House, Wilmslow Road, East Didsbury, Manchester 20, to reach him not later than ten days after the appearance of this advertisement. 2987

## MIDLANDS ELECTRICITY BOARD

### North Staffordshire Sub-Area

APPLICATIONS are invited for the following appointment:—

SENIOR ASSISTANT ENGINEER (Construction). Applicants should have a wide experience in the construction, erection and installation by direct labour of sub-stations, and of overhead lines and underground cable networks up to and including 33-kV.

The conditions will be those of the National Joint Board and the salary, within the range £750/850 per annum, will be provisional and subject to negotiation.

Applications, stating age, education, qualifications, experience, present appointment and salary, and giving the names of two referees, should be sent to reach the undersigned within fourteen days of the appearance of this advertisement.

A. STEPHENS, Secretary.

Midlands Electricity Board,  
Mucklow Hill,  
Halesowen, Nr. Birmingham.  
4th February, 1949. 3080

## MIDLANDS ELECTRICITY BOARD

### Worcester Division

#### Demonstrator

APPLICATIONS are invited for the position of Demonstrator in the Worcester District of the Worcester & District Division of the Board.

Applicants should have had experience in a similar capacity in the electricity supply industry and hold a diploma in Domestic Science. The possession of an E.A.W. Certificate would be considered an advantage.

The appointment will be subject to the conditions of the National Joint Council (Administrative and Clerical grades) for the Electricity Supply Industry and the salary within the range of £270/£330 per annum will be provisional and subject to negotiation.

Applications, endorsed "Demonstrator," stating full details of qualifications, age, experience and present salary, should be forwarded with fourteen days of the advertisement to The Secretary (Ref. F.W.C.), Midlands Electricity Board, Mucklow Hill, Halesowen, Nr. Birmingham.

A. STEPHENS,  
Secretary, 3081

4th February, 1949.

## EASTERN ELECTRICITY BOARD

### Chilterns Sub-Area

#### Assistant Mains Engineer, Bedford District

APPLICATIONS are invited for the appointment of an Assistant Mains Engineer for the Bedford District from candidates who have had a sound technical training and experience in the construction, operation and maintenance of underground and overhead systems up to 11kV.

The provisional salary will be in accordance with the N.J.B. schedule Class H Grade 83, at present £465 per annum. The salary and conditions of employment will, however, be in accordance with the terms and conditions laid down from time to time by the appropriate negotiating body.

The person appointed will be required to contribute to a Superannuation Scheme and may be required to pass a medical examination.

Applications, stating age, education, training, experience, technical qualifications, present appointment and salary, and enclosing copies of two recent testimonials (or the names of two referees) should be addressed to the Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend Street, Bedford, so as to reach him within fourteen days of the appearance of this advertisement. 3087

## CROWN AGENTS FOR THE COLONIES

APPLICATIONS from qualified candidates are invited for the following post:—

METER SUPERINTENDENT required by Nigerian Government Electricity Undertakings for two tours each of 18 to 24 months, with prospects of permanent, pensionable employment. Salary, (including expatriation pay) £860 rising to £970 a year. Quota allowance £50. Free passages and liberal leave on full salary. Candidates, preferably under 40, must be fully conversant with fixing, testing and maintenance of all types of A.C. and D.C. (single and polyphase) meters, and with protective systems and testing and maintenance of operative and protective gear. Knowledge of Solkor protective system essential. Apply once by letter, stating age, whether married or single, and full particulars of qualifications and experience, and mentioning this paper to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting M/N/18261 (3B) on both letter and envelope. 3014



## BRITISH ELECTRICITY AUTHORITY

London Division

West Ham Generating Station

APPLICATIONS are invited for the position of ASSISTANT CONTROL SHIFT ENGINEER.

Salary and conditions in accordance with N.J.B. Schedule, Class J, Grade 9A. Qualifications required are not less than ordinary National Certificate standard and experience of Control Room operation in a large modern power station.

Applications, stating age, qualifications and experience, should be addressed to the Divisional Secretary, Ergon House, Horseferry Road, Westminster, S.W.1, and be received within 14 days of the appearance of this advertisement.

J. N. WAITE, Divisional Controller. 3088

## BOROUGH OF CREWE

Electrical Department

APPLICATIONS are invited for the appointment of ELECTRICAL SUPERINTENDENT in charge of Public Lighting and all electrical installations in Council Property.

The salary offered is in accordance with Grade IV (£480-£525 per annum) of the A.P.T. Division of the National Scale of Salaries.

Applicants should be Corporate Members of the Institution of Electrical Engineers, or possess similar qualifications, with good practical experience of electrical installation work, including design, preparation of specifications and estimates, installation and maintenance, for houses, public buildings and works, and public lighting.

The post is superannuable and the successful candidate will be required to pass a Medical Examination.

Applications, giving particulars of experience and qualifications, with copies of two recent testimonials, should be forwarded to the undersigned not later than the 19th February, 1949.

K. B. EDWARDS, Town Clerk.  
Municipal Buildings, Earle Street, Crewe. 2935  
26th January, 1949.

## BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following post in the Transmission Department at Divisional Headquarters, Barker Gate, Nottingham.

SENIOR ASSISTANT TRANSMISSION ENGINEER (MAINTENANCE). Salary range £359-£370 per annum. The successful candidate will be responsible to the Transmission Engineer for the organisation and supervision of the Departmental Staff to secure systematic and efficient maintenance of Transmission Lines, Plant and Equipment.

Candidates should have received sound training as Electrical and Mechanical Engineers and should have had experience in connection with the design, manufacture, erection and operation of High Voltage Transmission Plant and be keenly interested in relating field experience to advance in design. Corporate membership of the Institution of Electrical and/or Mechanical Engineers is desirable.

The salary is in accordance with the scales at present operating, but might be subject to negotiation through the appropriate bodies. The appointment will be superannuable under the conditions of the B.E.A. Scheme or Regulations made under the provisions of the Electricity Act, 1947.

Applications should be submitted on the official form to be obtained from the Divisional Establishments Officer, at the under-mentioned address and be delivered not later than 1st March, 1949.

W. S. BURGE, Divisional Controller.  
British Electricity House,  
Barker Gate, Nottingham. 3085

## Huddersfield Technical College

Principal: Dr. W. E. Scott, M.B.E., M.Sc., Ph.D., F.R.I.C.

APPLICATIONS are invited for the post of Head of the Department of Electrical Engineering. Candidates should possess a good degree, should have had experience in industry, and should preferably be corporate members of the Institution of Electrical Engineers. The successful candidate will be expected to commence duties on 1st September, 1949. The Department is Grade I. Salary £700-£25-£850, with additions for graduateship and training, which may raise the maximum to £955.

Further particulars are obtainable from The Principal, Technical College, Queen Street South, Huddersfield, to whom applications (there is no standard form), with two recent testimonials and the names of three referees should be addressed as soon as possible.

H. KAY, Director of Education. 3082  
February 1st, 1949.

## MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments at No. 2 Sub Area:—

(a) Two JUNIOR ASSISTANTS (MAINS) on District Engineer's Staff. Salary within range £330-£465 per annum (according to age, qualifications and experience).

(b) Two DRAUGHTSMEN at Sub Area Headquarters at salary within the range £350-£450 per annum (according to qualifications and experience).

For posts (a) applicants should have a good general education and be Graduates I.E.E. or possess Higher National Certificate in Electrical Engineering. Preference will be given to applicants with some experience of H.T. and L.T. Overhead and Underground Distribution Systems.

For posts (b) applicants should be under 45 years of age and have some experience of Sub Station construction, HV and LV plant layout and preparation of Switchgear wiring diagrams.

The salary ranges quoted are provisional and subject to any adjustment found necessary after negotiation with the appropriate staff organisations.

Successful candidates will be required to satisfy the Board's Medical Adviser, and if eligible to contribute to the Provisional Superannuation Scheme adopted by the Board.

Forms of application may be obtained from the Manager, No. 2 Sub Area, Merseyside and North Wales Electricity Board, Electricity House, Sandway, Nr. Northwich, and should be returned to him in an envelope endorsed with the appointment sought, so as to be received not later than 14 days after the appearance of this advertisement.

JAMES RANKIN, Secretary. 3099

## BRITISH ELECTRICITY AUTHORITY

South East Scotland Division

APPLICATIONS are invited for the position of JUNIOR CHARGE ENGINEER (SHIFT), Class "J" Grade 8(a), at Portofenno Power Station; commencing salary £526 per annum. This Officer will be directly responsible to the Senior Charge Engineer for operation and operation personnel control in the boiler house.

Candidates should preferably have experience of steam electric power plant, including detailed working knowledge of the operation of steam turbo-generators, modern boiler plant (preferably pulverised fuel), and of high-tension electrical switchgear. Certificated Engineers with extensive marine experience would also be considered.

It should be noted by intending applicants that a new 60-MW turbine and unit 540,000 l/h P.F. boiler are being installed at the moment with steam conditions of 1,350 p.s.i.g. and 950 deg F steam temperature. This plant should be steaming by 1950 and will raise the classification of the station to "K."

Applicants will be subject to superannuation under the terms and conditions approved by the British Electricity Authority.

Applications, stating age and experience, should be addressed to the Divisional Controller, British Electricity Authority, 1, Dewar Place, Edinburgh.

J. F. FIELD, Divisional Controller. 3084

## BRITISH ELECTRICITY AUTHORITY

Merseyside and North Wales Division

APPLICATIONS are invited for the appointment of THIRD ASSISTANT ENGINEER in the Transmission Department at Divisional Headquarters, Liverpool, within the salary range of £534 3s. to £665 8s. per annum.

The salary is to be regarded as provisional pending negotiation between the Authority and the appropriate organization.

The Appointment will be subject to Medical Examination and Superannuation under terms and conditions to be approved by the British Electricity Authority.

Applicants should have experience in the erection and maintenance of 132kv overhead lines, transformers, switchgear, etc. Corporate or Graduate Membership of the I.E.E. or equivalent qualification will be an advantage.

Forms of application may be obtained from the Divisional Secretary, British Electricity Authority, Merseyside and North Wales Division, Clarke Gardens, Woolton, Liverpool, and should be returned in a sealed envelope endorsed in the top left-hand corner "Third Assistant Engineer (Transmission)" so as to reach the Divisional Secretary at the above address not later than the first post on Friday, 25th February, 1949.

A. R. COOPER, Divisional Controller. 3077  
2nd February, 1949.



## SOUTH EASTERN ELECTRICITY BOARD

### Staff Vacancy

APPLICATIONS are invited for the following appointment:

**PRINCIPAL SECRETARIAL ASSISTANT**, Croydon and West Kent Sub-Area, Croydon, Surrey. Commencing salary £650 per annum. This salary is provisional, and is subject in due course to negotiation with the appropriate organization. Arrangements for superannuation will be made. Applicants, who should be members of the Chartered Institute of Secretaries or be similarly professionally qualified, must have had considerable experience in secretarial and administrative work, including the preparation of reports, minutes, statistical statements, and the control and supervision of staff, together with a knowledge of modern office organization and systems. A knowledge of the Electricity Supply Industry is desirable.

Applications, stating age, present position, experience and qualifications, and giving the names of two referees, should reach:—

T. A. D. Honnor, Esq., M.I.E.E., Manager Croydon and West Kent Sub-Area, South Eastern Electricity Board, Electric House, Wellesley Road, Croydon, Surrey, by not later than the 21st February, 1949.

A. L. BURNELL, Secretary.

10, Queen's Gardens, Hove, 3, Sussex. 3090  
February, 1949.

## BRITISH ELECTRICITY AUTHORITY

### Midlands Division

APPLICATIONS are invited for appointments as **THIRD ASSISTANT ENGINEERS** in the Transmission Department at Divisional Headquarters. Salary will be within the range of £534 5s. to £665 8s.

Applicants should possess a Higher National Certificate in Electrical Engineering or hold equivalent qualifications and should have had experience in the construction and equipment of High Voltage Sub-stations, High Voltage Transmission Lines, and Civil Engineering works relating thereto.

The salary mentioned is to be regarded as provisional until the final scales have been negotiated with such organizations as are appropriate. Superannuation will be under terms and conditions approved by the British Electricity Authority.

Applications should be made on forms which may be obtained from the Divisional Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, and be returned within 14 days of this advertisement.

F. W. LAWTON, Divisional Controller. 3016

## COUNTY COUNCIL OF DURHAM

### Education Department

### Stockton-on-Tees Technical Institute

APPLICATIONS are invited for the post of full-time Assistant to teach mainly Engineering Drawing, Engineering Science and Workshop Practice and Technique. Candidates should be graduates in Engineering or hold an equivalent qualification, and must have some industrial experience.

Salary in accordance with the Burnham Scale of Salaries for teachers in Technical Schools.

For forms of application (which must be returned, duly completed, as soon as possible) apply, enclosing stamped, addressed foolscap envelope, to the Director of Education, Shire Hall, Durham.

A. A. DENHOLM, Director of Education.  
Shire Hall, Durham. 3033  
3rd February, 1949.

## EASTERN ELECTRICITY BOARD

### Fens Sub-Area

### Appointment of Draughtsman

APPLICATIONS are invited for employment in the Distribution Drawing Office at Sub-Area Headquarters, Milton Hall, Cambridge. Previous experience in the preparation of diagrams and drawings in connection with urban and rural distribution network preferred.

The provisional salary will be £425 per annum. This salary is subject to adjustment to conform with the appropriate negotiating body. Previous experience in the preparation of diagrams and drawings in connection with a superannuation scheme and may be required to pass a medical examination.

Applications, stating age, education, qualifications and experience, accompanied by the names of two referees, should be addressed to The Manager, Fens Sub-Area, County Hall, Hobson Street, Cambridge, within fourteen days of the appearance of this advertisement. 3086

## SOUTHERN ELECTRICITY BOARD

### Assistant Plant and Equipment Engineer

APPLICATIONS are invited for the post of **ASSISTANT PLANT and EQUIPMENT ENGINEER**, in the Chief Engineer's Department at Southern Electricity House, Maldenhead.

Candidates, who must be Corporate Members of the Institution of Electrical Engineers should have considerable knowledge of all types of indoor and outdoor equipment used on distribution systems, with particular reference to switchgear, transformers and protective gear, etc., preferably up to 66kv.

The commencing salary, which is provisional and subject to adjustment by the negotiating machinery, will lie within the range £800-£1,000, at a point dependent upon qualifications and experience.

Applications on the prescribed form, which may be obtained from the Secretary, Southern Electricity Board, Southern Electricity House, Bath Road, Maidenhead, Berks., should be forwarded so as to reach him not later than 14 days after the appearance of this advertisement.

F. W. KEMPTON, Secretary. 2935

## BRITISH ELECTRICITY AUTHORITY

### East Midlands Division

### General Technical Assistant—Telecommunications

APPLICATIONS are invited for the post of General Technical Assistant—Telecommunications at the Headquarters of the British Electricity Authority, East Midlands Division.

The duties relate to Communications and Supervisory Equipment in connection with the Grid System and Generating Stations in the East Midlands Division. Qualifications of Graduate I.E.E. standard are required. Together with experience of electronics, and application of automatic telephone type circuits and equipment.

Salary will be provisional within the range of £592/8-£523/18, subject to negotiations with the appropriate organisations.

Applications must be submitted on the prescribed form which may be obtained by writing to the Establishments Officer at the undermentioned address and be delivered not later than 21st February, 1949.

W. S. BURGE, Divisional Controller.  
British Electricity House, 2896  
Barker Gate, Nottingham.

## BOROUGH OF WIDNES

### Appointment of Street Lighting Superintendent

APPLICATIONS are invited for the above appointment in the Borough Engineer and Surveyor's Department at a salary in accordance with Grade III (£450-£495) or Grade IV (£480-£525) of the A.P.T. Division of the National Scale of Salaries, dependent on the qualifications of the applicant.

Candidates must have had considerable experience in a street lighting department.

The appointment will be subject to:

(a) Conditions of Service of the National Joint Council as adopted by the Borough Council.  
(b) Provisions of the Local Government Superannuation Act, 1937.  
(c) The passing successfully of a medical examination.

Applications stating age, qualifications and experience, together with particulars of past and present appointments and the names of two persons to whom reference may be made, should be forwarded in envelopes endorsed "Street Lighting Superintendent" to the Borough Engineer and Surveyor, Town Hall, Widnes, not later than 9 a.m., Monday 28th February, 1949.

Applicants must disclose in writing whether or not they are related to any member of the Council or Chief Officer. Canvassing will disqualify.

JAMES WALLACE, Town Clerk.  
Town Hall, Widnes. 2983  
February, 1949.

## YORKSHIRE ELECTRICITY BOARD

### No. 7 Sub-Area (Grimsby)

APPLICATIONS are invited for the positions of **OVERHEAD LINESMEN** to work from the Scunthorpe, Gainsborough and Grimsby Depots. Applicants must be experienced in the erection and maintenance of overhead lines up to 11 kv.

The present rate of pay is 2/8¼ per hour, in accordance with the conditions of the National Joint Industrial Council for the Electricity Supply Industry.

Applications, giving full particulars of age, experience and present occupation should be addressed to the Manager, No. 7 Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, to be received within fourteen days of the appearance of this advertisement. 3054



## NORTHERN GROUP HOSPITAL MANAGEMENT COMMITTEE

### APPLICATIONS are invited for the post of ASSISTANT GROUP ENGINEER.

Candidates should have served an apprenticeship in Mechanical Engineering, possess a qualification at least up to the standard of the Higher National Diploma, or Certificate in Mechanical Engineering, and have a sound knowledge of the principles and practice of the efficient operation of institutional boiler plants and possess electrical experience and a knowledge of building construction. The duties will involve responsibility under the Group Engineer for the operation and maintenance of the engineering services generally at the various hospitals in the Group and for the maintenance of the fabric of the buildings.

Salary Grade A.P.T.V. £520-£570, plus London Weighting £30 per annum.

Transferred officers within the meaning of the Act may opt to retain their existing salaries and conditions of service.

The appointment will be subject to the National Health Service (Superannuation) Regulations, 1947, and to the passing of a medical examination.

Applications, stating age, qualifications, experience, present position and salary, together with copies of two recent testimonials, should be sent to the Secretary, Northern Group Hospital Management Committee, Royal Northern Hospital, Holloway, London, N.7. not later than 15th March, 1949. 3041

## BRITISH ELECTRICITY AUTHORITY

### East Midlands Division

APPLICATIONS are invited from qualified Engineers for the following appointments:—

(a) ASSISTANT TO GENERATION ENGINEER (O). The selected candidate will be required to assist the Generation Engineer in the control and operation of a group of Power Stations based at Leicester. Applicants should have served an engineering apprenticeship and have had extensive experience in all phases of operation and maintenance of modern high-pressure Generating Plant.

Salary range £707/8-£838/13 per annum.

(b) ASSISTANT TO EFFICIENCY ENGINEER. The selected candidate will be required to assist the Divisional Efficiency Engineer at Headquarters.

In addition to a thorough technical training, applicants should have had Generating Station or equivalent experience involving responsibility for the efficient operation of all types of modern generating plant. Experience in running acceptance trials on boilers, turbines and associated plant, and in the organisation and keeping of technical records will be an advantage.

Salary range £707/8-£838/13 per annum.

(c) GENERAL ASSISTANTS TO CHIEF GENERATING ENGINEER (O) DEPARTMENT.

Applicants should have a thorough technical training and experience in the operation of modern Generating Stations (Nottingham Headquarters).

Salary range £592/8-£523/13 per annum.

Applications should be submitted on the official form which may be obtained from the Establishments Officer at the under-noted address and be returned not later than 21st February, 1949.

W. S. BURGE, Divisional Controller.

British Electricity House, 2895  
Barker Gate, Nottingham.

## THE SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following positions in the Civil Engineering Department of the Board at St. Mellons, Cardiff:—

ARCHITECTURAL ASSISTANT. Applicants will be required to undertake the design, lay-out and preparation of working drawings for Show-rooms, Offices and Sub-Stations, including alterations to existing buildings.

The salary will be in the provisional range of £600-£700 per annum, according to qualifications and experience.

ARCHITECTURAL DRAUGHTSMAN. Applicants will be required to prepare drawings and details from rough sketches for erection and alteration of Offices, Show-rooms and Sub-Stations.

The salary will be in the provisional range of £400-£500, according to qualifications and experience.

Both positions will be superannuable and subject to one month's notice on either side.

Applications, stating age, present position, present salary, qualifications and experience, together with the names and addresses of three referees, should be addressed to the Secretary (Establishments Section), The South Wales Electricity Board, St. Mellons, Cardiff, and be received by him not later than the 26th February, 1949.

D. G. DODDS, Secretary. 3040

## BRITISH ELECTRICITY AUTHORITY

### Midlands Division

APPLICATIONS are invited for appointments as GENERAL ASSISTANT ENGINEERS in the Transmission Department. Salary will be within the range of £392 8s. to £523 13s.

Applicants should possess a Higher National Certificate in Electrical Engineering or hold equivalent qualifications and should have had experience in the maintenance and operation of High Voltage Transmission Lines and Sub-stations.

The salary mentioned is to be regarded as provisional until the final scales have been negotiated with such organizations as are appropriate. Superannuation will be under terms and conditions approved by the British Electricity Authority.

Applications should be made on forms which may be obtained from the Divisional Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, and be returned within 14 days of this advertisement.

F. W. LAWTON, Divisional Controller. 3015

## BRITISH ELECTRICITY AUTHORITY

### Midlands Division

APPLICATIONS are invited for the following appointments in the Drawing Office at Wolverhampton.

(a) One SENIOR MECHANICAL DRAUGHTSMAN to act as Section Leader, with experience in layout and design of Generating Stations or Generating Plant, e.g., Boiler Plant, Alternator Plant, or Ancillary equipment. Salary within the range £600/£700 according to qualifications and experience.

(b) Two MECHANICAL DRAUGHTSMEN with similar experience as above. Salary in accordance with age and experience.

(c) One CIVIL ENGINEERING DRAUGHTSMAN with wide experience in Civil Engineering, including the design of heavy structures and associated foundations, also railway sidings. Salary £550 per annum.

(d) One ARCHITECTURAL DRAUGHTSMAN for work on Generating Station Buildings. Salary £505 per annum.

(e) Two JUNIOR ARCHITECTURAL DRAUGHTSMEN. Salary in accordance with age and experience.

The salaries quoted are to be regarded as provisional until the final scales have been negotiated with such organizations as are appropriate. Superannuation under terms and conditions approved by the British Electricity Authority.

Applications should be made on forms which may be obtained from the Divisional Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, and be returned within 14 days of this advertisement.

F. W. LAWTON, Divisional Controller. 3017

## SOUTHERN ELECTRICITY BOARD

### No. 1 (Southall) Sub-Area

District Distribution Engineers and Assistant District Distribution Engineers

APPLICATIONS are invited for the following appointments:

A number of vacancies exist in several of the Districts of the No. 1 (Southall) Sub-Area of the Southern Electricity Board for District Distribution Engineers and Assistant District Distribution Engineers. The posts are subject to the National Joint Board conditions of service, with salaries ranging from £500 to £850 per annum, depending upon qualifications and experience.

Applicants should have had sound experience in the layout of Networks and Sub-stations, with the usual ancillary apparatus, and be thoroughly familiar with underground cable Networks up to 11 kv. Applicants should have recognised technical qualifications, and in the higher grades preferably be Corporate Members of the Institution of Electrical Engineers, and have had sound technical training, followed by extensive experience, and be capable of drawing up a Programme of Work of future development in the particular District concerned.

The above salaries are provisional, and subject in due course to negotiation with the appropriate Organisation.

Applications for these posts should be made upon an Application Form to be obtained from the Administrative Officer, No. 1 (Southall) Sub-Area, Southern Electricity Board, 2-6 Windmill Lane, Southall, Middlesex, and returned to him not later than 14 days after the publication of this advertisement.

F. W. KEMPTON, Secretary. 3055

CLASSIFIED ADVERTISEMENTS  
ARE PREPAID



**BRITISH ELECTRICITY AUTHORITY**

**Eastern Division**

**A**PLICATIONS are invited for the following positions in the Generation Construction Department at Divisional Headquarters in North London:—

(a) SENIOR ASSISTANT ENGINEER (MECHANICAL). Salary range £802-£950 per annum.

Applicants should preferably hold a recognised Mechanical Engineering Degree and be a corporate Member of one of the Professional Institutions. They should have a wide practical knowledge of the design, layout and construction of Generating Stations and be capable of preparing specifications for mechanical plant.

(b) SENIOR ASSISTANT ENGINEER (ELECTRICAL). Salary range £802-£950 per annum.

Applicants should preferably hold a recognised Electrical Engineering Degree and be a corporate Member of one of the Professional Institutions. They should have a wide knowledge of electrical plant associated with generating stations including H.V. switchgear, and be capable of dealing with generating stations.

(c) ASSISTANT ENGINEERS (MECHANICAL) (three vacancies). Salary range £606-£699 per annum +5% London Weighting. N.J.B. Schedule, Class J, Grade 7 to 5.

Applicants should preferably have attained degree standard and had practical experience with mechanical plant associated with generating stations.

(d) ASSISTANT ENGINEER (ELECTRICAL). Salary range £606-£699 per annum +5% London Weighting. N.J.B. Schedule, Class J, Grade 7 to 5.

Applicants should preferably have attained degree standard and had practical experience with electrical plant associated with generating stations.

(e) GRADE 1 DRAUGHTSMEN (MECHANICAL) (four vacancies). Salary range £494-£606 per annum +5% London Weighting. N.J.B. Schedule, Class J, Grade 8b to 7.

Applicants should be in possession of the Higher National Certificate or equivalent and preferably have served a recognised apprenticeship course. They should be familiar with one or more of the following:—

Generating Station layout and design, Coal Handling Plant, Ash and Dust Handling Plant and pipework systems.

Applications are also invited for the following positions:—

(f) CLERK OF WORKS (PLANT)—Rye House Generating Station, Hoddesdon. Salary range £506-£764 per annum +5% London Weighting. N.J.B. Schedule, Class J, Grade 7 to 4.

Applicants should be in possession of the Higher National Certificate and preferably have served a recognised apprenticeship course. They should have wide experience of constructional work on site and be capable of dealing with Contractors' Staff.

(g) SENIOR ASSISTANT ENGINEER—Albert Meadow Generating Station, Peterborough. Salary in accordance with N.J.B. Schedule, Class G, Grade 4, at present £677 per annum.

Applicants should preferably hold a recognised Engineering degree and be a corporate member of one of the Professional Institutions. They should have a wide practical knowledge of the design, layout and construction of generating stations and be capable of preparing specifications.

The salaries are in accordance with the scales at present operating but may be subject to negotiation through the medium of the Joint Board. The appointments will be Superannuable under the conditions of the Scheme or Regulations to be made under the provisions of the Electricity Act, 1947.

Applications, stating age, qualifications, experience and present position and endorsed with the appointment sought should be submitted to arrive not later than 25th February, 1949, to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14.

W. N. O. CLINCH, Controller.

Northmet House,  
Southgate, N.14. 2893

**THE UNIVERSITY OF LIVERPOOL**

**A**PLICATIONS are invited for LECTURESHIPS in the Department of Electrical Engineering (Electrotechnics) at salaries between £650 and £1,050 per annum. The status and initial salary for each post being determined according to qualifications and experience in Generation Transmission and Distribution of Electrical Energy, Design of Electrical Machinery, Electric Traction and Advanced Electrical Technology.

Applications stating age, academic qualifications and experience, together with the names of three referees, should be received not later than 1st March 1949, by the undersigned from whom further particulars of the conditions of appointment may be obtained.

STANLEY DUMBELL,  
Registrar. 2851

**MERSEYSIDE AND NORTH WALES  
ELECTRICITY BOARD**

**Birkenhead District**

**Appointment of Meter Engineer**

**A**PLICATIONS are invited for the post of METER ENGINEER in the Birkenhead District of No. 3 Sub-Area of this Board. The salary will be within the range of £550 to £650 per annum according to qualifications and experience. The salary range quoted is provisional and will be subject to such adjustment as may be necessary to conform with the scales of salary agreed after negotiation with the appropriate staff organization.

The duties will include the control and organization of a Class "A" Meter Test Station and the testing of relays for protective systems, and applicants should have had a sound training in a large station covering similar work.

The successful candidate will be required to satisfy the Board's Medical Adviser and to contribute to the Provisional Superannuation Scheme adopted by the Board.

Applications should be made on a form obtainable from the Sub-Area Manager, No. 3 Sub-Area, Electricity House, Newgate Street, Chester, and should be returned to him so as to be received not later than the first post on Friday, 18th February, 1949.

JAMES RANKIN, Secretary. 2936

**A** COMPANY of agents and electrical wholesalers distributing electrical goods in the West of England would consider applications for the post of Sales Director. Applicant must be young with practical experience, able to promote sales on his own initiative.—Write, stating age and past experience to Box 2872.

**A**N electrical engineering company in the Midlands desires Draughtsmen experienced in mechanical design and in construction of a.c. and d.c. machines.—Reply, full particulars of experience and training to: Roy No. 473, T. & G., 101, St. Martin's Lane, London, W.C.2. 164

**A**N experienced layout draughtsman, by old-established engineering firm in the Midlands. The work involves the layout of power station equipment for steam and diesel electric projects. The position is progressive and carries a good salary. Only applicants who are capable of taking full responsibility and are able to handle correspondence should apply, giving details of their experience and qualifications, etc., to Box 2737.

**A**N opportunity occurs for a well-educated man with sound technical training and some experience in instrument manufacture or light engineering to fill the position of assistant works manager in factory near London. The post is one with good prospects for a man of character and ability.—Apply, stating age, training, experience and salary required, Box 3047.

**A** RCHITECTURAL Assistants urgently required. Qualifications: At least three years' Architectural training, and, preferably, some experience in an Architect's office. Ability to carry out under supervision working drawings of smaller works from prepared sketch plans and elevations. Knowledge of subsidiary duties common to an Architect's Office and written testimonies already accepted and/or in a position to sit for Intermediate Examination of the Royal Institute of British Architects.

Structural Engineering Assistants urgently required. Qualifications: Basic knowledge Static Mechanics, properties of materials, and structural detailing and design obtained over a period of not less than three years at a Technical College, plus one year in a Structural Engineer's office, or four years in a Structural Engineer's office supplemented by Technical Classes. Capable of site surveying, dealing with specifications and making reliable reports. Sanitary Engineering Assistant urgently required. Qualifications: Three years as an Apprenticed Pupil or Assistant in a Civil Engineer's Drawing office and three years' part-time study in Engineering subjects including drainage and water supply. The post is full-time study in Engineering subjects including drainage and water supply, and at least one year's experience in a Civil Engineer's Drawing Office. At ages above 21, corresponding advanced knowledge, experience and Drawing Office technique are required. Preference given to candidates who have passed for Associate Membership of the Institution of Sanitary Engineers. The Intermediate Examination or the Testamur Examination of the Institution of Municipal Engineers, or equivalent. The commencing salary for all these posts at age of 21 years is £283 per annum, rising to a maximum of £488 per annum. Entering salary is increased by £20 per annum for each year of age above 21 years, subject to a maximum commencing salary of £420 per annum.

The posts are at Cambridge. Although these posts are not established posts, some of them have long-term possibilities, and competitions are held periodically to fill established vacancies. Apply to Ministry of Works (R.D.I. Estac.), Shaftesbury Rd., Brooklands Avenue, Cambridge. (Issued after consultation with the Ministry of Labour and National Service.) 3057



**A**n important London Company requires an Electrical Engineer to take charge of the installation and maintenance of electrical equipment. Applicant should be between 22 and 45 years of age, an Associate Member of the Institute of Electrical Engineers, or have equivalent qualifications, and have wide experience of the operation and maintenance of E.H.T. Sub-stations, large industrial power installations and general factory equipment. Letter of application should be in own handwriting, and should be accompanied by full details of education, age, experience and present-day salary.—Write to Box "V.Z.", c/o J. W. Vickers & Co., Ltd., 7-8, Great Winchester St., London, E.C.2. 3058

**A**RMATURE winders and improvers required, experienced in local repairs and conversions. Bristol area. State full details.—Box 3021.

**A**RMATURE winder by large industrial organisation for service in the Middle East. Full apprenticeship essential and Ordinary National Certificate advantageous. Not less than three years' experience on repair shop rewinds covering H.T. and L.T. motors up to 800hp. Age limit 30. Attractive salary, plus generous allowance in local currency. Free passages out and home, free medical attention, kit allowance, Pension Scheme, good leave arrangements. Write, stating age, and full details of qualifications and experience, quoting Dept. F.146, to Box 1708, at 191, Gresham House, E.C.2. 190

**A**SSISTANT design engineer for medium a.c. and d.c. machines. Previous experience essential. Progressive position.—Write Box 517, T. & G., 101, St. Martin's Lane, London, W.C.2. 2599

**A**SSISTANT Technical Sales Engineer by reputable non-ring transformer manufacturers in S. Wales. Permanent and progressive post for man experienced in preparing costs and handling enquiries for all types of transformers up to 1,500 kVA.—Write, stating age, experience and salary expected, to Box 2866.

**A**UTHORISED electrical wholesalers (E.E.A.M.A.) require representative for West Yorks area to sell electrical equipment, preferably to industrial users.—Box 3020

**A**VACANCY occurs with an old-established firm for a junior engineer to be trained for the London sales department; state age and training.—Box 8951.

**C**ABLE jointers urgently required by large industrial concern operating in the Middle East for H.V. jointing on underground cables up to 33 kv and for L.V. distribution networks. Vacancies also exist for E.H.T. cable jointers. Applicants must be thoroughly experienced in modern methods. Age not over 35. Attractive salary, plus generous allowance in local currency. Free passages out and home, medical attention and kit allowance. Pension scheme.—Write, stating age and full details of qualifications and experience, quoting Department F.39, to Box 1706, at 191, Gresham House, E.C.2. 189

**C**HIEF transformer draughtsman, age 35-45, for a works employing 150 in London area, good prospects for right man; state age, full details of experience and salary required.—Box 2970.

**C**OMMERCIAL Assistant.—Applicants are invited from senior or experienced commercial assistants for an appointment with a large electrical organisation in Central London. Applicant should be British National, about 30 years of age, matriculated, preferably with commercial degree. Some electrical knowledge an advantage. Salary approximately £500 per annum, according to age and experience.—Write, stating age and full details of experience and qualifications, to Box 2803.

**C**ONTRACTS Engineers required at Stafford for large steam turbine and diesel engine comprehensive generating plant contracts; previous experience with electrical manufacturers and in power stations desirable; permanent. Houses may be available to suitable applicants with children.—Apply, quoting Ref. 193, Central Personnel Services, The English Electric Co., Ltd., 27-30, Gillingham St., Westminster, London, S.W.1. 240

**C**OUNTER hand by electrical wholesalers.—Apply by letter stating age and experience to Manager, Mosers, Ltd., 170-192, Borough High St., London, S.E.1. 3091

**C**ROMPTON PARKINSON, Ltd., invite applications for the position of Switchgear and Transformer Sales Engineer in the Yorkshire area.—Applications, with details of education, technical qualifications, age, salary required to Ref. JHP/P. Crompton Parkinson, Ltd., Crompton House, Aldwych, W.C.2. 2901

**D**ESIGNER-Draughtsman.—Experienced in the design of low-tension air-break and oil-break switchgear, to work under chief designer at works of Switchgear Manufacturers in N.W. London. Permanency to suitable man.—Reply, stating age, experience and salary required, to Box 2449.

**D**ESIGNER-Draughtsman, aged 28-38, for electro-mechanical instrument design and design. Some electronic experience desirable. Must have sound knowledge workshop practice. Progressive position. 5-day week. Modern factory Beckenham area.—Apply, giving full details of age, experience and salary required, to Box 3031.

**D**RAUGHTSMAN.—Leading man by old-established engineering firm in Glasgow. Experience in hoisting and lifting machinery essential.—Box 3049.

**D**ESIGNER-Draughtsman, with knowledge of the design of small industrial electric motors a.c. and d.c. Must have considerable experience in this field and be prepared to work in the North.—Apply, with full details of training, experience and salary required, to Box 3045.

**D**EVELOPMENT engineer with experience in design and manufacture of medium-sized a.c. and d.c. machines; position offers good prospects for man with creative ability and enterprise.—Write Box 518, T. & G., 101, St. Martin's Lane, London, W.C.2. 2600

**D**EVELOPMENT engineers; several vacancies occur in the laboratories of a well-known lamp works in the North for assistants to work on filament lamp or discharge lamp development. They should be graduate physicists and preferably possess practical experience in high vacuum technique, but new graduates will be considered.—Box 2943.

**D**RAUGHTSMAN, experienced, for mechanical/constructional design work. National Certificate Standard preferred. Apply to the Secretary, Marconi's Wireless Telegraph Co., Ltd., New St., Chelmsford, stating age, education, experience and salary required. 3042

**D**RAUGHTSMEN for transformer and rectifier work, preferably with previous transformer experience. Salary £300-£500, depending on age and experience. Write to the Secretary, Marconi's Wireless Telegraph Co., Ltd., Fulham Palace, London, W.8. 1972

**D**RAUGHTSMEN for transformer division of well-known West of England manufacturers, preferably with some experience of small transformers up to 50 kVA; interview and preliminary training in London area.—Box 2871.

**D**RAUGHTSMEN by the Research Laboratories of the Radio Electric Co., Ltd., North Wembley, Middlesex, for work in the field of radio or telecommunications. Vacancies exist for seniors with several years' experience as well as for more junior candidates.—Apply to the Director, stating age, academic qualifications and experience. (This advertisement is inserted by permission of the Ministry of Labour and National Service under the Control of Engagement Order, 1947.) 2756

**D**RAUGHTSMEN for contract work on motor control gear.—Write with full particulars including experience to Brookhirst Switchgear, Ltd., Chester, E.C. Department. (By permission of the Ministry of Labour and National Service under the Control of Engagement Order, 1947.) 8644

**D**RAUGHTSMEN, for development and design of radio communication equipment. Drawing office experience in the production of electro-mechanical apparatus essential. Applicants should be of National Certificate standard.—Apply to the Secretary, Marconi's Wireless Telegraph Co., Ltd., New St., Chelmsford, stating age, education, experience and salary required. 2746

**D**RAUGHTSMEN.—Two required with experience in low-tension air-break and oil-break switchgear for Contracts Section of Switchgear Manufacturers' Works in N.W. London. Permanent positions with opportunity for advancement.—Reply, stating age, experience and salary required, to Box 2448.

**E**DITIONAL Assistant for the monthly journal "Electronic Engineering." Ability to write good English and wide reading of electronic and general scientific literature essential. A knowledge of make-up, proof correcting, etc., desirable. Applicants must not be less than 22 years of age and of good personality.—Full particulars of education, experience, etc., should be sent by letter in the first place, to the Staff Director, Morgan Brothers (Publishers), Ltd., 28, Essex St., Strand, W.C.2. 3019

**E**LECTRIC lamp distributors require representatives with established connections to carry reputable lamps as additional line; commission basis.—Box 9110.

**E**LECTRICAL engineer for preparation of control schemes, wiring diagrams and specifications of furnace equipment.—Birlec, Ltd., Tyburn Rd., Erdington, Birmingham, 24. 3022

**E**LECTRICAL engineer for London offices of large oil company. Qualifications—engineering degree or equivalent, and having completed apprenticeship with manufacturers of heavy electrical apparatus or with Electricity Supply Authority. Responsible practical experience in preparation of mains layouts (overhead and underground) i.t. and h.t. Switchgear up to 500mva, transformers heavy industrial and domestic installations. Drawing office experience, preparation of specifications and enquiries; responsible work in Contract Dept. Age limit 40. Salary £850.—Write quoting No. 265 to Box 2672, c/o Charles Barker & Sons, Ltd., 31 Budge Row, London E.C.4. 2992

**E**LECTRICAL engineers, by large industrial concern operating in the Middle East. Applicants should have obtained their National or Higher National Certificate and have experience of construction and maintenance of overhead and underground mains, indoor and outdoor sub-stations and a system operating on voltage up to 33kv; also a knowledge of H.V. cable jointing and the keeping of mains records. Age 25-35. Attractive salary, plus generous allowance in local currency. Free passages out and home, medical attention, kit allowance. Pension scheme.—Write, stating age and full details of qualifications and experience, quoting Dept. F.61, to Box 1741, at 191, Gresham House, E.C.2. 186



**ELECTRICAL-mechanical** engineer by large brewery in N.W. London. Age 28-35, with degree or professional institution qualifications. Ac-dc generation and factory distribution essential. Knowledge of design and maintenance on steam and power plants, refrigeration, heat interchangers, pumps and general electrical and mechanical plant desirable. Remuneration £800 to £1,200 depending upon age and experience. Excellent staff amenities.—Write, giving full details of training and experience, to Box 2932.

**ELECTRICAL** engineer required as joint manager with Principal, for contractors in East Coast town, to take complete charge of all classes of contracts from estimating to final accounts. Selling and interviewing experience an advantage. State age and experience.—Box 9097.

**ELECTRICIAN** by North London electrical contractors: 5-day week.—Box 9102.

**ELECTRICIAN** for London contractors, must have thorough knowledge of trade, permanency for good man.—Write stating age and experience, to Box 3093.

**ELECTRICIANS** by London contractor, used to Ministry Contracts and general installation work. State experience.—Box 9068.

**ENGINEER**, by firm of electrical accessories manufacturers situated in N. Lanes. Applicant must be able to take charge of existing research and design department, and be able to advise on technical matters generally. Preference will be given to applicant with degree in electrical engineering and corporate membership of the Institute of Electrical Engineers, and having experience in both electrical research and designing for mass production.—Application should state age and salary required.—Box 2919.

**ENGINEER** 40, twelve years experience in production, repair, winding, portable, electric tools, desists change.—Box 9081.

**ESTIMATOR** by N.W. London Switchgear Manufacturer, to take charge of the preparation of estimates and quotations for low-tension air-break and oil-break switchgear. Must also have ability to estimate costs of production from detailed drawings. Permanent position with opportunity for advancement.—Rep'v stating age, experience and salary required, to Box 2450.

**EXPERIENCED** foreman winder, with experience of high-tension winding.—Collins Electrical, Ltd., 112 Clerkenwell Rd., London, E.C.1. 24

**EXPERIENCED** telephone maintenance engineers. Senior telephone development engineer and draughtsmen, senior/junior structural draughtsmen (electric signs), radio development engineers, draughtsmen, men/women tracers, inspectors, instrument makers and fitters, production planning engineers, ratifiers, physicists, chemists, electrical engineers (knowledge dielectrics and condensers), assistant chemist (electro-plating), television service engineers.—Technical Employment Agency, 179, Clapham Rd., S.W.9 (Brixton 3447). 9092

**EXPERIENCED** trade counter hand for cable and accessories stores. Hours 9 to 5.30, five-day week.—Apply Acalite Ltd., 20/22, Craven Rd., Farringdon W.2, Tel. Amb. 3231. 9053

**FOREMAN** by lamp factory in North-West London area. Must be experienced flame setter and used to unit production system on either household gas-filled and vacuum lamps, or on miniatures.—Box 3044.

**HEATING**, Ventilating and Electrical Engineering Draughtsmen urgently required. The minimum qualifications at age 21, are that the applicants shall have had at least four years Heating and Ventilating and Electrical Engineering experience or apprenticeship in an industrial or government undertaking, or alternatively with a reputable Installation Contractor, of which at least one year should have been spent on drawing office duties. Candidates will be required to produce evidence that they have undertaken or are undertaking a recognised course of study advancing to the standard of National Certificate or equivalent. Applicants who have reached a higher standard and who are capable, without undue supervision, of initiation and design of moderate sized schemes, preparation of specifications and estimates, analysis of tenders and technical correspondence, and who have reached a level of study equivalent to Higher National Certificate Award, are preferred. The commencing salary for these posts at age of 21 years is £283 per annum, rising to a maximum of £495 per annum. Entering salary is increased by £20 per annum for each year of age above 21 years, subject to a maximum commencing salary of £420 per annum. The posts are at Cambridge. Although the number is not established, some of the posts have long-term possibilities and competitions are held periodically to fill established vacancies. Apply to Ministry of Works (R.D.1. Estab.), Shaftesbury Rd., Brooklands Avenue, Cambridge. (Issued after consultation with the Ministry of Labour and National Service). 3056

**INSTRUMENT** maker for standardization of precision type indicating wattmeters, voltmeters, etc. Only men of proved ability and technical training should apply, giving full particulars of experience, salary required, etc., to the Personnel Manager, Landis & Gyr, Ltd., Victoria Rd., North Acton. 3059

**GENERAL** operating superintendent for three inter-connected hydro-electric generating plants located abroad. Applications invited from engineers thoroughly experienced in operation and maintenance and in the scheduling of water usage from seasonal storage reservoirs. Inclusive salary £2,500. Six months' vacation at the five-year National Certificate. Apply, Personnel Office, Ferguson Fallin, Ltd., Higher Openshaw, Manchester, 11. 2837

**JUNIOR** switchgear sales engineers to handle detail switchgear enquiries and orders. Excellent prospects of advancement for those showing ability to deal with sub-station and ultimately power station switchgear jobs. Preference given to applicants with works training and Higher National Certificate. Apply, Personnel Officer, Ferguson Fallin, Ltd., Higher Openshaw, Manchester, 11. 2837

**JUNIOR** technical assistant for switchgear development. National certificate and drawing exp. Full particulars, and salary reqd.—Power Equipment Co., Ltd., Kingsbury Rd., Hendon, N.W.9. 3029

**LONDON** manufacturers of high-class light fittings (small firm of long standing) requires an assistant to proprietor, capable of indoor and outdoor work. Only gentlemen with wide technical knowledge, long experience and good connections need apply. The ability to sketch would be an advantage.—New Light Fittings, 20-1, Tottenham Mews, London, W.1. Mus. 9290.

**MACHINE** shop foreman by large heavy electrical engineering firm in the London area. Qualifications must include detailed knowledge of modern machine shop methods and the control of male labour. Only first-class men with wide experience of both repetitive and special duty machining need apply. Good salary for right man. Full details of previous experience in confidence to Box 2995.

**MAN** required to answer telephone and deal with light correspondence. Some knowledge of radio essential. North London district.—Write, stating age, experience and salary required, to Box 3092.

**POWER** engineer by large industrial organisation for service in the Middle East; candidates should have wide experience of operation and maintenance of modern turbine and associated boiler plant and be thoroughly conversant with modern power station operating methods and boiler house practice; experience of G.C. engines and diesel-drive alternators would be an advantage. Possession of an engineering degree or qualifications up to A.M.I.Mech.E. standard essential; age limit 37 years. Attractive salary plus generous allowance in local currency. Free passages out and home; free medical attention; kit allowance; pension scheme; good leave arrangements.—Write stating age and full details of qualifications and experience quoting Reference F.149 to Box 1790 at 191, Gresham House, E.C.2. 187

**POWER** house mechanical maintenance engineer required in London area. Applicants should have good general education up to B.Sc. standard with suitable technical and practical experience, be fully conversant with all repairs to mechanical plant in modern high steam generating station. Preference will be given to M.I.M.E. or those with equivalent qualifications. Experience with power plant manufacturers desirable. Salary £700 p.a.—All applications, giving full details of such education, experience, service history, etc., to Box 3028 quoting reference E/P/M/M.E.

**POWER** station shift engineers by major oil company operating in Persian Gulf. Shift engineers experienced running a.c. power generating units of up to 1,500kw, synchronising of alternators, station loss keeping, etc. Diesel experience preferred. Under 35. Starting salary £710 p.a., plus free messing accommodation.—Write, giving details age, experience, quoting R861, to Box "K.B." c/o J. W. Vickers & Co. Ltd., 7-8, Great Winchester St., London, E.C.2. (By permission of the Ministry of Labour and N.S. under the Control of Emigration Order, 1947.) 3052

**PRODUCTION** engineer in control purchasing, stores, programme of equipment through works and shop loadings. Situation requires a man who knows where to buy and has previous experience of production control, together with some knowledge of electrical engineering.—Box 2971.

**PROGRESS** clerk, preferably with experience in electric cable manufacturing industry. There are good prospects for the right man.—Apply, stating age, experience and salary required, to Box 3018.

**PROGRESSIVE** post as senior transformer designer is offered to a candidate having experience of high voltage units up to at least 66kv and 10mva. The post is one offering a real business opportunity and a good salary will be paid to the successful candidate.—Full details of training and experience, age, etc., must be submitted in the first instance to Box 2968.

**PROMINENT** firm of industrial and street lighting fittings manufacturers require a representative for the London area. Excellent opportunity for man of good approach and appearance, aged 25 to 35, prepared to work hard develop business in both fields of lighting in an area which offers considerable scope. Possession of a car would be an advantage but not a necessity.—Please write, giving fullest details, to Box 3068.

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**PHYSICISTS** by manufacturers in South-east England to carry out work on semi-conductors, phosphors, etc. Applicants should preferably have some experience of work on electronic equipment.—Apply, quoting Ref. 152, to Box 2690.

**PROGRESSIVE** manufacturers of electric cookers, domestic appliances and control gear, require representative in the Birmingham and Midlands area. Substantial salary will be paid to suitable applicant who must have had experience with other manufacturer of similar products. Only men with well-established connections amongst B.E.A. and E.W.F. considered. State age, experience and if car owner.—Apply Clifton Aircraft Ltd., Appliance Division Lytham, Lancs. 2865

**QUALIFIED** and experienced engineer to fill vacancy for manager of the electrical insulating division of a well-known manufacturer of paints and varnishes. Must be able to develop sales of all types of insulating products for the electrical industry and experience in the use of such products is essential. Age not over 45. Salary according to qualifications.—Box 3060.

**QUALIFIED** testers for radar equipment, electronic instruments, radio transmitters and receivers. Technical qualifications to City and Guilds standard. Practical experience on testing and alignment of test equipment. Good salary is offered to men who have the necessary qualifications and experience. Works are in the London Area. Write giving full particulars of past experience and salary required to Box S/5832, A.K. Advg., 212a, Shaftesbury Ave., W.C.2.

**RELIABLE** and competent electrician for maintenance of plant at Greenwich. Total installation 650kw. Motors up to 140hp. All new equipment.—Write to Amalgamated Roadstone Corporation, Ltd., Thames St., Greenwich, S.E.10. 9034

**REPRESENTATIVE** by leading manufacturers for London area. Must have knowledge of accessories and switchgear trade and connection with wholesalers. Car essential. State experience, age and salary required. to: Box 9038.

**REPRESENTATIVE** required for Sussex and part Surrey territory by leading firm of electrical engineers. Good turnover already assured; can be considerably increased by live man. Write giving full particulars as to age and experience.—Box 3091.

**REPRESENTATIVE** required by old-established firm manufacturing electric lighting fittings, London area.—Apply, giving experience, etc., to Fredk. Thomas & Co., Ltd., Everton Buildings, Stanhope St., N.W.1. 3046

**REPRESENTATIVES** by established transformer manufacturer to take over existing connection in London area. Must have previous sales experience in all types of transformers. Permanent progressive position on salary and commission basis. Excellent opportunity.—Write, giving details of salary required, previous experience and area covered, to London Transformer Products, Ltd., Cobbold Estate, Cobbold Rd., Willesden, N.W.10. 3064

**REVO ELECTRIC CO., Ltd.**, invite applications from technical representatives having actual sales experience in the following areas: (1) London and Home Counties. (2) South Coast area. (3) South Midlands (Worcestershire). (4) South Eastern area. For appointments to their Home Sales Staff. Applicants should preferably be between 30/40 years of age and have knowledge of electric heating and lighting technique.—Apply, in confidence, and with full details, to Sales Director, 30, Gt. Queen St., London W.C.2. 2917

**REVO ELECTRIC CO., Ltd.**, invite applications from heating/cooking technical representatives having actual sales experience in the Scottish areas for appointment to their Home Sales Staff. Applicants should preferably be 30/40 years of age and have had sound knowledge of the domestic electric cooker business.—Apply, in confidence, and with full details, to the Sales Director, 30, Gt. Queen St., London, W.C.2. 2916

**R.F.** heating sales engineer, preferably with wide experience in industrial applications of dielectric and induction heating, required by the Manchester branch of a large well-known firm of engineers. State age, experience and salary required.—Box 8998.

**SALES** engineer for estimating and preparing quotations for L.V. and H.V. switchgear in London office. Write, stating experience, age, salary required, to G. Statter & Co., Ltd., 82, Victoria St., London, S.W.1. 3061

**SALES** representative and engineer by fluorescent fittings manufacturers (E.F.A.) for London area, able to influence sales and prepare lighting schemes under supervision of manager. Write full details in first instance.—Box 3045.

**SENIOR** estimating engineers, by The Plessey Company. Applicants should have comprehensive practical experience of general machine shop work and assembly in the light electrical engineering field and not less than five years experience in estimating in a responsible capacity. Salary will be in accordance with capabilities. Application to be made by letter only in first instance addressed to—The Personnel Manager, The Plessey Co., Ltd., Ilford 3095

**SENIOR** design engineer, preferably with experience in switchgear mechanism, required by large manufacturer in Midlands. H.N.C. or degree in mech. eng. essential. Progressive appointment, housing facilitated.—Reply details of experience, age, salary required, to Box 3027.

**SENIOR** development engineer by large manufacturer in East London area for design work in connection with electrical accessories for the aircraft industry. Sound theoretical knowledge and practical experience are essential. Salary will be commensurate with qualifications and experience.—State full details to Box 3030.

**SENIOR** draughtsman required. Experience in lighting and power layouts, main switchgearing and automatic control circuits. Applicants must be under 45 years of age.—Apply Industrial Relations Dept., Kodak, Ltd., The Works, Wealdstone. 109

**SENIOR** switchgear draughtsman, experienced in the design of indoor and outdoor h.v. switchgear, urgently required by large manufacturer in Midlands. Excellent conditions. Housing facilitated.—Reply age, experience and salary required, to Box 3026.

**SENIOR** switchgear draughtsman for contract work on cubicle and link back types of A.C. and D.C. switchboards, with diagram experience. Reply by letter only, stating age, salary required, and full details of experience and technical education to Erskine, Heap & Co., Ltd., Lancashire Switchgear Works, Salford, Manchester. 2977

**SENIOR** wiring diagram draughtsman in connection with arc and induction furnace installations, which includes H.V. switchgear, transformer and control gear diagrams.—Write, Electric Furnace Co., Ltd., 161, Queens Rd., Weybridge, Surrey. 2768

**SHIP'S W/T** electrical fittings; Midland manufacturers require sales representative, with good contacts and carrying non-competitive lines, in the North-East and/or Scotland.—Box 9094.

**SITE** engineer to electrical contracting company, first contract Persian Gulf, approx. 12 months on return permanent position on London staff. Attractive salary, plus free accommodation and board. Free passages out and home and kit allowance.—Write giving qualifications and experience to Box 2994.

**SUPERVISING** electrical engineer for London contractors. One able to take full charge of contracts, must have thorough knowledge of trade, excellent prospects for live man.—Write full particulars, stating age, etc., to Box 3094.

**TELEPHONE** cable jointers for home and overseas service. Preference given to men willing to work overseas in first instance.—Write, stating age and experience to Box 2993.

**TEST** engineer for Electrical Control Gear. Send applications to the Secretary, Morecambe Electrical Equipment Co., Ltd., Westgate Works, Morecambe, giving full particulars of training, experience and salary required. 2787

**THE ENGLISH ELECTRIC CO.** invites applications for the post of sales manager, to be in full charge of the department concerned with the sale of industrial motors.—Please write, quoting Ref. 204, to Central Personnel Services, The English Electric Co., 24-30, Gillingham St., London, S.W.1. 2969

**TRANSFORMER** assistant works manager with practical experience by London firm. Good salary and prospects.—Apply, stating age, experience and qualifications, to Box 3048.

**TRANSFORMER** tendering engineer, good general training, preferably including design and minimum three years' tendering experience, age 25/30.—Apply, stating qualifications, age, and salary required, to Box 3025.

**WANTED**, trained, first-class, practical senior mechanic and electrical engineer(s) on the erection of large mining installation in North-Eastern Turkey, comprising usual coarse and fine crushing, concentrating and smelting plants and auxiliaries, also steam turbine and hydro-electric power stations of combined 7,700kw capacity. Widely experienced men only to apply. Minimum two years contract, with possible extension for operations.—Apply British Geo Engineering Co., Ltd., Adelaide House, London Bridge, E.C.4. 3062

**W. H. ALLEN, SONS & Co., Ltd.**, Bedford, invite applications for three appointments, as follows: (1) Experienced draughtsman for mechanical development of industrial and marine gas turbines; (2) Experienced draughtsman-designer for mechanical development of industrial and marine epicyclic gears; (3) Experienced draughtsman for detailing and installation arrangements of centrifugal pumps. The above are permanent appointments with staff pension scheme.—Applications, stating full particulars of qualifications and experience, also age and remuneration required to be addressed to The Secretary. 2996



## APPOINTMENTS FILLED

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

**B**OX 8946.—Instrument engineer, Weymouth Gauges & Instruments, Ltd.—Chief Inspector. All applicants are thanked.

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**A**DVERTISER, experience negotiation and carrying out of contracts, estimating and supervising; prepared to go anywhere.—Box 9024.

**A**DVERTISER (age 38), with 22 years' experience design and production of industrial and domestic cooking and heating equipment, seeks position of responsibility.—Box 9022.

**A**DVERTISER situated S.W. England, requires position as electrical surveyor with reputable insurance Co. Same or similar locality. M.V. apprenticeship. Works, inspection, test, D.O. Subsequently repair specialist. Necessary technical qualifications. Highest refs. Age 31. Owner-driver.—Box 9015.

**A**.M.I.E.E., 38, on leave in India, desires change, pref. U.K., excellent health, wide gen. (thermal trans., dist. and industrial experience; available as senior chief engineer, manager, or other executive position.—Box 9059.

**B**.Sc. (hons.), grad I.E.E., 5-year B.T.H. apprenticeship, works, D.O., test, design, 1 year distribution, some power station, commercial and contracting experience, age 23, requires progressive post.—Box 9076.

**C**APABLE electrical engineer, of proven responsibility, seeks progressive post. 26, H.N.C., 9 years practical experience, latterly supervisory.—Box 9023.

**C**HARTERED electrical engineer, 42, open for engagement, progressive post with responsibility, conversant radio, switchgear, small power plant, factory layout. Administrative experience. Willing to travel.—Box 9059.

**C**HARTERED electro-mechanical engineer, B.Sc., A.C.G.I. (38), seeks executive appointment, wide experience tele-communications apparatus design and all branches light electro-mechanical engineering; present salary £850 p.a. Car available.—Box 9021.

**E**LECTRICAL engineer (27), works apprenticeship. Grad. I.E.E., experienced maintenance and installation power stations, etc.; ex-Lieut. R.E., available now.—Box 9062.

**E**LECTRICIAN disengaged, good all round. Town or country.—A. H., 208, Cambridge Rd., Kilburn, N.W.6. 9013

**E**NGINEER, disengaged, 20 years' executive experience contracting with architects, consultants, etc., requires position of responsibility London area; good contacts.—Box 9103.

**E**STIMATING supervisor requires progressive post. 25 years' continuous experience, lighting, heating, power, electrically ignited oil fuel burners, plant patent, etc. Age 40. London area. Min. £500.—Box 9096.

**F**ULLY qualified electrical engineer, having extensive knowledge of research, installation and commercial engineering; over 9 years experience of Eastern conditions, both as commercial and works manager, desires change.—Box 2891.

**G**ENTLEMAN of good appearance, sound personality, highest integrity, requires position as sales representative with electrical firm, where technical knowledge will be an asset; Birmingham and Staffordshire area.—Box 9050.

**G**RAD. I.E.E., 26, works, estimating and commercial exp. of motors, rotating and allied equip. up to 20kw. seeks progressive post.—Box 9040.

**K**EEN young executive, A.M.I.E.E., A.M.I.P.E., seeks managerial position with progressive firm. Wide works experience with first-class results.—Box 9027.

**M**AINTENANCE electrical engineer, 33, thoroughly conversant all systems, seeks progressive position. Own car.—Box 9112.

**M**ANAGER E.C.A contractor, desires similar position in West Midlands. A.S.E.E. rates.—Box 9106.

**R**EPRESENTATION, part time Kent and/or Surrey. A.M.I.E.E., with wide connections, own car, reasonable remuneration.—Box 9014.

**S**UPERVISING engineer desires change, fully competent estimating, drafting specifications, correspondence, accounts, etc.; M.O.W., L.C.C., A.M. and Industrial experience.—Box 9104.

**T**ELEPHONE transmission engineer, experience at home and abroad, age 28, ex-Major R. Signals, desires to change position, from Midlands to London area.—Box 9025.

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

**A**.C. and d.c. motors, generators from stock.—Service Electric Co., Ltd., Water Rd., Alperton, Middx. Perivale 7251-2-3. 91

**A**.B. & W. water tube boiler will cut down your fuel costs; we can supply from stock. Two 25,000lb evap. 525lb w.p. One 20,000lb evap. 175lb w.p. Two 16,000lb evap. 190lb w.p. Two 12,000lb evap. 200lb w.p. We install complete, including brickwork, also turbo alternators, 6,000 kw.—Burford, Bray, or & Co., Ltd., Boiler Specialists, Commercial St., Middlesbrough. Tel. Middlesbrough 2622. 22

**A**.BARKAIN an electric motor can always be obtained from A. Couksey & Co., Ltd. 21-25, Tabernacle St., London, E.C.2. 'Phone Monarch 3357. Stocks at present comprise new squirrel cage motors 1-25hp, also new and second-hand slip ring motors with starters from 7½hp to 30hp. 212

**A**LARGE quantity of 5ft Unity tubular heaters, in lots of 6, at 27/6 each. Also new H.M.V. converters, 2 to 5kw at bargain price.—Wm. Don & Partners, 45, Hunslet Rd., Leeds, 10. 2812

**A**QUANTITY of brand new ¼hp B.T.H. motors, fitted with a special Opperman reduction gear box, voltage 200/230 a.c., single phase, 50 cycles, 1,425rpm, type B.S. 2408, reduction ratio 4.561 to 1, output revs approximately 300 per minute.—Godiva Industrial Products, Ltd., 61, City St., London, E.C.2. 2161

**A**QUANTITY of type 100R Variac 2kva, thoroughly inspected and tested; 8gns. each, carriage extra. Electro-voice products.—Rear of 137, Harrowdene Rd., East Lane, N. Wembley. 9041

**A**BOUT 70 hp, 400v, 3-phase, 50-cycles geared motors, with double-ended shafts, 1,400/58 rpm; makers, Normans Electrical Co. Ltd., Newmans, Ltd.; all brand new; offers.—Syd Davis (West Bromwich), Ltd., 59, High St., West Bromwich. Tel. Wes. 0132. 9069

**A**.C. and d.c. motors, all sizes, large stocks, fully guaranteed.—Milo Engineering Works, Milo Rd., East Dulwich, S.E.22. Forest Hill 2278-9. 102

**A**.C. and d.c. house service meters, all sizes, quarterly repair and reconditioning, guaranteed one year. Repairs and recalibrations.—The Victa Electrical Co., 47, Battersea High St., S.W.11. Tel. Battersea 0780. 118

**A**.C. and d.c. motors, large stocks, fully guaranteed.—Lytton Electric Co., 7, Picton Place, W.1. Welbeck 8098.

**A**.C. Metro-Vick, B.T.H. motors, ¼hp, 200/250v, 50c 1-ph., 1,425 rpm, new capacitor start. £6/14/6; ½hp, £8/13/3; ¾hp, £12/17/6; 1hp, £16/19; 1½hp, £19/18/6; also 3-phase and d.c. Guaranteed repairs and rewinds.—Johnson Engineering, 319, Kennington Rd., S.E.11. Reliance 1412-3. 99

**A**.C. motors, quantity to clear, 1hp E.E. 400/3/50, £10 each; ¼hp G.E.C., 230/1/50, £4/10 each; also others.—Mayfield Electrics, Ltd., Wentworth 3131. 9115

**A**.C. squirrel cage motors at manufacturers' list prices. £600 available. 1 to 20hp. 400/3/50, ex-stock.—Hampson Industries, Ltd., Arthur St., West Bromwich. Tel. 0873. 231

**A**CCUMULATOR capacity testing sets, in enclosed panels 23in x 18in x 6in, comprising multirange voltmeter, 0-10 ammeter, indicating rheostat and sealed ampere hour meter, ex-Govt., unused; 3hp G.E.C. motors, 400/3/50 1,400rpm; £12/10 each.—Johnson & Wright, 41, Serpentine Rd., Birmingham, 17. 9052

**A**LMOST new motor converter, Bruce Peables, 500 kw, 6,000v, 6,000 volts, outgoing 440 volts d.c. for immediate disposal at low price to clear.—Box 3009.

**A**LTERNATORS, brand new, single and 3-phase up to 60kva; also d.c. generators up to 25kw; diesel and petrol sets from 3 to 70kw.—Hampson Industries, Ltd., Arthur St., West Bromwich. Tel. 0873. 236

**A**LTERNATORS (British) from stock, 1kva to 10kva, single- and three-phase, complete with gear.—Fyfe, Wilson & Co., Ltd., Bishop's Stortford. B.S. 1000/1. 3067

**A**LTERNATORS, 3½, 5, 10, 15, 20, 25, 45, 67, 100, 130, 265kva; a.c. motors, 1 to 300hp, 400v, 3ph; dynamos, 230v, 2 to 200kw; two 20kw, 120v d.c. steam gen.-sets; Kohler sets rebuilt 800, 1,500w.; also quantity spare parts.—E. Binns, Works, 156a, Falsgrave 9107 Scarborough.

**A**MMETERS and voltmeters for a.c. Voltmeters 0 to 300, ammeters 0/30. Unused. Over 500 in stock of each.—Fyfe, Wilson & Co., Ltd., Bishop's Stortford. B.S. 1000/1. 3070

**A**MMETERS, voltmeters, new, by Metro-Vick, all a.c./d.c. prot. type 6in dial, 0-15 amps, 15/-; 6in dial, 0-50 amps, 29/6; 6in dial, 0-300 volts, 35/-. Totally enclosed stud type rheostats, 1,000 ohms, 0.6 amps max., 25/-. D'to 300 ohms, 2 amps max., 22/-. Send for lists. Hundreds of meters of all types in stock.—Oak Instruments, 195, Coppermill Lane, London, E.17. Larkswed 6122. 2847

**A**PPROXIMATELY 900 G.E.C. tapoff fuse insulators, catalogue number X7002, 30amps ex-Government surplus stock, all unused, 5/- each.—Advance Industries (Pentru), Ponsheaden Shipyard, Falmouth. 2771

**A**UDIO frequency precision oscillators by B.S.R., type LC40, 500 cycles/sec or 60 cycles/sec, 400 dials, portable, new, mains operated 200-250v 50 cycles/sec. Price £27. Send for spec.—Oak Instruments, 195, Coppermill Lane, E.17. Larkswed 6122. 2846

**A**UTO bulbs, miniatures and general household lamps of first-class quality at competitive prices.—The Bergen Lamp Co., 12, Noel St., London, W.1. 9109











ONE new 500amp T.P. and N. H.R.C. "Bill" switch-fuse with trifurcating box. £35 f.o.r.—Write, C. Clarke, 14, Castle Rd., Tongwynlais, Nr. Cardiff. 9116

ONE 200kva oil-cooled transformer by Parsons. 3,500/4,000 volts. 3-phase. 50 cycles. usual tapplings. Steel welded tanks. One 600kva. 625/440 volts. 3-phase. 50 cycles. and one 200kva 660/440 volts. 3-phase. 50 cycles.—Slaters Electrical, Ltd., 34, Princesway, Team Valley Estate, Gateshead-on-Tyne. 9017

ONE only Tangent bending machine, suitable for the complete fabrication of sheet metal cabinets. The machine is of the latest American manufacture, and is capable of an extremely high rate of production. The machine is brand new, in its original packing cases. Full specification and particulars on request.—Box 9100.

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P.I.L.C. Served, Armoured and Unarm. ed. .01 to 5 sq. in. In stock and for very early delivery; also V.I.R., T.B.C. single-core, up to 1 sq in section. 660v: Heavy Cab Tyre Trailing Cables. 6 sq in per core. 104/04 and smaller stock. Cable & Electrical Supply Co., 28, Wimbledon Park Rd., Southsea, Hants. Tel Portsmouth 31730. 37

PLATING and anodising generators. Over 100 in stock from 150 to 1,600 amps. d.c. or a.c. motors can be supplied for most sizes.—Fwfe. Wilson & Co., Ltd., Bishop's, Stortford. (E.S. 5000/1.) 30

PLATING Dynamos new 800 amps. 6 volts. 400 amps. 6 volts with d.c. or a.c. motors or new petrol engines.—Britannia Manufacturing Co., Ltd. 22-26 Britannia Walk, London, N.1. 156

PLATING Dynamos. 1,600 amps. 10 volts. with d.c. or a.c. motors.—Britannia Manufacturing Co., Ltd. 22-26 Britannia Walk, London, N.1. 155

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POLISHING spindles, double ended. 3" ball bearings with 2ft 6in extension shafts suitable for internal and external work. 400-volt, 3-phase motor at bottom of 3ft high stand. Allen West starter, automatic brakes. Price £25 each.—Lipson Products, Ltd., Lower Glory Mill, Wooburn Green, Bucks. Tel. Bourne End 680. 2950

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QUANTITY 5amp Smith a.c. 1-1/2 c/n prepayment meters, variable tariff, certified.—Kippax Bros., Root St., Burnley. 207

REBUILT Motors and Generators. Long deliveries can often be avoided by purchasing rebuilt second-hand plant. We can redesign or replace surplus plant of any size. Send us your enquiries. Over 1,000 ratings actually in stock here.—Dynamo & Motor Recalls, Ltd., Wensley Park, Middlesex. Tel. Wensley 3121, 4 lines; also at Phoenix Works, Beavre Terrace, Soho Rd., Handsworth, Birmingham (Tel. Northern 0998). 26

RECONDITIONED Rapid 30in dia. circular crane lifting magnet, maximum capacity 5 tons, 110volt d.c. Complete with patent new spring-loaded winding drum.—Henriion Bros. (Belstaff), Ltd., Machinery Merchants, Belstaff. 2022

ROTARY converters, unused, 1kw, 110v and 220v, d.c. 230/150, £19, car. pd.; 6kw, 110v, d.c., 230/150, £55, car. pd.; also 1kw, 110v and 220v, d.c., 25/40v 35a, d.c., £19, car. pd.; 24kw, 110v/170v, d.c., 35-40v, d.c., £29, car. pd. Lists.—Benmotors, Power Supplies, Summerley St., Earlsfield, S.W.18. Wim. 3933. 151

ROTARY Converters in stock, all sizes; enquiries invited.—Universal Electrical, 221, City Rd., London, E.C.1. 2022

SIMMONS Motors.—Fractional d.c. compound wound, ball bearing, drip proof, 1/4hp, £11/15; 1/2hp, £12/10. Discount to trade.—Simmons Electrical & Winding Co., Ltd., 6, Simpsons Rd., Bromley, Kent. Rav. 5906. 3012

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SINGLE 1/2in vee pulleys only, 12in and 16in; 21v, 27v and 27-1/2.—Busfield Engineering, Bingley, Yorks. 8983

SLIP-ring motor. 75hp, 400/350 G.E.C., 960rpm, with control gear, brand new ex stock.—Electric Machinery Co. (Mer.), Ltd., Union St., Ancoats, Manchester. Col. 1352. 2774

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SLOTMETERS (Prepayment Meters), a.c. and d.c., all kinds and sizes supplied. Billiards Switches.—Brent Electrical Co., 6, Holmdale Gardens, London, N.W.4. 130

SLYDLOK fuses, 5, 15, 30, 60, 100 amp in stock at competitive prices.—L. Wilkinson, 204, Lower Addiscombe Rd., Croydon. 2948

SLYDLOK fuses, all types available from stock.—Rvness, Ltd., 78 Stamford Hill, N.16. 8961

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SQUARE brass tube, solid drawn, bending quality, 1/4in O.D. X20 gauge, approx. 5cwt.—C. Brinkman & Co., Ltd., Northcourt Works, Chitty St., London, W.1. 2724

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STARTERS.—24v new ex-Govt. (3hp.) heavy duty, adaptable almost any engine; £9/10. Lists.—Benmotors Power Supplies, Summerley St., Earlsfield, S.W.18. Wim. 3933. 149

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TIME delay switches, fully adjustable; 15/3.—Labour-Less Products, 81, Chertsey Rd., Woking, Surrey. 8913

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TRANSFORMERS, 50 kva 11 000 volts, H.T., 400, 200 1/2 volts L.T. with tapplings, for outside use. (New). £25 each.—Lipson Products, Ltd., Lower Glory Mill, Wooburn Green, Bucks. Tel. Bourne End 680. 2954

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TWO Federal spot welders, 17kva, 400v, 50-cycles. Compressed air operated; one Metro-Vic 50kva with electronic timer, 400v, one Coventry Climax generator, 15kva, 3-phase, 50-cycles, 230 or 400v, petrol engine, one Sklapy pedestal welder, 35kva, 400v, compressed air operated; one Sklapy portable welder, 200kva, 400v, compressed air operated; what offers? All second-hand can be seen working by arrangement.—Syd Davis (West Bromwich), Ltd., 59, High St., West Bromwich, Tel. Wes. 0132. 8930

TWO 250kw 220 volt d.c. General Electric generators with Brown-Lindley steam engines, complete with 3-panel switchboard and spare armature. These units may be inspected running, and further particulars obtained on application to Manufacturing & Mechanical Engineer, Gas Works, Portslade, Sussex. Offers to be lodged by 14th March, 1949. 3034



**TRANSFORMERS**, new and guaranteed up to 60kva. any phase or voltage. Good deliveries ranging from 6 weeks. Manufactured to customers' requirements.—**Box 223.**

**TRIPLE-pole tumbler switches** 30 amp on/off in stock at 20/- per dozen. D.P. on off 30/- dozen.—**L. Wilkinson, 204, Lower Addiscombe Rd., Croydon.**

**TUBULAR heaters**, 3ft, 5ft and 10ft sizes available. Attractive prices. Write for list.—**T-B Productions, The Mail House, Weedon, Northants.** 61

**TWO New Automatic Diesel Electric Sets**, 10 k.w. each at 20/- per dozen. In parallel, including 110 new cells 300 ampere storage battery with stands. Immediate delivery. Two 7½ k.w. Generating Sets second-hand, comprising 12/14hp Petter Semi-Diesel engine direct coupled to 110 volt compound wound dynamo for separate concrete mounting, including switchgear. Immediate delivery. **Workman Reed and Co., Ltd., Beacon Works, Hewish, near Bristol.** Telephone: Yatton 3207 2801

**VENNER time switches**, various types, hand-wound and synchronous, excellent condition.—**Kippax Bros., Boot St., Burnley.** 303

**WARD Leonard control equipment**, all sizes 3/6. **Britannia Manufacturing Co., Ltd., 22-26, Britannia Walk, London, N.1.** 10

**WELDING sets**, self-contained, petrol engine driven by Meadows, complete and suitable for electrodes, from 2 zes 6 to 14.—**Fyfe, Wilson & Co., Ltd., Bishop's Stortford.** (E.S. 1001/2) 3063

**Z.E.P. fluorescent starter switches** are available in 6 models at list prices from 3/4 to 5/10 each, and will suit any make of fitting. Our trade and wholesale discounts are the highest in the industry.—**Zodiac Electrical Products, Springfield Rd., Guiseley, Leeds.** 105  
**1, 2, 3, 4, 5 and 6B.A. precision turned brass** steel hex nuts and lock self-colour or zinc plated. Quick delivery and keen prices for large quantities.—**Small Parts Repetition, Ltd., Treforest Trading Estate, Glam.** 9064

**BANDA spirit duplicator**, as new, hardly used, complete with accessories; £30.—Write or apply **Lamberts, Ltd., 97-99, Southwark Bridge Rd., London, S.E.1.** 3001

**3 Sets G.E.C. motor generating plants**, each driven by a synchronous motor, 9,350hp, 7,200kva 30amps, 6,600v 3-phase, 50 cycles, 500rpm; 3 G.E.C. reactors reactive kva 6,600, max hours 3 (rest), mins 2 1/2 mins start, line v 6,600, reactive volts per phase, 1,690amps, 1,300 max, phases 3, frequency 50, type of cooling O.N. core and windings, 5,500 lb, wet self-colour or zinc plated, 11,250cu ft, oil 330 gals; 9 generators, 2,200kw, 400v, d.c., 440/500rpm, 5,500amps; 3 G.E.C. 80hp motors, 400v, 3-phase, 50 cycles, 122amps, 485rpm, complete with auto-transformers and starters, 90hp, 3-phase, 50 cycles, volts no-load 40/10%; 3 generator exciters, 36kw, 400v d.c., 440/500rpm, 90 amps; 3 motors, 40kw, 70/200v, 500rpm, 250amps; 3 motors, compound wound, 220v, 8hp, 36amps, 1,050/900rpm.—**C. J. Rice, 137, Mayplace Rd., Bex. Hth. Tel. Bex. Hth. 3282.** 70

**4 kva generator set**, 230v, Coventry-Climax engine, all as new, complete with panel. £145.—**Daking & Wright, Estate Offices, Broadway, Peterborough.** 2720

**5 kva Diesel Engine**, Ruston, Hornsby-Baker. 2720  
**5 Alternator**, 230-1,50, direct drive, mounted on M.S. bed, with A.V.C., switchboard.—**Berry Hill Plant Division, Cheadle, Staffs. Tel. Cheadle 2181 and 2261.** 175

**5.6 kva Cub diesel alternating set**, 230/1,50, used for showroom demonstration. Immaculate condition. £185.—**Lovat Engineering & Supply Co., Ltd., 167, Road Lane, London, E.C.3.** Man. 3558. 27

**9 kva new Switchboards**, 230 v, 1-phase, with Instrumental Voltage Regulators.—**Midland Counties Electrical Eng. Co., Ltd., Grice St., West Bromwich.** 169

**15 amp Slydlok fuses** for busbar and single wire connection. Large quantities available ex stock.—**Metropolitan Distribution, Ltd., Truro 2277.** 3037

**15 hp Bolinder high-compression cold-starting industrial engines** delivered February.—**Bolinders Co., Ltd., 4, Lloyds Ave., London, E.C.3.** 9047

**20 hp 24in gauge diesel loco**, spirit tank, 7ft 6in dia x 19ft long, Welb tubular heater (320 sq ft), 400kw Belliss steam generating set, 440v d.c., 35kw, 110 volts d.c. steam generator; 80lt semi-portable stat conveyor, 30in wide.—**Harry H. Gardam & Co., Ltd., Staines.** 60

**30 amp fused main switches**, 2 and 4 ways; splitters; 15amp distribution boxes, 2 to 12 ways d.p. and s.p. and n. Deliveries from stock. Send for lists.—**Winco Industries, 17, Stretford Rd., Manchester, 15.** 218

**£40**—New d.c. generators, compound, 7½kw, 115v, 65a, 1,750 r.p.m., with mounted base and pulley, packed for shipment.—**B.E.R.L., 39, Brighton Rd., Birmingham.** 9073

**50 Drums approx. 250 yards per drum heavy duty cable**, 2 core v.l.r., 37,064, 4 shgs. per yard. Quantity new cable, 19,044, 19,012, 7,064, 7,044, 7,094, from £1 10s. per 100 yards.—**Robert Gillam, Bowling Iron Works, Bradford.** 9067

**60-VOLT d.c. generator** by Crompton Parkinson, 800 amps, 960 r.p.m., with 110 volt 10 amp exciter.—**Cox & Danks, Ltd., Langley Green, Oldbury, Birmingham.** Tel. Broadwell 2011. 2989

**60 hp square cage 400v, 3ph Phoenix motor**, 725rpm, with Ellis n Star Delta starter, and fitted screen protected ammeter, 6/6kw generator, 100/140v d.c., 60 amp, 275 rpm. Complete with panel, voltmeter, regulator, cut-out and switches. No driving unit. View London.—Full details from **William Moss & Sons, Ltd., North Circus Rd., Cricklewood, N.W.2. Gladston.** 8090, Ex. 15. 30 and 21-kva, 400/230v, Diesel Engine—**The Horseshoe Supply Co. (Spalding), Ltd., Horseshoe Rd., Spalding, Tel. 2535.** 49

**230 kva 3/50/400v oilbreak switch** and auto-transformer starter 2 O/L, 1 N/V.—**S. C. Bilby, A.M.I.C.E., A.M.I.E.E., Crosswells Engineering Works, Langley Green near Birmingham.** 82

**250-kW Rotary Converters (2)**, with transformers and switchgear, input 6,600 volts, 3-phase, 50 cycles, output 420/210 volts; also a.c. and d.c. Motors, Switchgear, Generating Sets, Welders, etc.—**Midland Counties Electrical Engineering Co., Ltd., Grice St., Spon Lane, West Bromwich.** 36

**500 Electric Motors**, Dynamos, Transformers, Con-verters, etc., etc., at low prices.—**S. C. Bilby, A.M.I.C.E., A.M.I.E.E., Crosswells Rd., Langley, near Birmingham.** Tel. Broadwell 1359. 21

**500 kw rotary converter** by Bruce Peebles, input 6,600 volts, output 230/270 volts.—**Fyfe, Wilson & Co., Ltd., Bishop's Stortford.** 3071

**70000** mirraly pillar size; keen price for quantities; sample per return.—**Metropolitan Distribution, Ltd., Truro 2277.** 194

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By Order of the Minister of Supply.  
**FULLER, HORSEY, SONS & CASSELL**

have been instructed to offer for Sale by Auction in Lots at the  
**MINISTRY OR SUPPLY DEPOT, 12-14, TOWER BRIDGE ROAD, LONDON, S.E.1, on TUESDAY, 22nd FEBRUARY, 1949, and following days at 11 o'clock precisely each day.**

**SURPLUS STORES AND EQUIPMENT**, including a Taylor Hobson Tool Room Microscope; 20in Portable Platform Weighing Machine; A.C. and D.C. Motors up to 25hp; 3-kVA Motor Alternators; Electro Magnetic Crack Detector; 4in Centrifugal Suction Pumps; Metal Differential Pumps; Pulley Blocks; Double-ended Box Spanners; Copper W.re; Unirubber Cable; Aluminium Rod; Scrap Batteries and Accumulators; Web, Canvas and Leather Anvils; Carpet Rags; old Waterproof Covers; Medical Stores; Electrical and Wireless Equipment; o.d. Bicycles and numerous other effects. Catalogues, 6d each, admitting two persons on View days and one on Sale days may be had, when ready, of Messrs. FULLER, HORSEY, SONS & CASSELL, 10, Billiter Square, London, E.C.3. 2875

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**No. 16 MAINTENANCE UNIT, STAFFORD** on the main Sandon Road, two miles from the centre of Stafford.

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On view Tuesday, February 15th, 10.0 to 4.0 o'clock and during of Sale, 9.0 to 11.0 o'clock. Catalogues 6d each (Postal Orders only—no stamps) admit two persons to view and sale from the auctioneers: Auctioneers' Offices, Bank Passage, Stafford (Tel. 82). 2874



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Rubber Strips, Die Castings, Safety Gates, Circuit Breakers, Blanking Plates, Frequency Changer Units, Rotary Converters, Bar Runners (6 Ton), Otter Boards, 1,800 Brass Sh'ds, Antenna Reels, Cradles, Copper Earth Mats, 100 Brass Cased Eight-day Clocks by Mercers & Smith, Cases of Spare Radio Parts, Asbestos Packing, 13 Petrol Generators, Large quantity of Twist Drills, Tap Wrenches, Stocks and Dies.

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BULL sleeve bearing rotary converter, 1,500 r.p.m. 3 input 240v d.c., output 230v a.c., 50 cycles, 1 phase, .8 power factor, approximately 3 kva, in perfect condition, complete with starting gear.—Offers to Box 3006.

GALVANISED or black wire from 1/4in to 3/4in. State tonnage, condition and price.—Box 2229.

MERCURY (Quicksilver) wanted. Write for packing list and instructions. Gold, Silver and Platinum also purchased.—Ollingridge & Co., Ltd., Riverside Works, Riverside Rd., Watford. (Tel. 5963) 20

MO pump, or similar, use with 27K. Ideal Britannia boiler.—Wilkie, New Palace, New Brighton, 9113

ONE 3,000-4,000 kw turbo alternator, steam pressure 200lb. p.s.i., alternator 3 phase, 6,600v, 50 cycles, with or without condensing plant. Must be in first-class mechanical and electrical condition. Advise as to price, age and where can be inspected.—Particulars to Box 3003.

REDUNDANT electrical, telephone and radio components, equipment and materials of all kinds urgently required in large quantities. Immediate cash available and fair prices paid.—Radio Agencies, Ltd., 157, Wardour St., London, W.1. Gerrard 4456. 245

TELEPHONE and telegraph components or equipment, in any condition. Please give full details and prices.—Harris, 93, Wardour St., W.1. 3005

URGENTLY wanted, 4 duplicate 10hp 250-volt d.c. motors, Speed 800/900 r.p.m.—James Grant & Co., 480, Pollokshaws Rd., Glasgow, S.1. 3075

WANTED, d.c. and a.c. ball-bearing Motors. Full details to Britannia Manufacturing Co., Ltd., 22/26, Britannia Walk, London, N.1. 29

WANTED for prompt cash, ferrous and non-ferrous scrap. Also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. & H. Cooper, Ltd., 176, Brady St., Bethnal Green, E.1. 202

WANTED urgently to meet an export order, 39/40hp Lister diesel engines, with or without d.c. generators or alternators. Used engines or sets in reasonably good order acceptable.—Box 3072.

WANTED, Rotary Converters, any size.—Universal, 221, City Rd., London, E.C.1. 22

WANTED, 20 to 50kw Maudslays generators, 100 volts, or 118/158/200 volts or 190/230/310 volts. Condition electrically immaterial.—Fyfe, Wilson & Co., Ltd., Bishop's Stortford. 3073

WESTERN ELECTRIC or Standard Telephones parts, coils, transformers, condensers, any condition. Please send full details and price.—Harris, 93, Wardour St., W.1. 3004

2 3hp, 440v, 1,400/1,500rpm, d.c. shunt or compound wound electric motors, fitted with ball or roller bearings, enclosed pattern preferred. 1 3hp, 440v, d.c. double automatic starter. 1 3hp, 440v, d.c. reversible starter. 2 1/2hp, 440v, or 220v, 1,400/1,500rpm, d.c. shunt or compound wound electric motors, fitted with ball bearings, enclosed pattern preferred.—Wm. Broady & S. n. Ltd., English St., Hull. 3036  
200/500 cycle alternator, 3-phase, 5kva or nearest.  
—Woden Transformer Co., Ltd., Bilston. Phone Bilston 41959. 3076

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A.C. and d.c. machine rewinds and repairs. First grade work and service. Nothing too small or too large.—Max Electric Co., Ltd., 190, Thornton Rd., Croston. 161

A CTIVE firm of designers can now undertake new commissions in lighting and industrial design. Schemes or product development.—Tricorn Designs, 6, High Holborn, London, W.C.1. Chancery 8050. Write or phone. 3007

ALL handpressing equipment and vacuum cleaner repairs. Components, exchange motors, switches, etc., from stock. Liberal trade discount.—F. W. Electric Co., 12a-13, Gloucester Mews West, London, W.2 (Ambassador 6935). 9080

ARMATURE Rewinds of all types. Heating Elements and Spirals of every description.—Elementa (Leicester) Windings Co., 307, St. Saviours Rd., Leicester. 203

ARMATURES—Vac. dryer and small electric tools ready to hand and returned in 7 days. Rewinding up to 100hp undertaken. Special attention given to snipping requirements. Guaranteed service.—Streamham Transformer Co., Ltd., 68, Streamham High Rd., London, S.W.16 Streamham 7626. 118

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ENGINEERS, Precision, South England, seeks manufacture of electrical, mechanical or domestic assemblies or components. Press tools, gauges, small stampings, constant turning, also internal and external grinding. Write.—Metal Components, Ltd., Dolphin Rd., Shoreham-by-Sea, Sussex. 74

EXPERTS in field, Solenoid, contactor and transformer coils offer prompt delivery. Latest impregnation processes. Transformers made. Rewinds.—Box 9077

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TRANSFORMERS, single phase, double or auto wound up to 1kva designed and manufactured to individual requirements.—Thomas Bolton, 20, Heath Terrace, Leamington Spa. Phone 18. 9033

#### AGENCIES

ADDITIONAL agencies required for South of England, including London: (a) cables and flexibles; (b) small switchgear; (c) transformers, and any lines suitable for distributing through wholesalers.—Box 40.

ELECTRIC motors. Established electrical agent, qualified engineer, with central stores and distribution facilities, Yorkshire, seeks sole buying agency, and asks manufacturers of full range to write in confidence.—Box 9002.

ENGINEER, resident Edinburgh, 30 years' experience electrical industry, desires one or two sole agencies for Scotland for first class electrical equipment.—Box 9087.

MANCHESTER mfrs.' agent with office in city centre desires additional lines to sell to wholesale electrical trade in North of England. Connection of many years' standing with all leading wholesalers.—Box 2335.

MANUFACTURERS' agents, covering the whole of Great Britain and Colonies, are desirous of contacting manufacturers with a view to sole selling rights (either commission or buying).—Box 23.

MANUFACTURERS of goods bought by electrical wholesalers requires agent or traveller with established connections.—Box 9056.

MANUFACTURERS requiring representation in Scotland are invited to submit particulars to Hourston, Macfarlane & Co., C.A., Secretaries, The Scottish Association of Manufacturers' Agents, 5, St. Vincent Place, Glasgow, C.1. 216



**O**LD-ESTABLISHED manufacturer of small electrical goods wishes to contact agents with established connections. Would consider manufacturing new lines to suit agent's market.—Box 9093.

**Q**UALIFIED radio and electrical engineer going to settle in Canada shortly, willing to undertake commissions for radio components, electronic instruments and electrical supplies; good connections in Canada.—Box 9096.

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**S**COTLAND.—For sale, old-established electrical engineering and machinery merchant's business. Modern freehold works and offices, splendid mining and shipping connection. To be sold outright as a going concern.—Box 3009.

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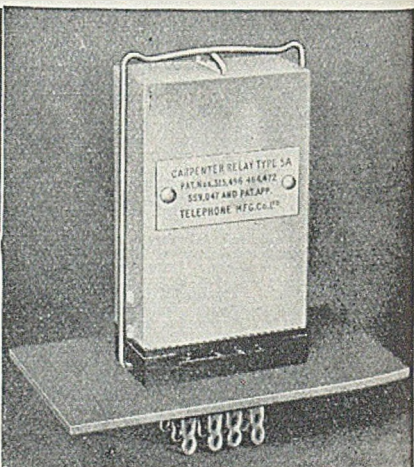
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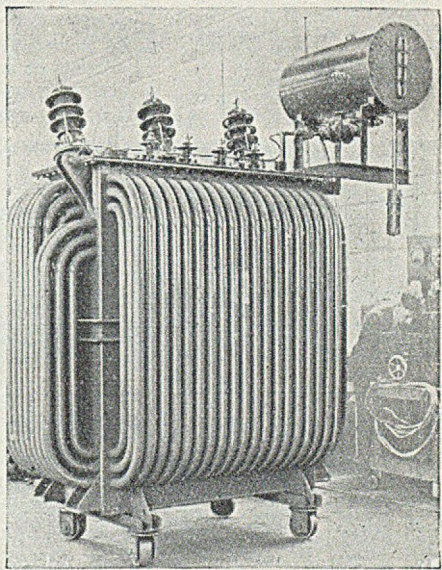
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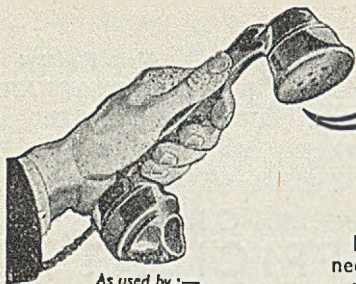
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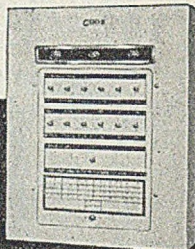
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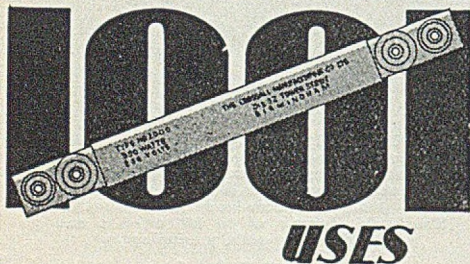


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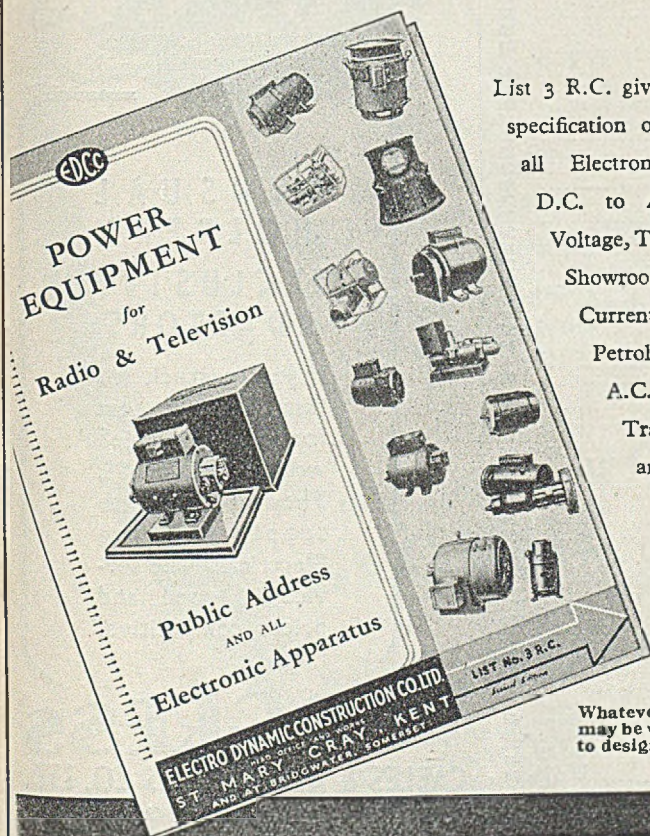
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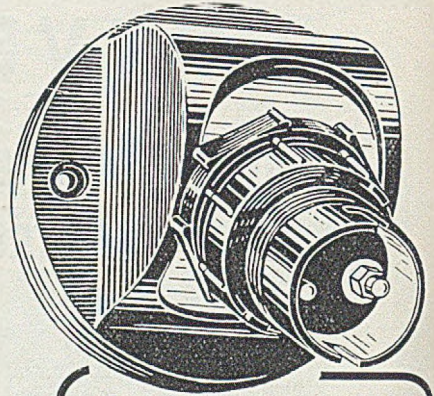
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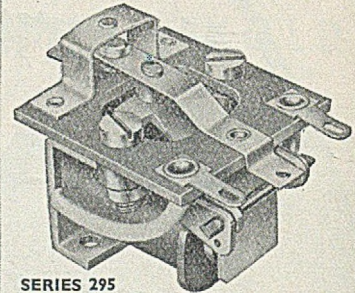


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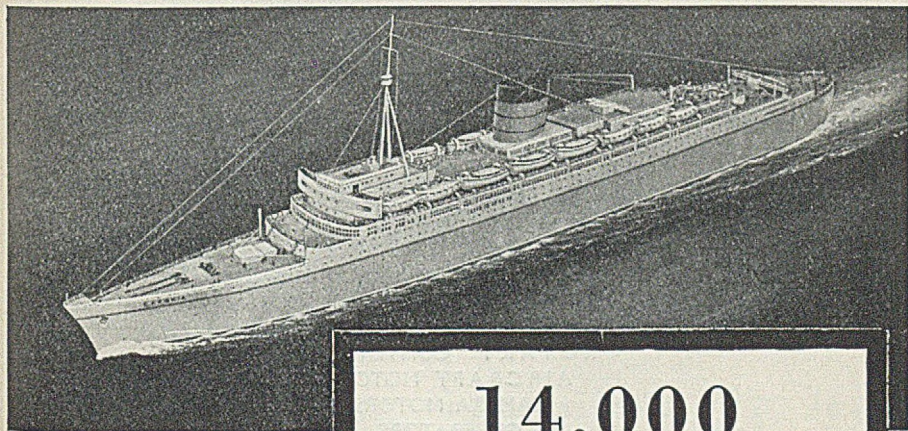
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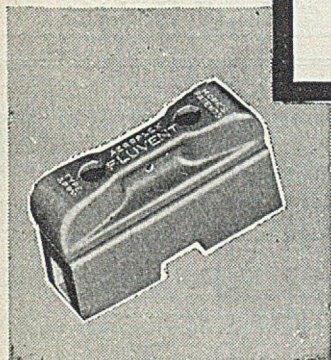
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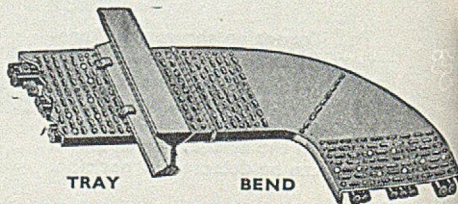
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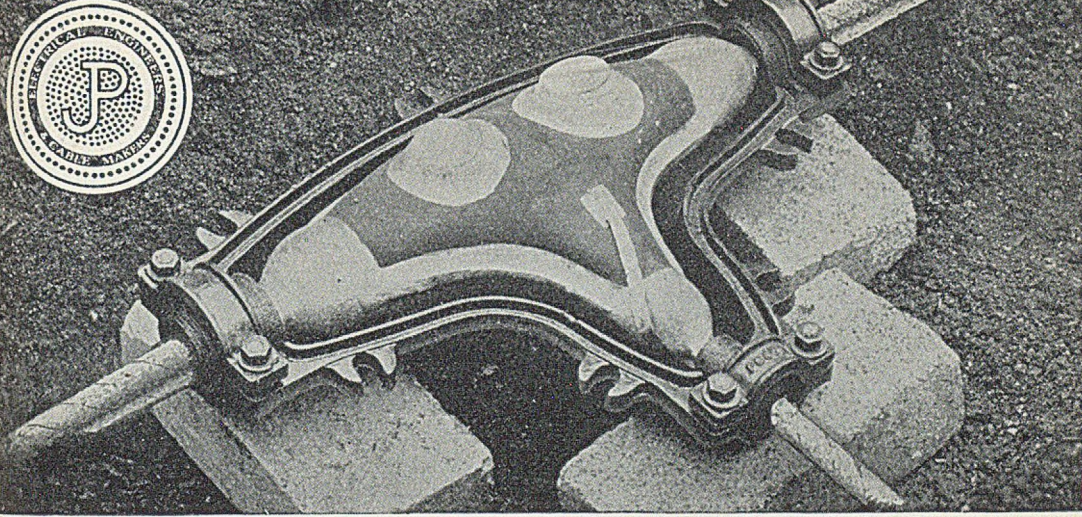
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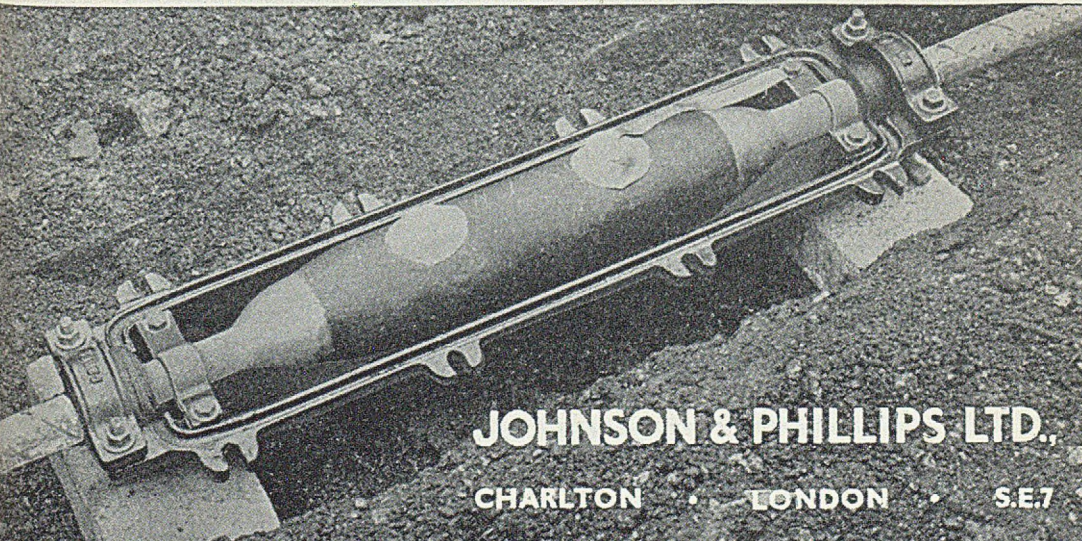


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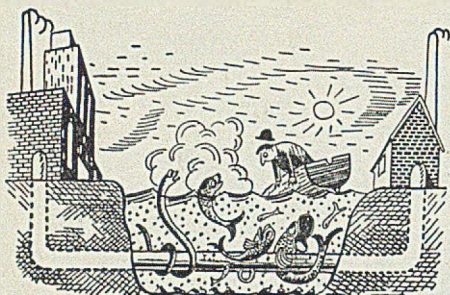


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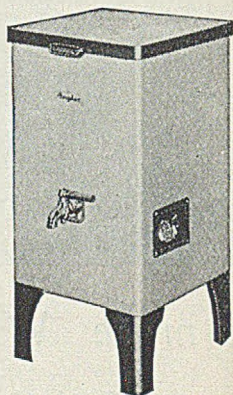
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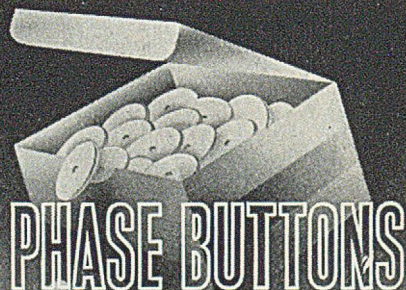
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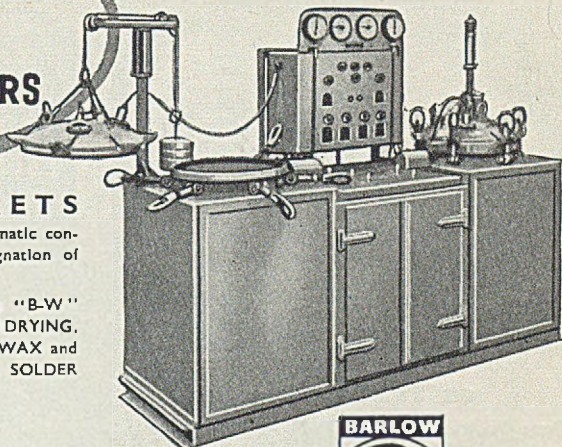
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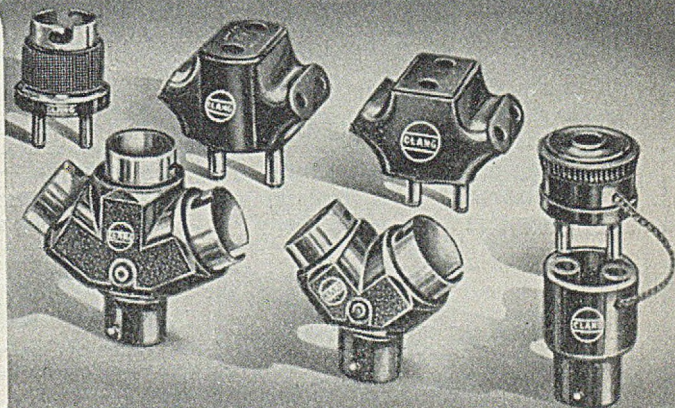
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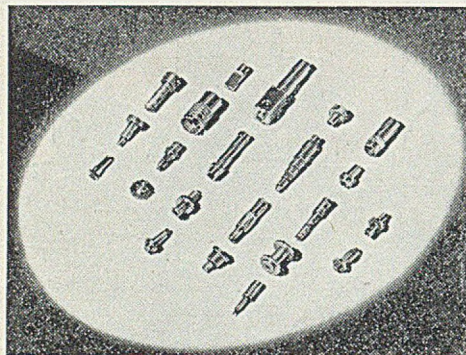
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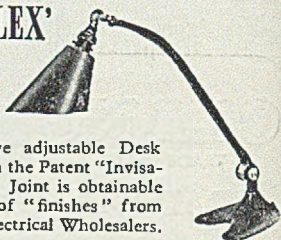
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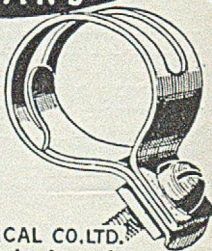
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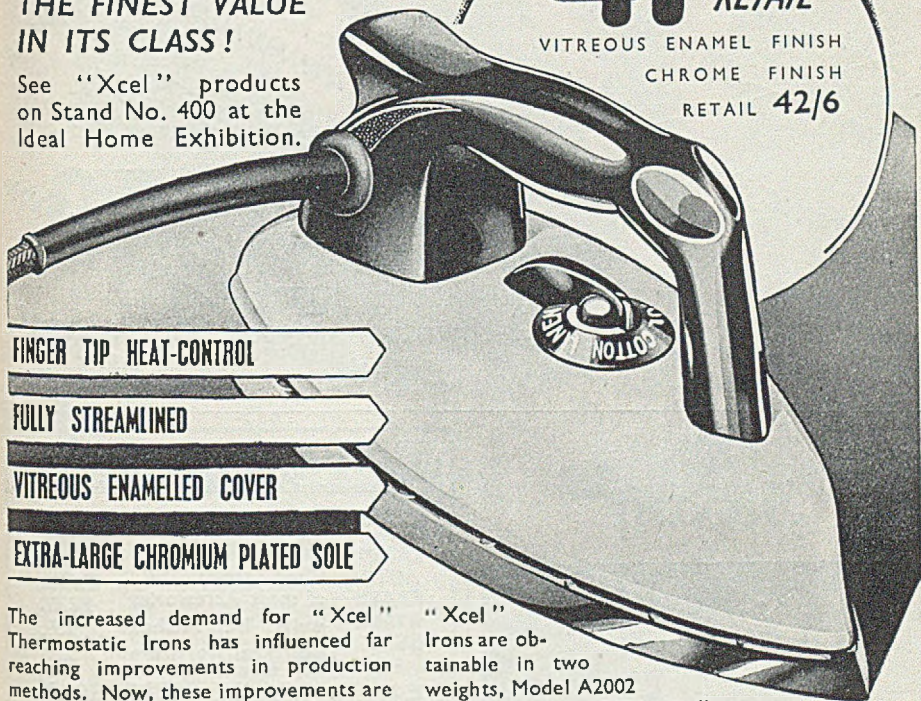
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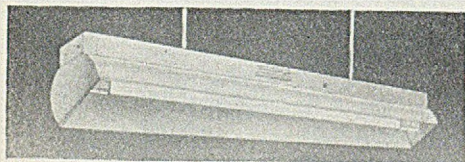


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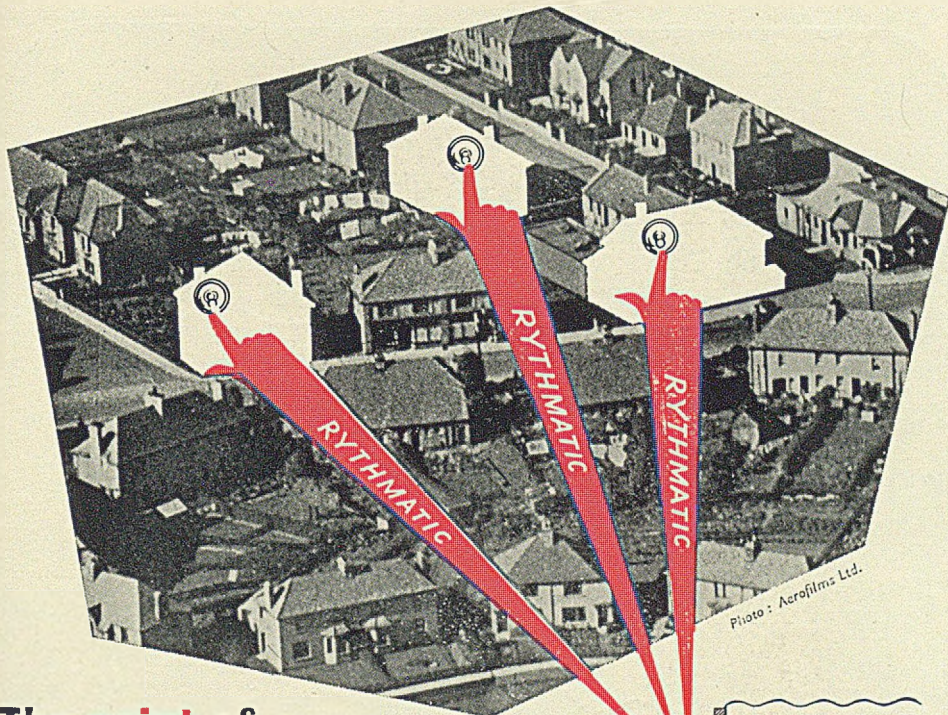
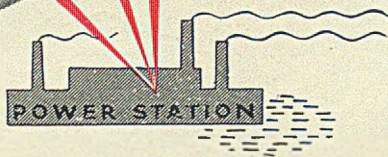


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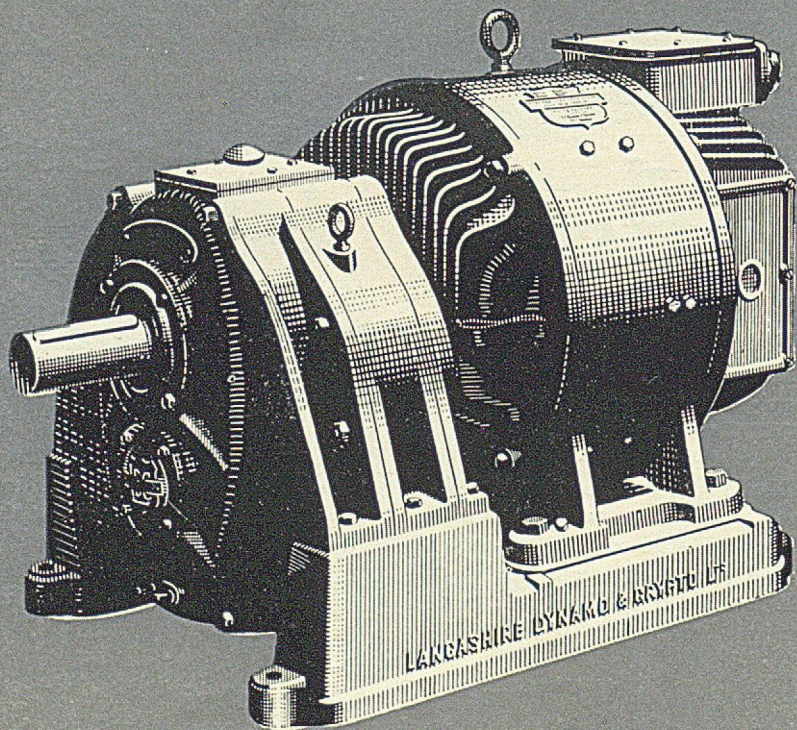
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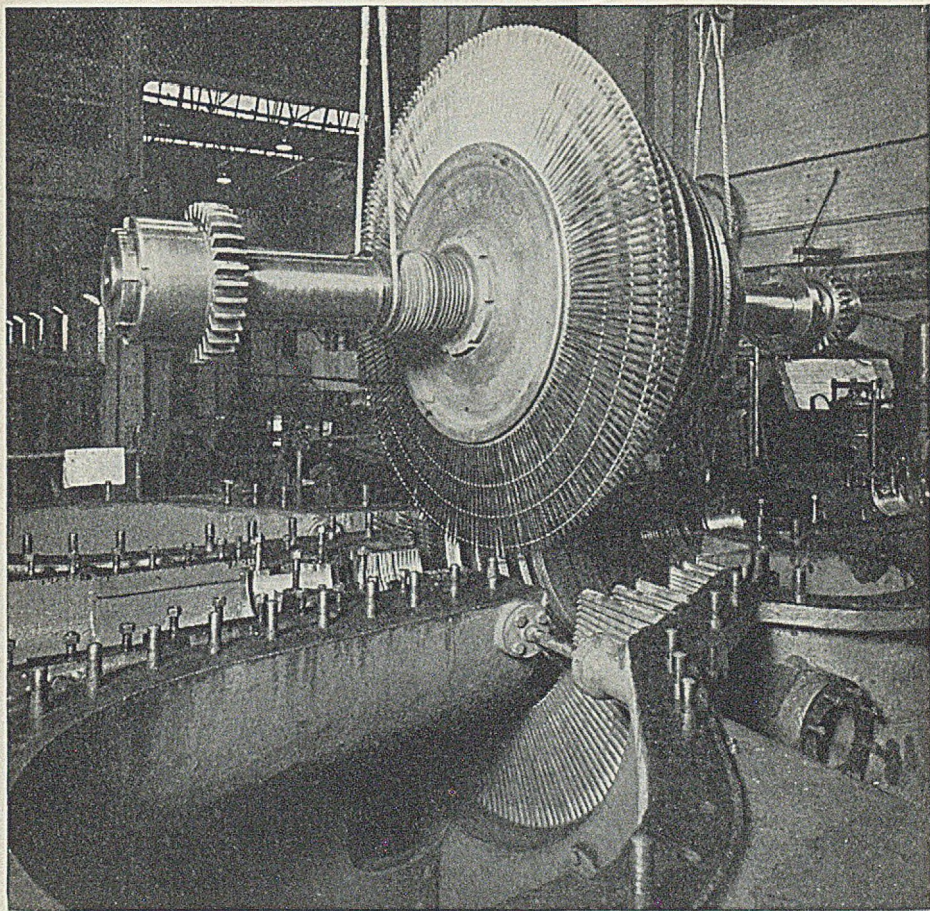
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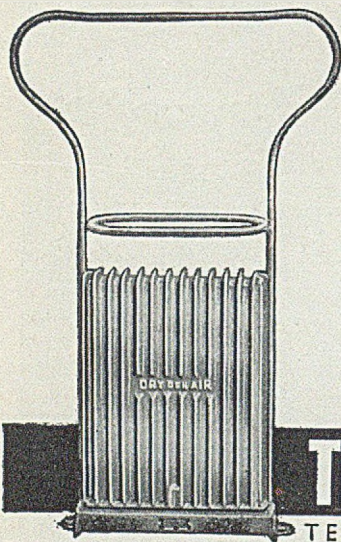
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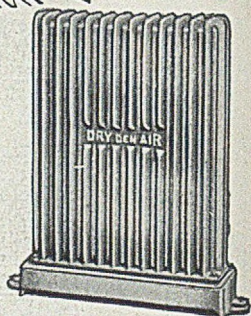
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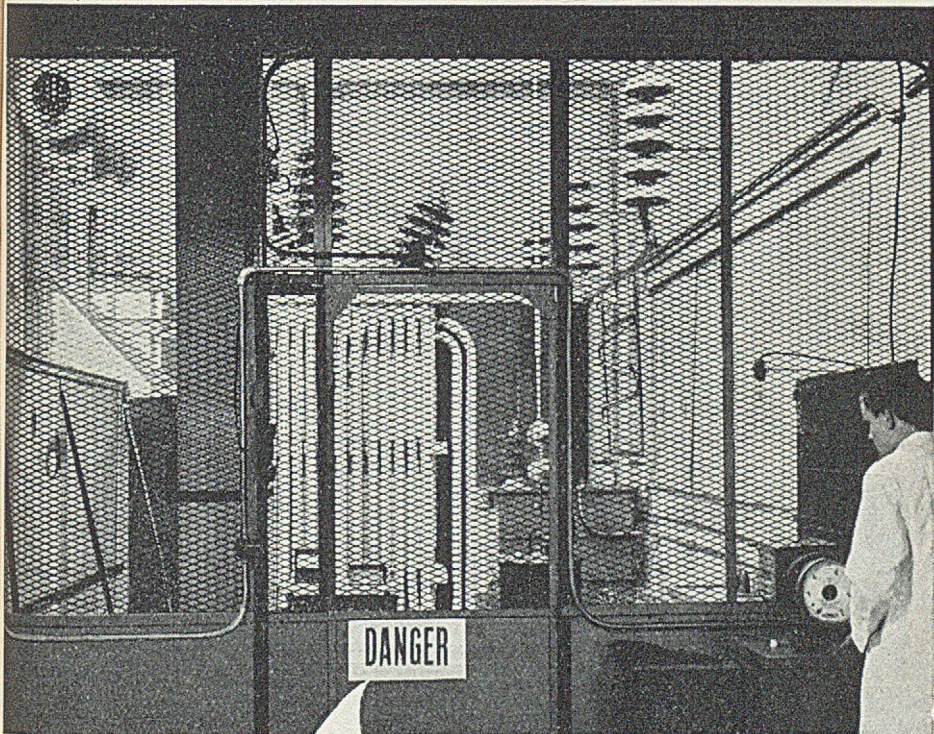
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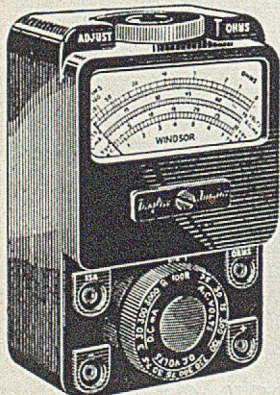
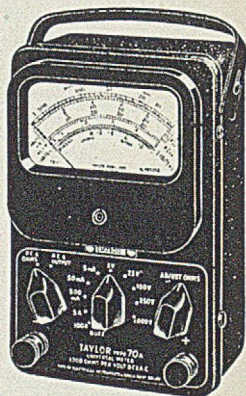


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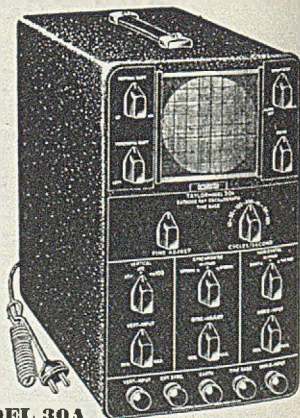
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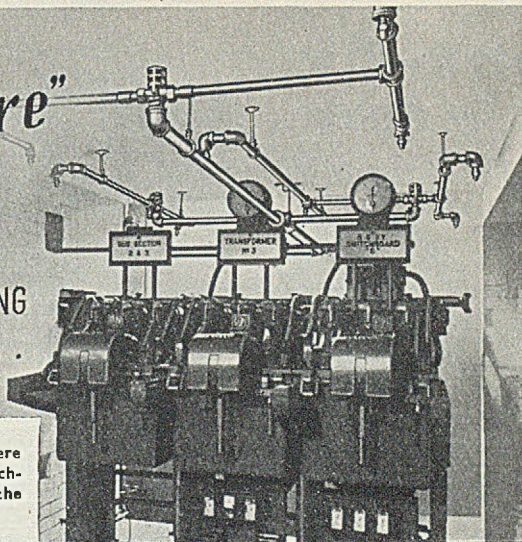
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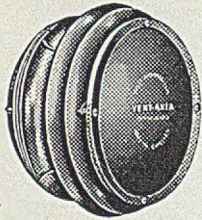


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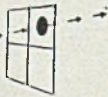


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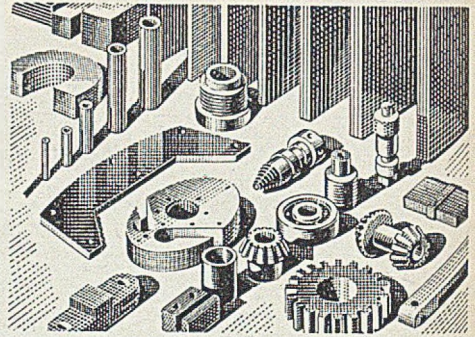
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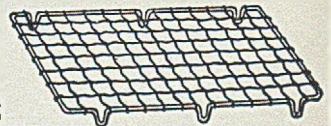
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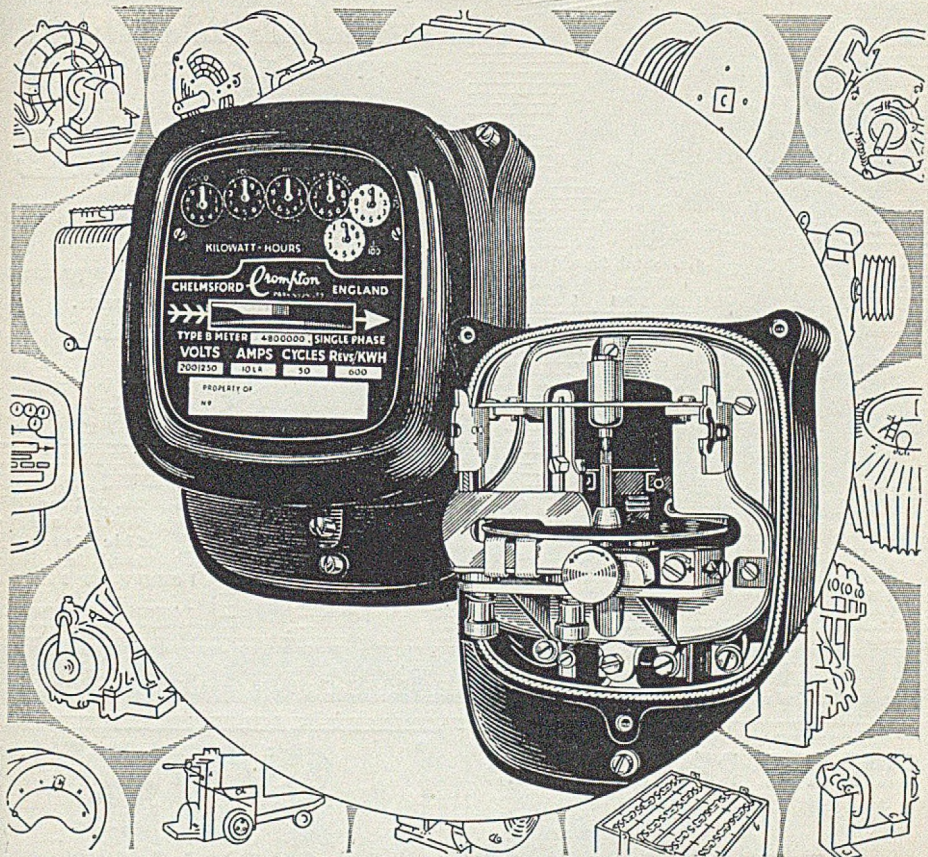
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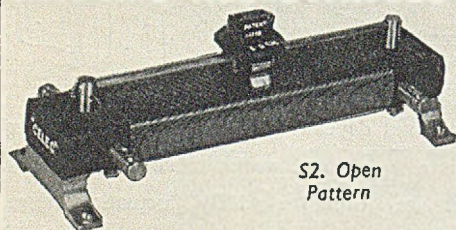
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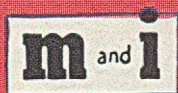
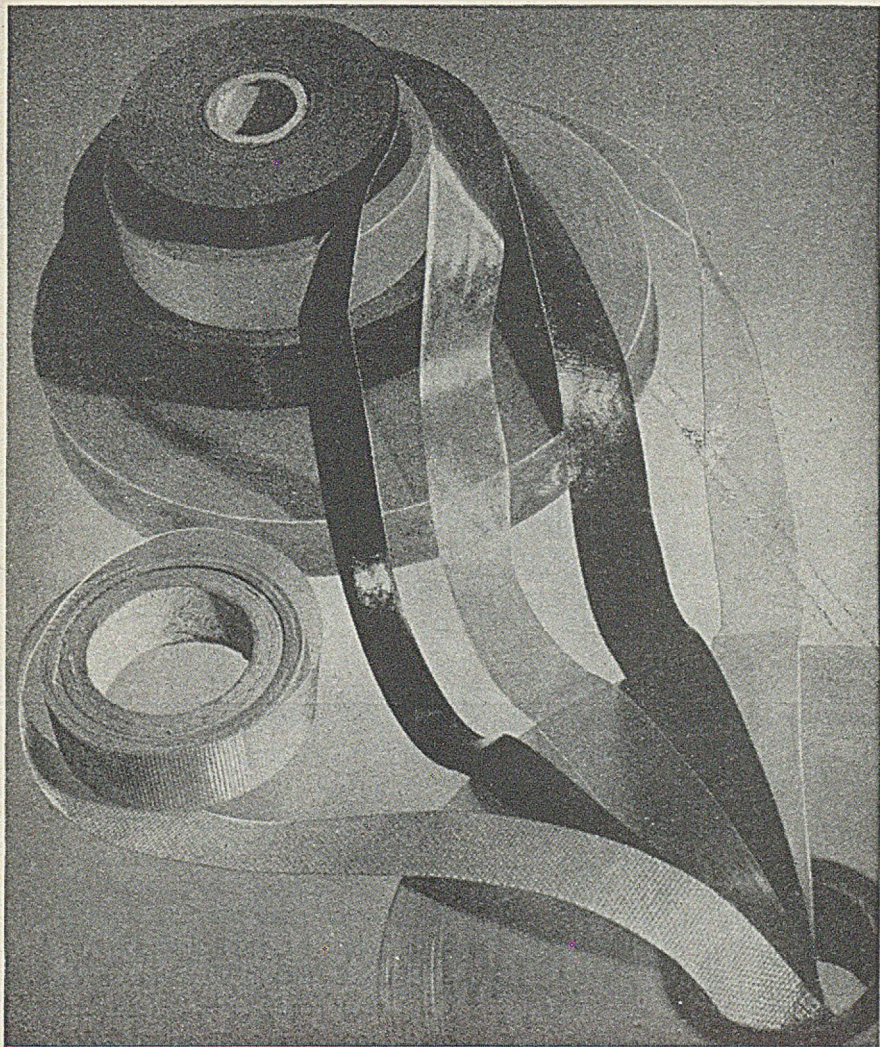
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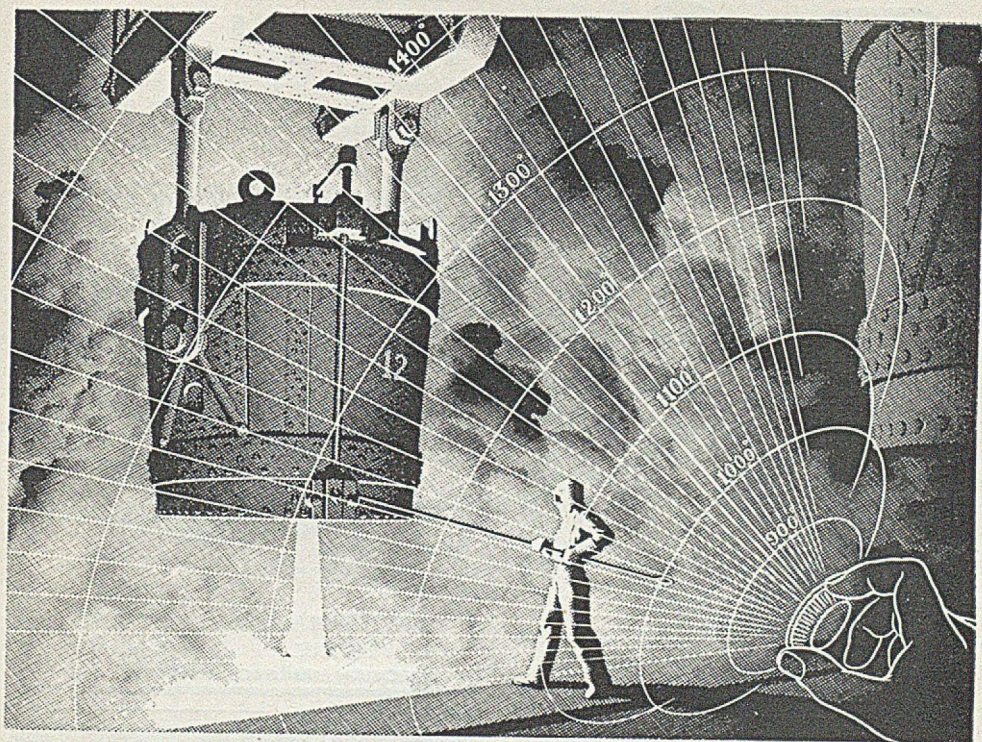
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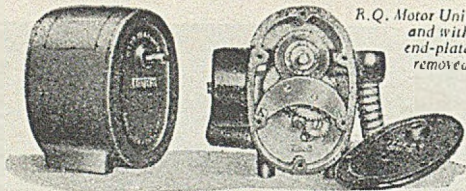
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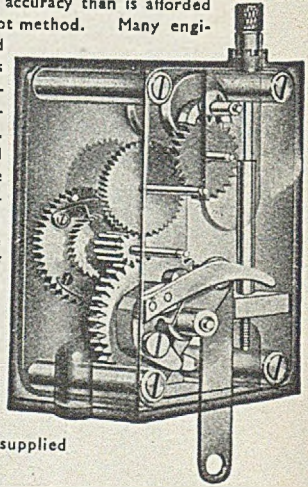
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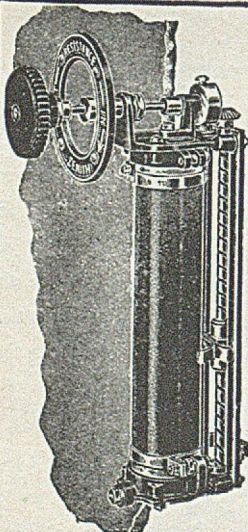
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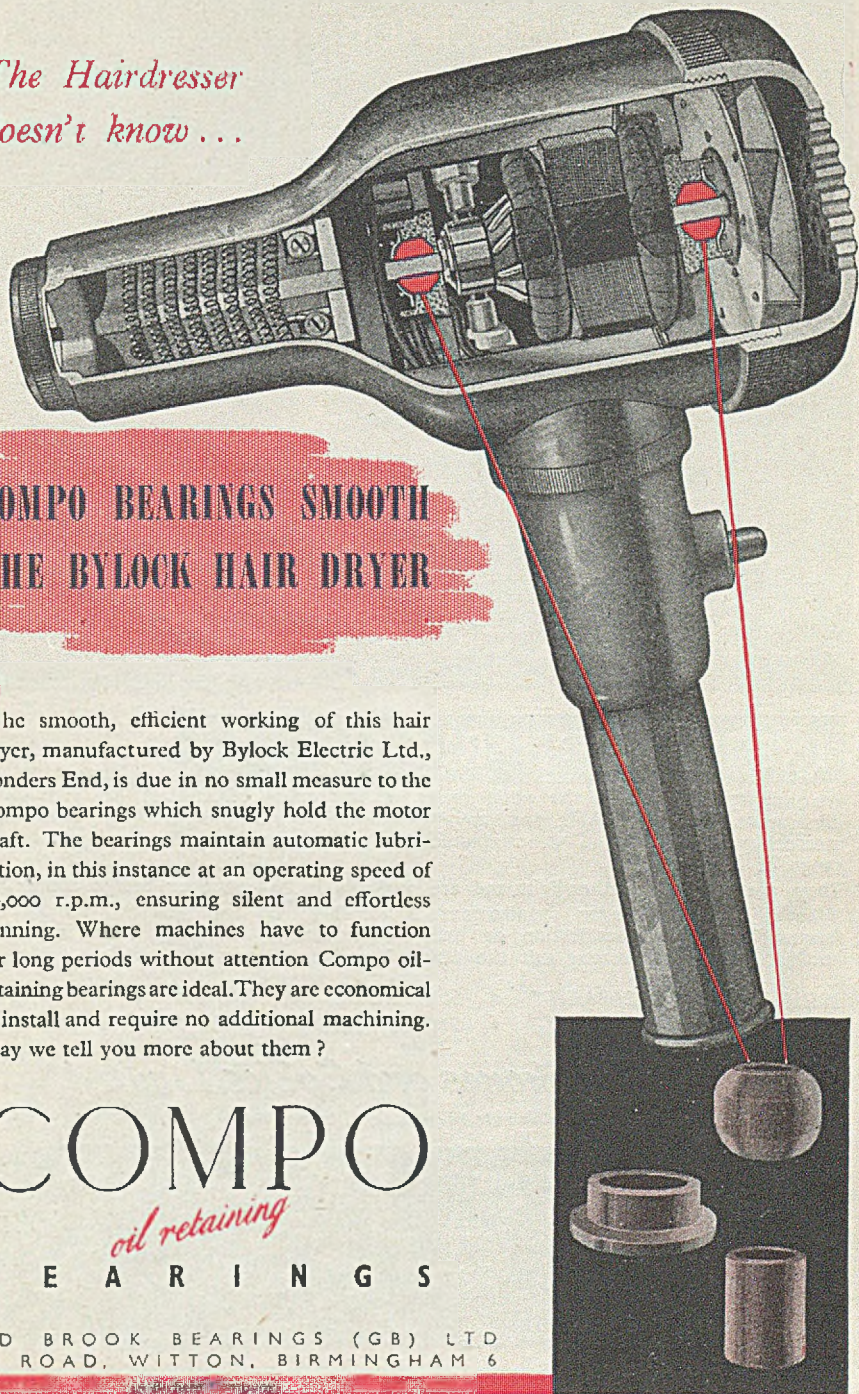
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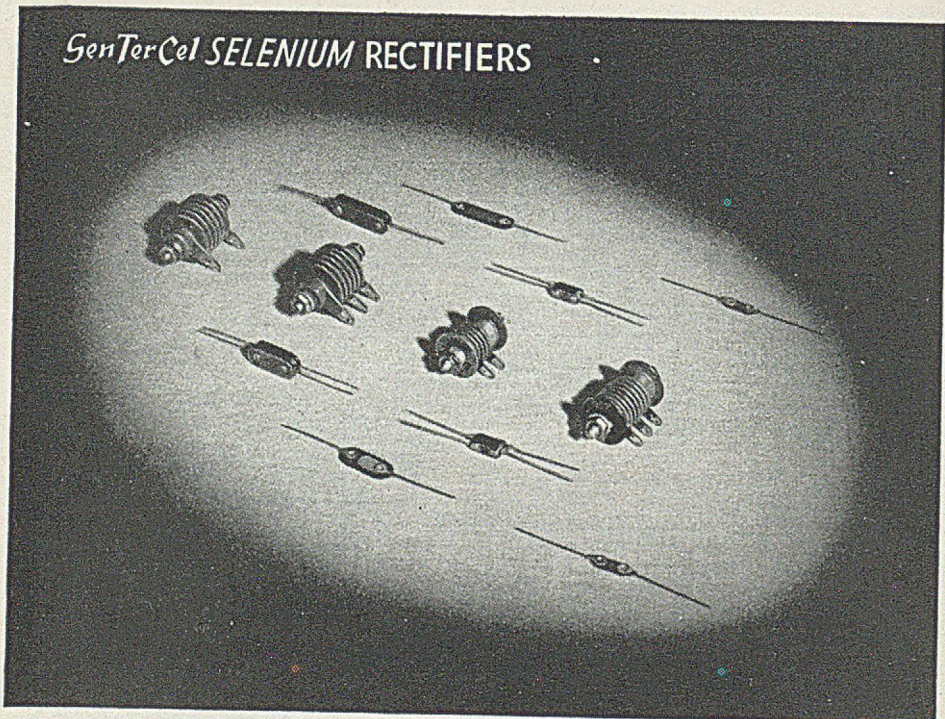
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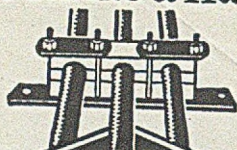
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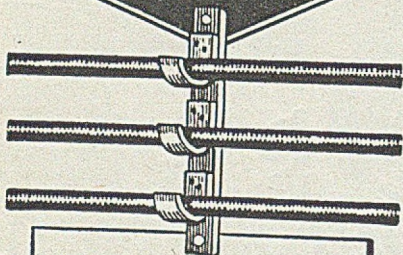
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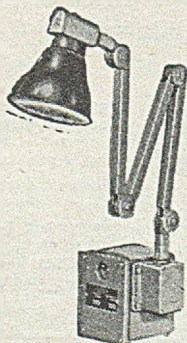
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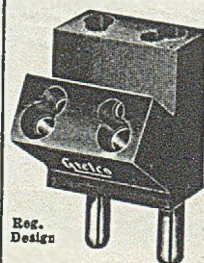
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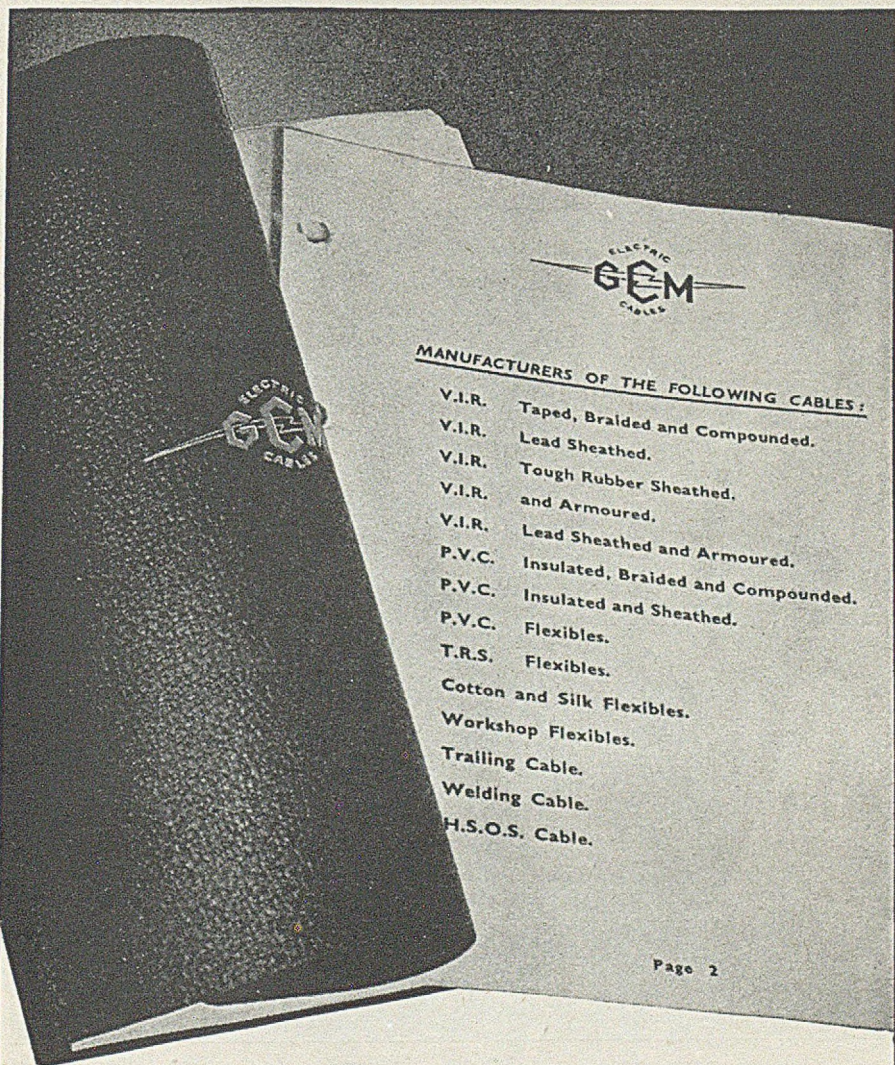
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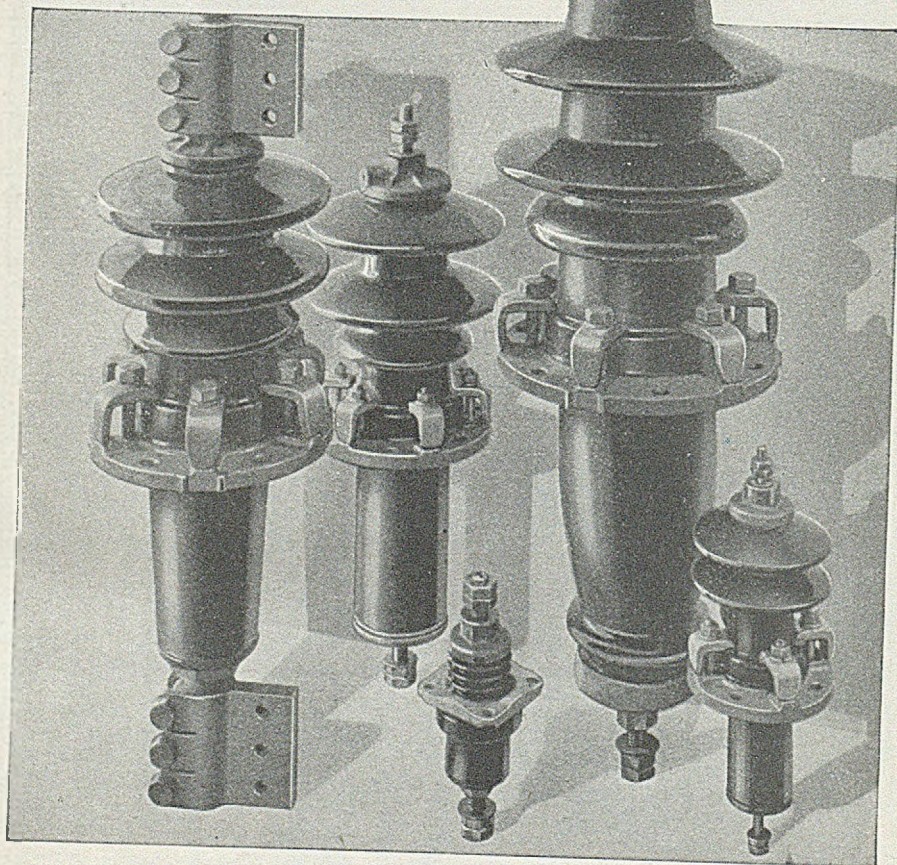
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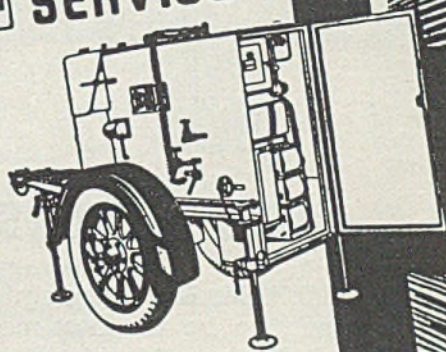


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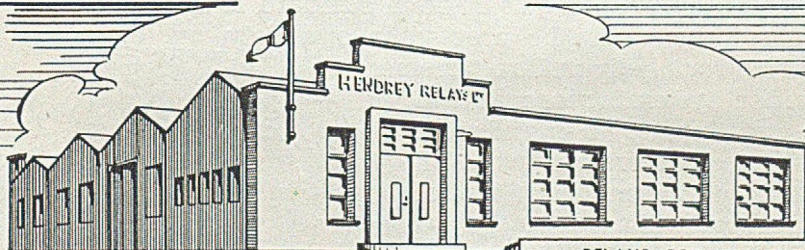
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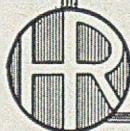
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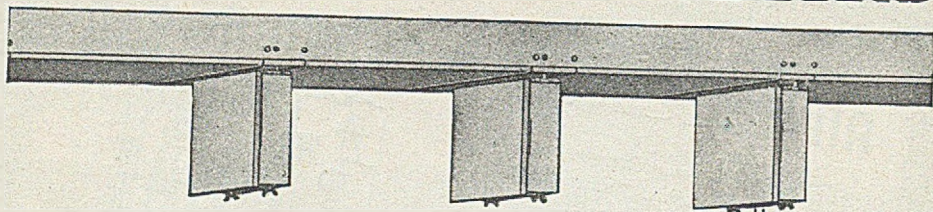
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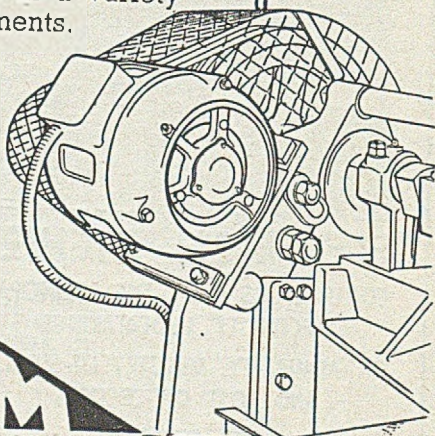
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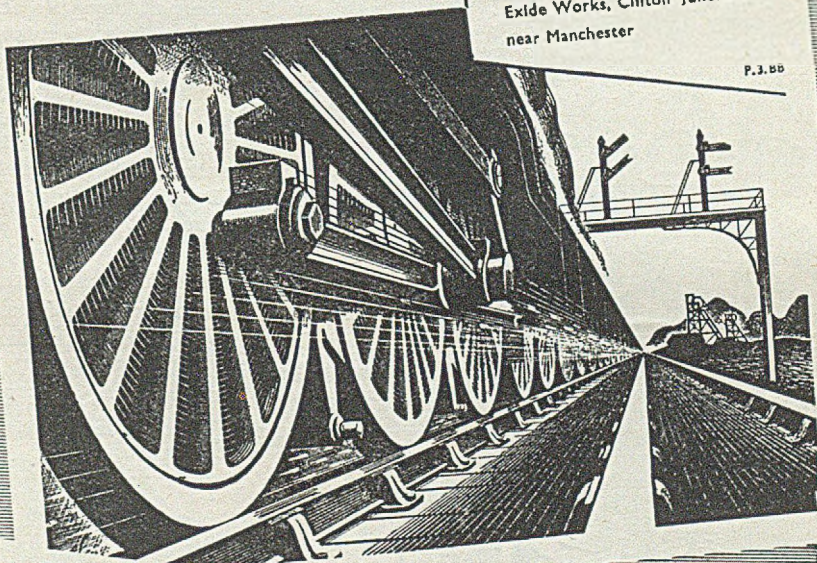
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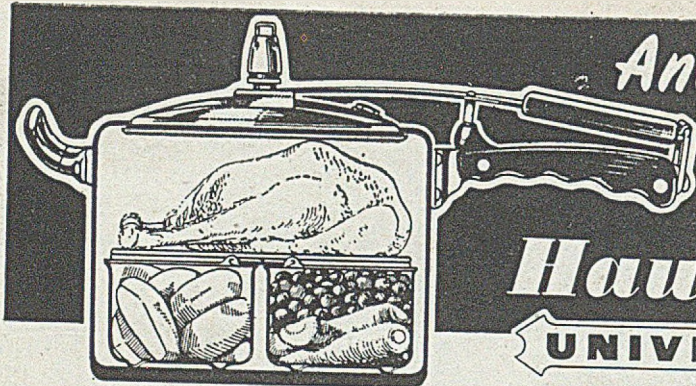
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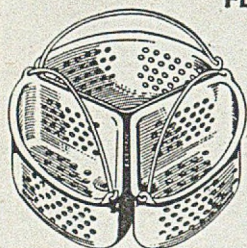


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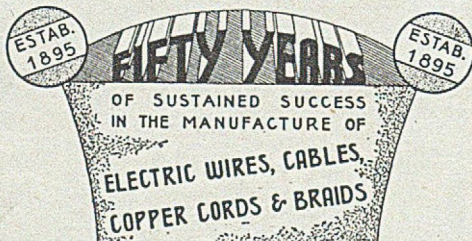
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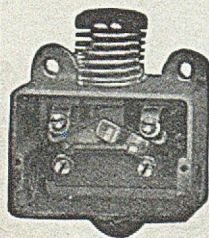


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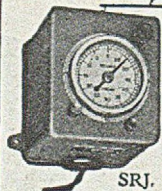
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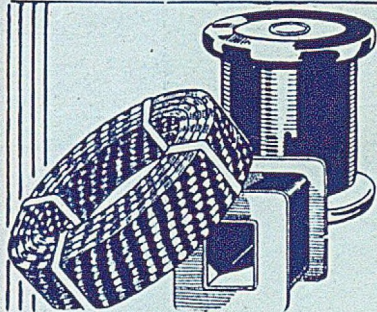
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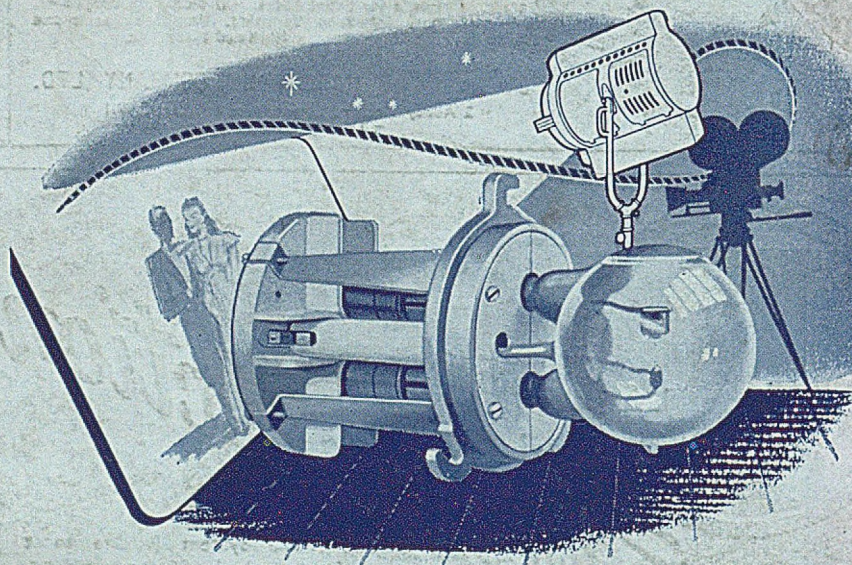
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