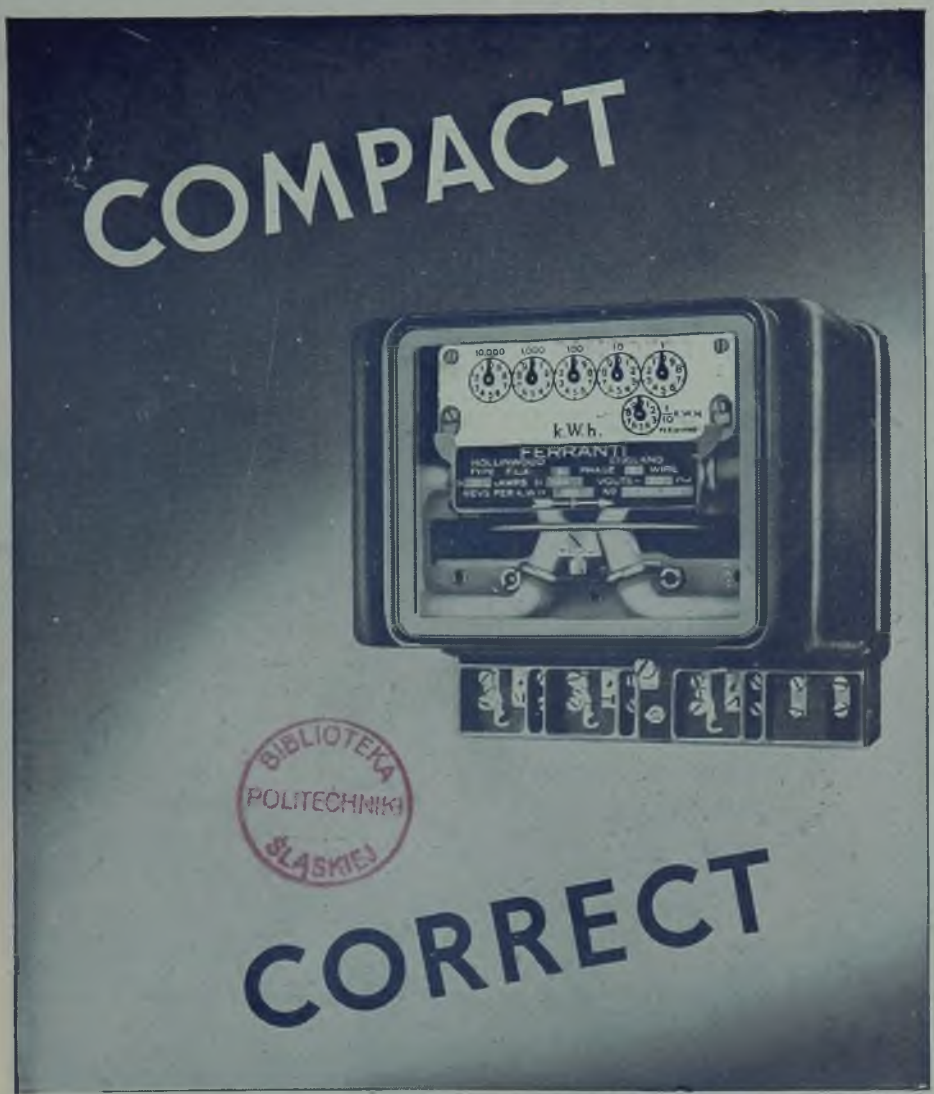
ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXVII. No. 3546 NOVEMBER 9, 1945 9d. WEEKLY



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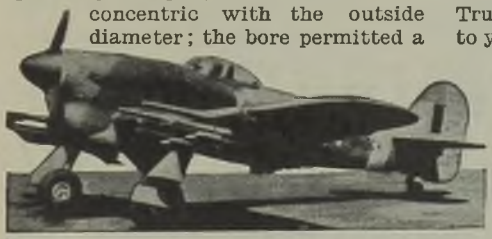
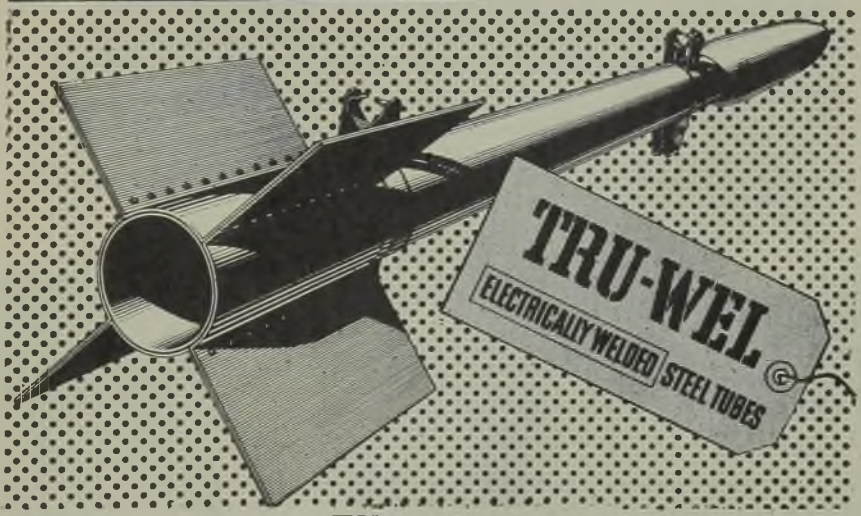
At first glance the making of rocket guns may seem to have little connection with your business, but if steel tubes play any part in your production programme we think you will be profoundly interested. *This was the task:* Rocket body tubes were urgently needed for defence and attack—it was a vital matter. The tubes had to be perfectly straight; the inside diameter concentric with the outside diameter; the bore permitted a maximum variation of only .004 ins. During the war period we produced more than 8,000,000 rocket body tubes. *And here's the moral:* All this is now war history, but the point to be underlined for future production is this—we are able to produce a precision job in vast quantities at speed. By using the production technique we have evolved you may well be able to apply Tru-Wel electrically welded steel tubes to your new requirements.



Tru-Wel electrically welded steel tubes are mass-produced to your requirements; identical in lightness and strength; in concentricity and evenness of wall-strength; identical in composition so that all can be manipulated with equal ease and at full-power speed.



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NOW IN LIMITED PRODUCTION

The Beautiful **'BELLING'** *Electric Streamline Cooker*

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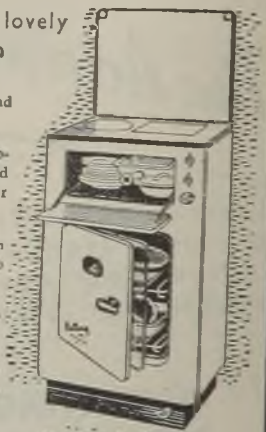
2 Grand big oven with automatic temperature control and full size patent glass door for 'visible cooking.'

3 Fast boiling plates which you can turn right down to "simmer."

4 Very simple to use. So easy to clean.

5 Hinged hob cover lifts up and keeps the wall clean when cooking.



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C.R.C.87

★ *This announcement is now appearing in the National newspapers and magazines*

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C.R.C.319

Look into 'Latest Fashion' in Street Lighting Control

The replacement of Street Lighting Equipment which has been damaged or has deteriorated during the war years is in many cases a large-scale and expensive task, but in tackling it the opportunity should be taken to install also a really modern, scientific form of control. Rythmatic equipment enables the simultaneous switching of all electric street lamps over any area to be accomplished conveniently from one selected point. This "Master Switch" control can easily be extended to cover after-closing shop window lighting, water heating and other remunerative facilities.

A typical multi-facility panel

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EQUIPMENT

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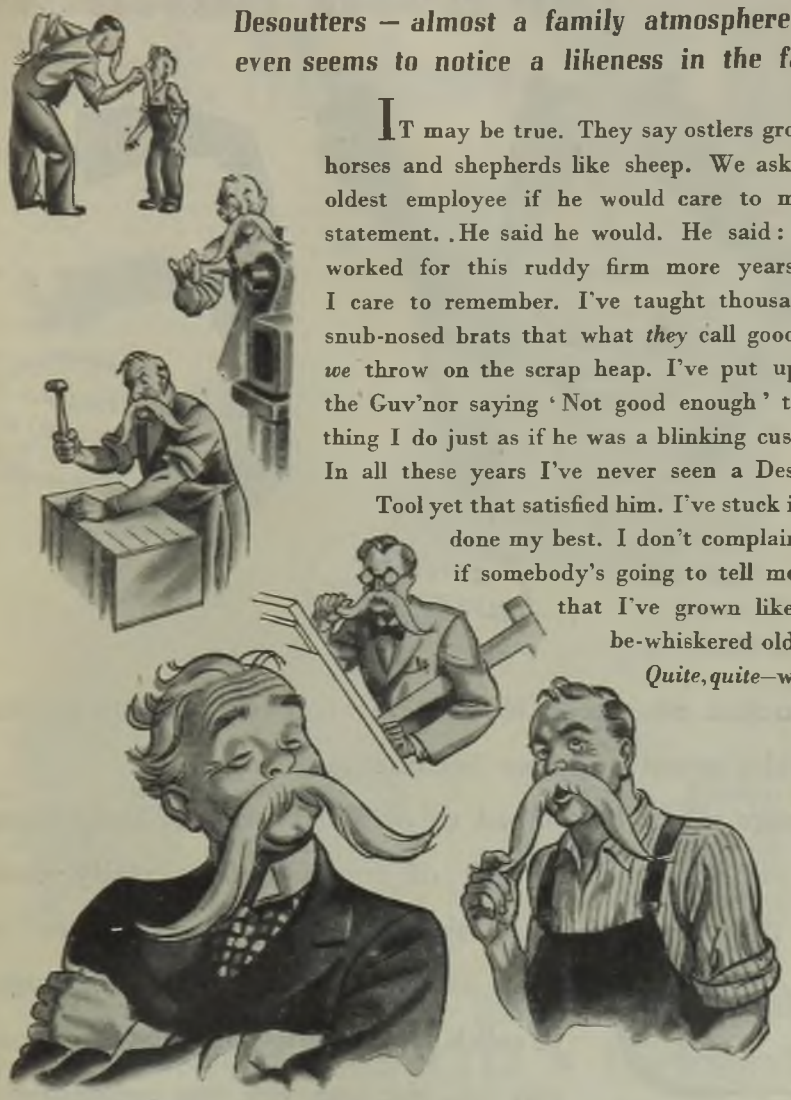
B

A distinguished visitor recently said—

"there is a noticeable team spirit at Desoutters — almost a family atmosphere. One even seems to notice a likeness in the faces."



IT may be true. They say ostlers grow like horses and shepherds like sheep. We asked our oldest employee if he would care to make a statement. He said he would. He said: "I've worked for this ruddy firm more years than I care to remember. I've taught thousands of snub-nosed brats that what *they* call good work *we* throw on the scrap heap. I've put up with the Guv'nor saying 'Not good enough' to anything I do just as if he was a blinking customer. In all these years I've never seen a Desoutter Tool yet that satisfied him. I've stuck it. I've done my best. I don't complain. But if somebody's going to tell me now, that I've grown like that be-whiskered old . . ."

Quite, quite—we said.

DESOUTTER *Specialists in Lightweight, Pneumatic & Electric Portable Tools*

DESOUTTER BROS. LTD. (Dept R.). The Hyde, Hendon, London, N.W.9. Telephone: Colindale 6346-7-8-7.

C.R.C. 154

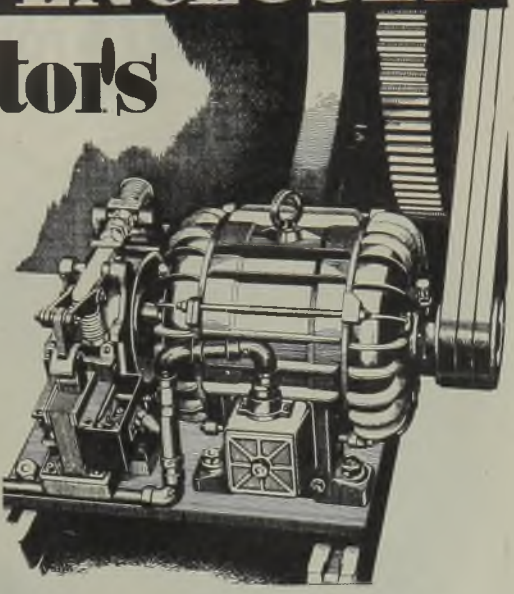
Keep in good shape for good business

The stockist who sells Kye lamps is paving the way for good sales when supplies become more plentiful.

Customers might be fobbed off with any sort of lamp when lamps are scarce. But that of course is not really good business. You want customers to come and come again. Then you ought to sell Kye, the lamp your customers can rely on, the one you can recommend.

KYE FOR GOODWILL AND SALES

TOTALLY ENCLOSED Brook Motors



APPLICATION

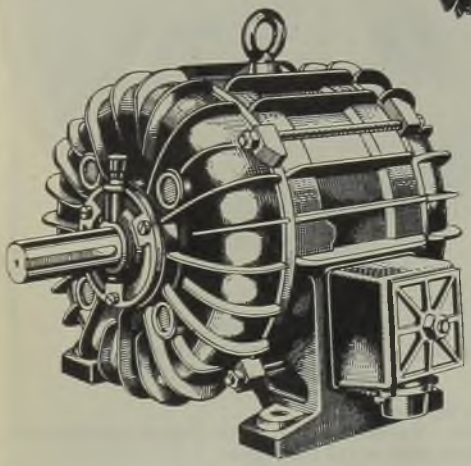
Specially designed for intermittent duty for short operating cycles, where exceptionally high starting torque is required, such as guillotines, hoists, valve operating, bridge lifting or opening gear, range between one and one hundred horse power.

CONSTRUCTION

Totally enclosed and weatherproof, radial cooled, oversize shafts and bearings sealed in dustproof housings, with lubricators for adding grease.

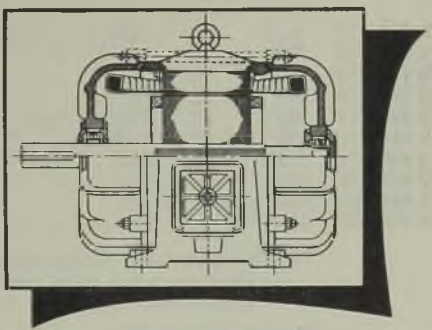
SUPPLY

Suitable for any voltage or phase on alternating current supply, at speeds between 3000 and 375 r.p.m., with minimum starting torques of twice full load.

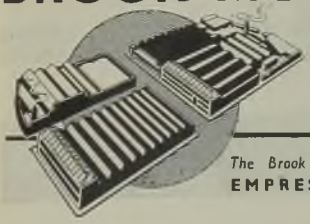


TYPES

Totally Enclosed, with or without Flange, with or without feet.



BROOK MOTORS LTD • Huddersfield



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

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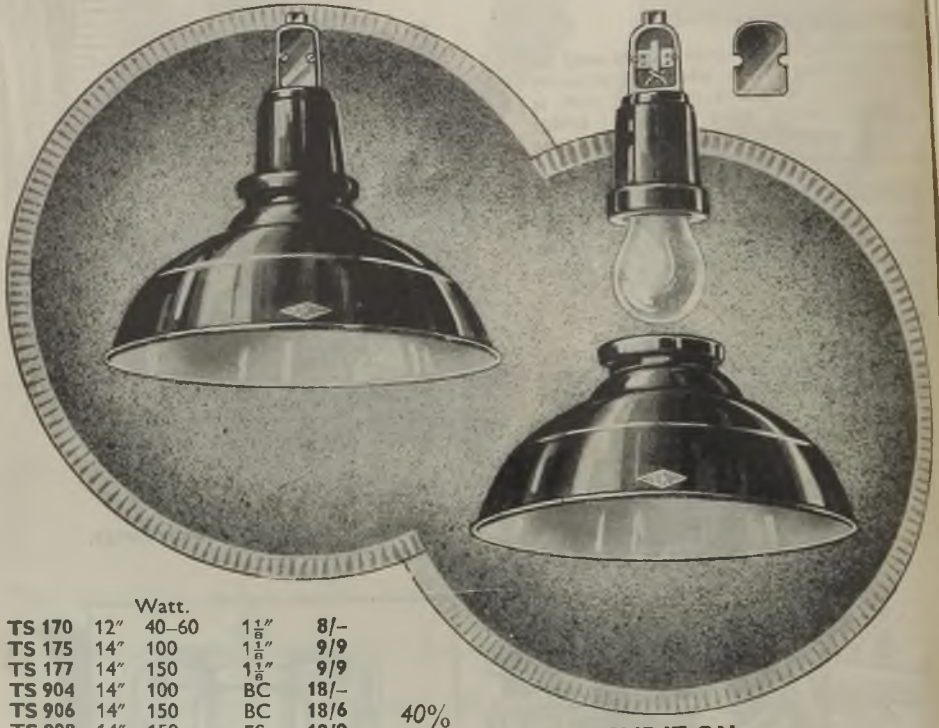
FOR EASY MAINTENANCE—THE BEST.



		Watt.		
TS 170	12″	40–60	1⅛″	**8/–**
TS 175	14″	100	1⅛″	**9/9**
TS 177	14″	150	1⅛″	**9/9**
TS 904	14″	100	BC	**18/–**
TS 906	14″	150	BC	**18/6**
TS 908	14″	150	ES	**19/9**
TS 910	16″	200	ES	**21/6**
TS 912	18″	300	G	**30/6**
TS 914	18″	500	G	**33/-**
TS 916	20″	750/1000	G	**38/6**

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SLIP-IT-OFF.
OVER THE LAMP FOR CLEANING.

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Replace with clean one. Repeat over whole installation.

Thorlux Wiring Box.
Remove Lid, connect Mains and Earth,
Replace Lid—**Job's done** (The Wireman's Friend).

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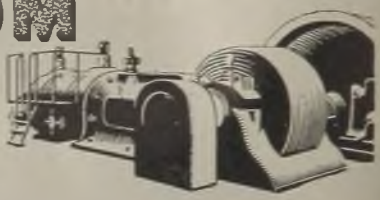
POWER FROM STEAM



How to make a servant of your power-producing medium

A good captain knows the idiosyncrasies of his team; a good workman knows his tools—a bad one blames them. You cannot expect to get the best out of your steam unless you know what its properties and capabilities are.

You may think that you know all that is necessary for the operation of your power plant, but unless you understand the Steam Tables thoroughly you cannot be sure. Do you know whether your steam engine is operating efficiently, what its steam consumption should be, what it actually is? Do you know *all* the possibilities of using the exhaust for process purposes?

These bulletins will help you:

STEAM FOR PROCESS AND HEATING (*Bulletin No.* 25)

A simple introduction to the properties of steam leading to a more critical understanding of the steam tables.

COMBINED POWER AND HEATING (*Bulletin No.* 40)

A complete survey of the possibilities of using the exhaust steam from an engine for process purposes, or for developing power from the steam before it reaches the process. This bulletin is written in a form suitable not only for the engineer and the specialist but also for the management.

STEAM FOR POWER (*Bulletin No.* 33)

An explanation of the power-producing properties of Steam. Read No. 25 first and then this bulletin, which, among other things, explains "entropy" without advanced mathematics.

THE EFFICIENT OPERATION OF STEAM ENGINES (*Bulletin No.* 34)

The practical side of steam engine operation: how to get the most power from the least steam. What the indicator diagram is and what it means.

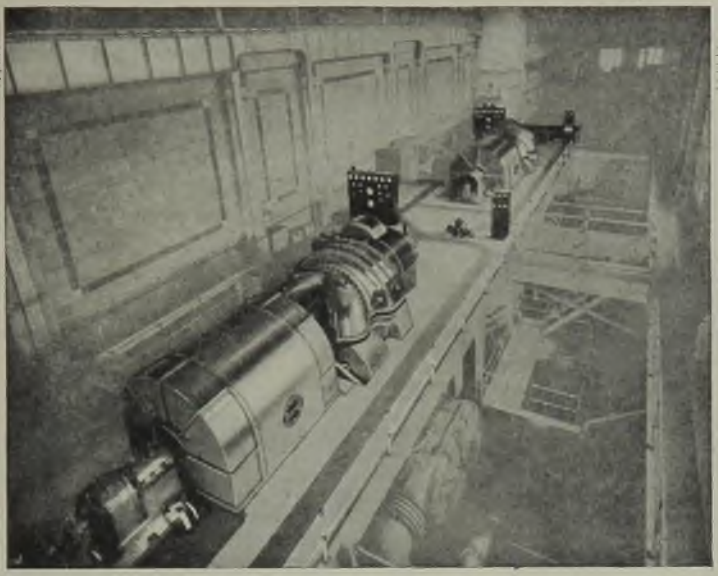
Few people know how interesting steam can be until they have had to learn about it. These bulletins make the learning easy. If you haven't all the copies you require, they can be obtained free on demand from the Ministry's Regional Offices.

ISSUED BY THE MINISTRY OF FUEL AND POWER

PARSONS

TURBO-GENERATING PLANT

Installed in Canada



Two 15,000 kW. Parsons Turbo-Alternators supplied to the Corporation of the City of Edmonton, Alberta, Canada.

Also Manufacturers of :—

ELECTRICAL TRANSFORMERS, TURBO-BLOWERS, TURBO-COMPRESSORS, SURFACE CONDENSING PLANT, GEARING, GLASS AND METAL REFLECTORS, ETC.

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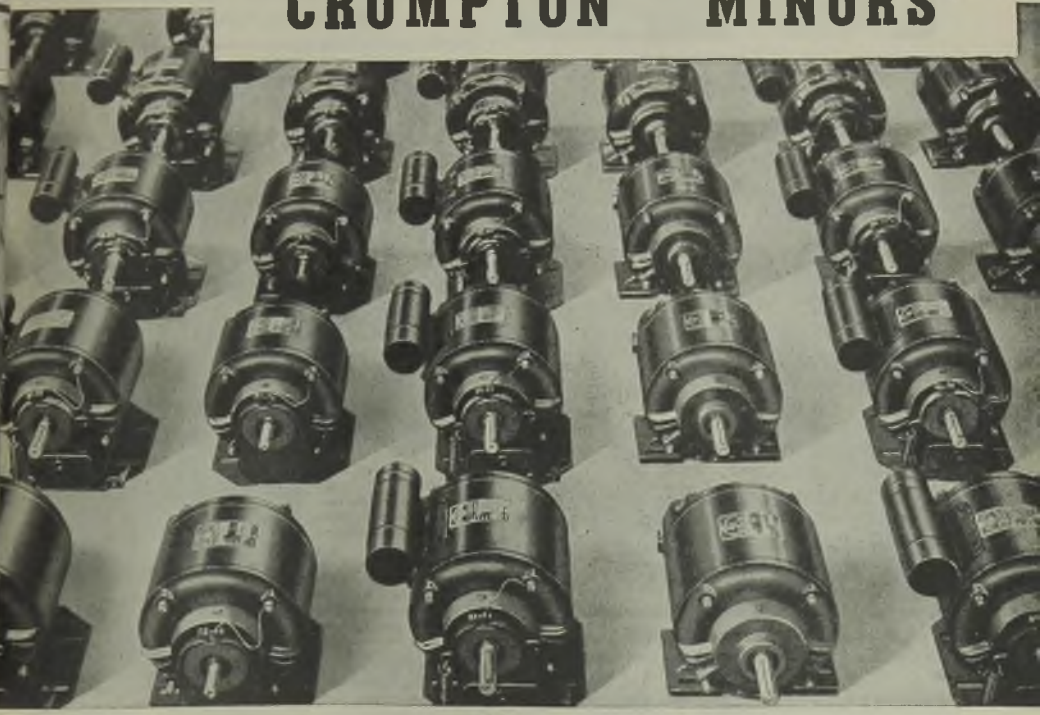
The FRACTIONALS with the "Marathon" Sleeve Bearing

CROMPTON 'MINORS'



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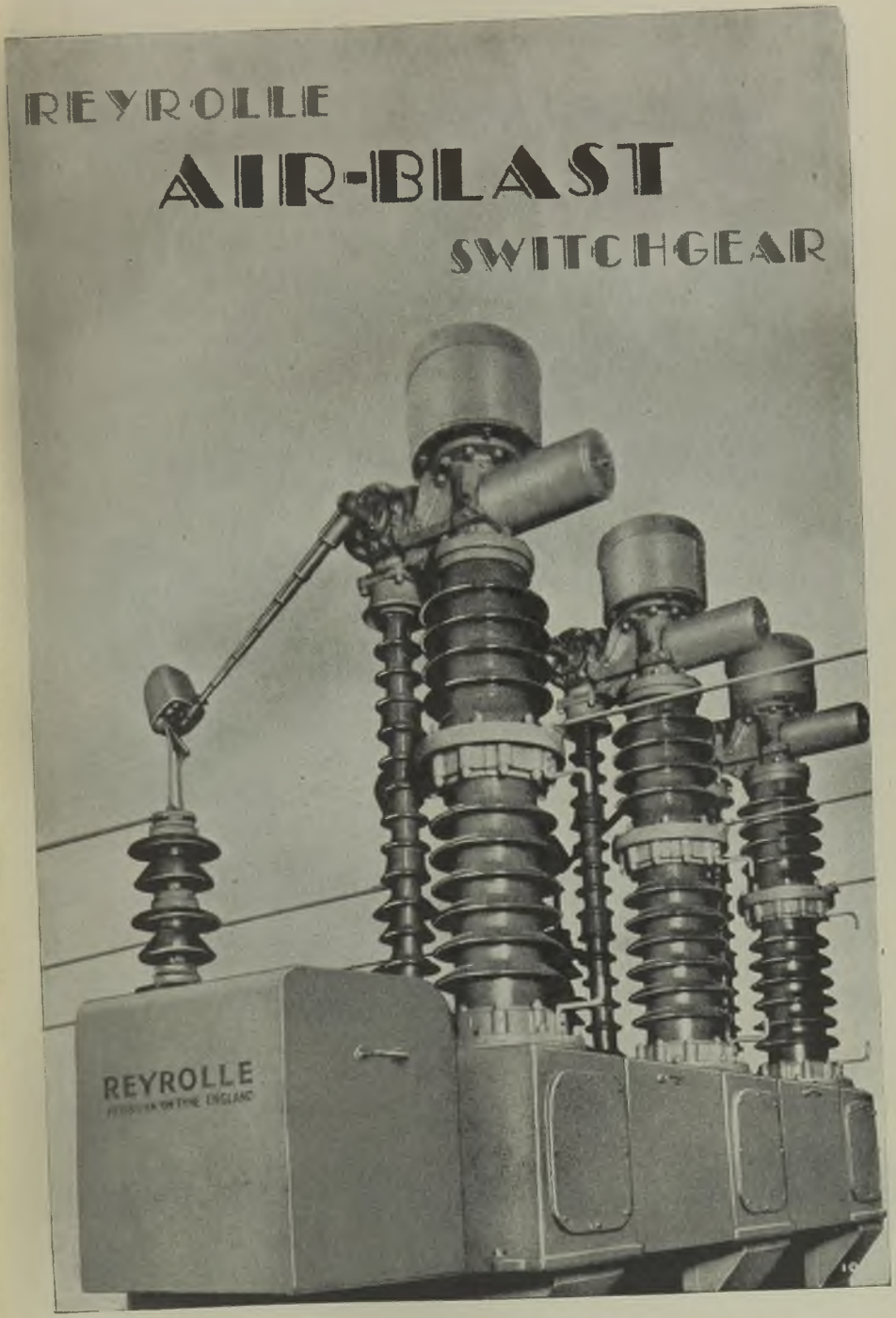
REYROLLE
AIR-BLAST
SWITCHGEAR
REYROLLE

"Many hands make light work. . ."

LIGHT WORKS MAKE "EXTRA" HANDS

HUNDREDS of war factories equipped with Mazda Fluorescent Lighting have demonstrated the important fact that peak production is not just a matter of "many hands". Working *conditions* have played a vital part in output and quality; and light has been a number one priority condition, for these reasons:—

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(2) The psychological effect of "daylight" lighting has been far-reaching. Fatigue, irritability and depression—arising primarily from eye-strain—have been largely eliminated, and absenteeism, due to ill-health and minor accidents, enormously decreased.

(3) Mazda Fluorescent Lighting has eliminated the "dark corners"; and a great deal of additional floor space has been utilised.

So, to *essential* factories and businesses which can and should have better light *now*; to others which need better lighting, but may have to wait some time before installing; and to those which are uncertain of the need for better lighting—we offer the free expert advice of our lighting engineers.

Write or telephone, making an early appointment.

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ELECTRICAL REVIEW

November 9, 1945

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

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Release from the Forces

Specialists Needed for Reconstruction

DISCUSSION of the rate of demobilisation of men and women in the Forces continues. In the House of Commons last week Mr. Herbert Morrison told Mr. Churchill that there were still 4,460,000 officers and men in the three Services of whom about 2,160,000 were stationed in this country. Mr. Churchill hinted that it might be necessary to ask for another debate on the subject of demobilisation before the end of November.

Within the limits of the " Bevin scheme " (which critics object to as too limited) there has been a certain speeding-up but neither the people in the Services nor industrialists who are held up by lack of labour are satisfied so far. The Bevin scheme was designed to give a square deal to all by ensuring that age and length of service alone would ordinarily determine the order of release.

Not Enough Pioneers

The establishment of " Class B " was a departure from this strict rule but it was held to be justified because " Class B " men were a sort of pioneers to clear the industrial road for the great majority. But this road is so much encumbered with wartime obstructions and diversions that many more pioneers are needed than " Class B " can provide. Moreover, this class is restricted to a certain number of industries when every industry, in greater or less degree, needs a reconversion force. The rate of demobilisation depends to a great extent upon the ability of industry to absorb the men and women and the situation is not improved if industry cannot obtain the people necessary to change over plant and methods for the resumption of peacetime production.

It is questionable whether this determination to be scrupulously fair is working out properly. For instance, it is found that officers are very largely in the earlier release groups and to let them go at the due dates would be to leave the rank and file without leaders. Then there are certain technical units which have to be held together to continue effectively and these are just the kind of men which industry needs. Thus while it is not considered unfair to retain men who should be released it is thought to be quite inequitable to demobilise men before they are due to go.

Possible Remedies

Some slight relief is being applied through the lending of men by the Service Departments for carrying out civilian work. Employment of troops at the docks, of course, is a special case, but there have also been " loans " of individual soldiers, sailors and airmen to the building and baking industries and, above all, the employment of men of the Royal Corps of Signals on telephone work which began last week. This is only a palliative and cannot be applied on a sufficiently large scale without causing a variety of trouble. Two remedies only seem to be feasible : the obvious and more easily applied one is the speeding-up of the present orderly process of demobilisation ; the second is an extension of " Class B " beyond the proportions to which the Government has

announced its intention to adhere. Arising out of this there is another matter to which the Government should give consideration. This is the calling-up of young key men which, as we have pointed out, is causing a great deal of trouble to manufacturers. Is it impossible to exercise some sort of intelligent discrimination in this direction?

High-Voltage Switchgear

DATA on a new air blast circuit-breaker presented in this issue substantiate a claim previously advanced in these columns—largely on the strength of the recognised success of the work of E.R.A. in this field which gave this country priority in time. The claim was that a demand for switchgear, proved at high-power testing stations to be capable of coping with the highest voltages and short-circuit conditions with rapid operation, could be met by British manufacturers when the need for it arose. In this development the ability to master the problem of re-striking transients is a most important factor. The leading position of Great Britain promises to be as well established in the upper range of switchgear duties as it has long been for lower voltages and rupturing capacities, which will still provide by far the greater part of the requirements.

Metering

HAVING regard to the truth of Kelvin's dictum relating knowledge of a subject to ability to measure it, the low esteem in which the testing of consumers' meters is sometimes held is surprising. An instance cited in Mr. S. H. Richards's inaugural address as chairman of the I.E.E. Measurements Section (a summary of which was published in our last week's issue) indicates the need for fully implementing the provisions of the Meters Act, 1936, as soon as man-power conditions permit.

Surplus Stores

As far back as July last year the Board of Trade set out in a White Paper its proposals for the orderly disposal of stores left in the hands of Government Departments at the end of the war. The war has now ended but so far as electrical equipment is concerned little has resulted from a great deal of discussion. It is agreed that the surplus goods should be disposed of through the industries concerned and for this purpose it has been proposed that panels representative of those industries should be set up to advise the Government Departments dealing with the matter. The Board of Trade has expressed its desire to get on with the disposal of the lighter types of electrical equipment as soon as possible without waiting for the adoption of a scheme for the industrial classes. A proposal to appoint a panel comprising representatives of the manufacturers, merchants, wholesalers and electrical contractors has not proved generally acceptable to all the parties concerned and so the matter still hangs fire.

Importance of Design

WHILE it is recognised that cost is probably the predominant factor in the bulk of both home and overseas trade, appearance also exercises a very important influence. What is not so often recognised is that a reasonable price and good design can go together. In the past endeavours to produce æsthetically satisfying goods have been too largely confined to the more expensive classes, or perhaps it is truer to say that high prices have been attached to good designs because they were good. It should be one of the objects of the exhibition of the Council of Industrial Design which is to be held next year to furnish proof to buyers that British manufacturers are able to produce things which can pass the appearance test and still be competitive in price.

Turbine-Governor Control

VOLTAGE regulation for alternators has usually been regarded as offering most scope for electronic control of generating plant, but the application of the method to turbine governing has, says the *Electrical World*, proved its value at the Calumet power station of the Commonwealth Edison Co. of Chicago during more than twelve months' operation. Relays have been replaced by the thyratron for adjusting the load on a 35,000-kVA turbo-alternator. DC impulses at 2-sec. intervals, sent out by a system-frequency and tie-line load recorder, cause the grid potential of the appropriate tubes to become positive in order to operate the governor motor to raise the load; lowering impulses produce similar action in the other direction.

Air-Blast Switchgear

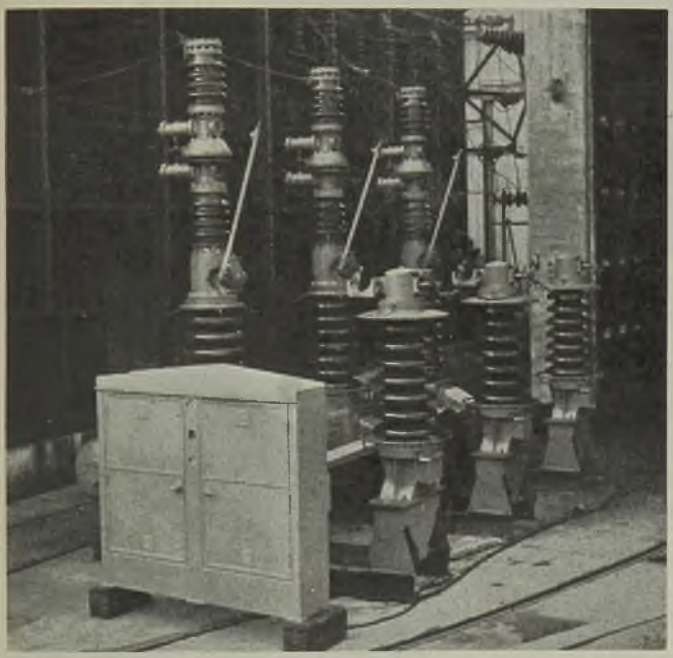
Tests on New Design at 132-kV and 2,500-MVA

MAINLY for the purpose of meeting the increasing need for circuit-breakers for very high transmission voltages with rupturing capacities in excess of 1,500 MVA, A. Reyrolle & Co., Ltd., have introduced an air-blast design, the testing of which at 132 kV and above is within the capacity of a modern high-power proving station. The influence of re-striking voltage has necessitated the adoption of a different technique for proving the ratings of certain types of breakers, of which the air-blast is one. This entails the making of additional tests to those prescribed in B.S.116, but these will be covered by a new specification now in preparation.

These requisite tests are lengthy, but those in the series carried out at Hebburn which were witnessed by us on November 1st, appear to be well representative of operating conditions, except that in regard to rate of rise of re-striking voltage they were probably more onerous than any that would be found in practice.

The type-132 OAB10 three-phase circuit-breaker consists of three interchangeable single-phase units, each of which incorporates a duplex air-blast turbulator, a pneumatically operated series air-break isolator and porcelain post-insulator mounted on a bedplate, which also houses the main blast valve, the tripping valve and isolator operating mechanism.

The turbulator embodies two sets each of moving contacts for normal current carrying and arc initiation, of co-axial fixed arcing electrodes and of metal venturi nozzles. This assembly is mounted in a metal enclosure between shedded porcelain insulators enclosing bakelised-paper tubes which take the mechanical stresses, the porcelains serving only as weatherproof enclosures. The nozzle and fixed electrode is designed to act as a control gap, which breaks down with excessive voltage transients. Between the two contact units is a vent with a flap valve which normally remains closed. The moving contact assembly can be taken out bodily by removing eight nuts.

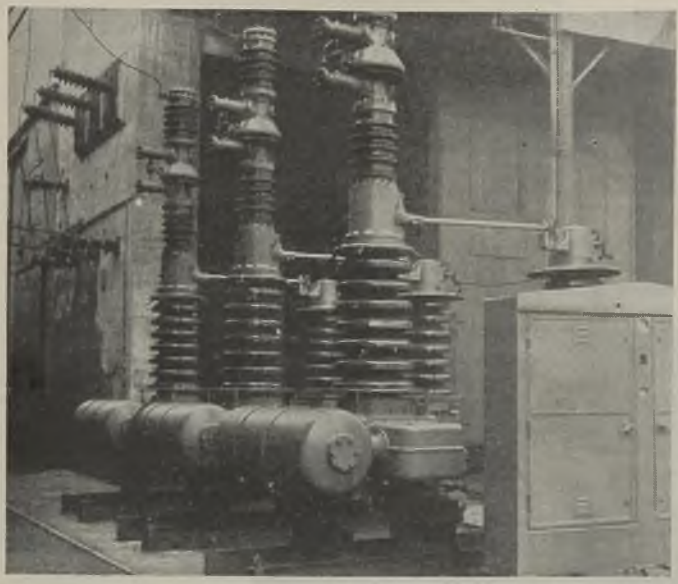


General view of 132-kV air-blast circuit-breaker with isolators open

In opening the circuit the isolator operates after the main contacts. The main air-blast is sustained until the necessary isolation clearance in air has been reached, after which the main contacts reclose on diminution of blast pressure. The isolator is used as a high-speed making switch and is fitted with arcing contacts and an ice-breaking device.

Current transformers are installed in the post-insulator supporting the fixed contacts of the isolator and also, where necessary, on

the opposite side of the circuit-breaker in a similar housing. The interior of the circuit-breaker is kept dry by the use of low-pressure



Air receiver side of gear; isolators closed

air supplied from the main air system.

Three distinctive features of the turbulator are:—All-metal construction (*i.e.*, no solid insulation near the arc); complete separation of the functions of the contacts and electrodes, without risk of mutual interference; means of limiting re-striking voltage.

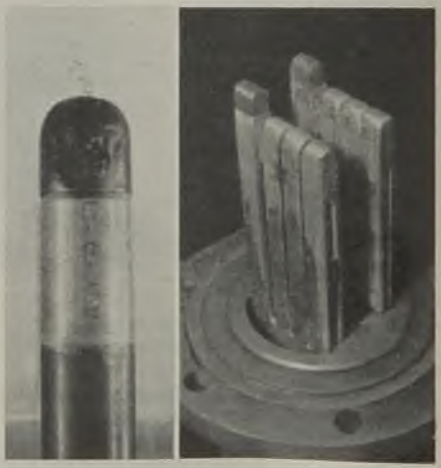
Research carried out by Reyrolles has established three basic relationships in proving the performance of air-blast breakers. The first two are that performance, expressed by the product of rate of rise of re-striking voltage, RRRV, and current broken, is proportional to (1) nozzle diameter and (2) to recovery voltage to the power -0·6; the third is that the curve of RRRV plotted against breaking current for the satisfactory performance limit of the breaker is a rectangular hyperbola.

In order to simulate short-circuit capacity at the requisite voltage within the scope of the station, the equivalent RRRV for the full circuit-breaker with 100 per cent. recovery voltage and normal nozzle diameter is arrived at by dividing the test RRRV for the half breaker by 0·55 (instead of 0·5) to allow for voltage out-of-balance. The same relationship applies when nozzle diameter is 66·7 per cent. of the normal and the full breaker will handle the same RRRV with the same performance if the breaking current equals the test breaking current divided by 0·667, and this is used for the purpose of obtaining the equivalent MVA value.

With reduced recovery voltage and normal nozzle diameter, the RRRV for the full circuit-breaker, corrected for 100 per cent. recovery voltage,

$$= \frac{\text{test RRRV}}{0{\cdot}55} \times \frac{100\%\ \text{recovery V}^{-0{\cdot}6}}{\text{test recovery V.}}$$

In action the circuit is opened by the admission of air into the metal enclosure causing the piston carrying the moving contacts to be pushed outwards, thereby transferring the current from these to the extended arc-initiating contacts, which on further movement start the arc in an air blast. This arc is then rapidly centralised vertically through the nozzle between the fixed arcing electrodes, to which it is confined by the air streams, which also sweep away



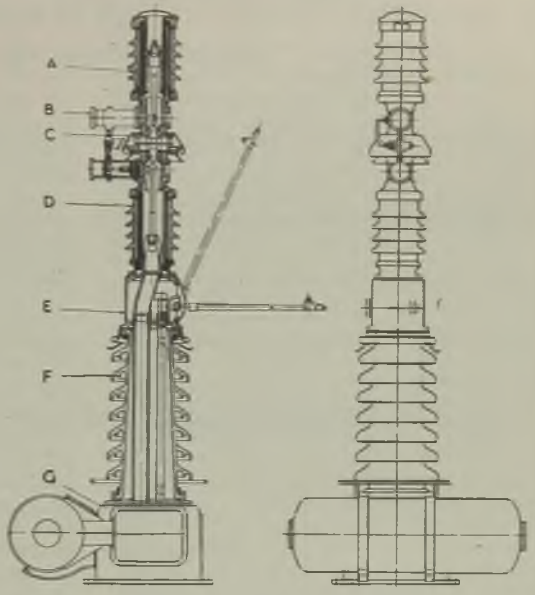
Contacts after 72 short-circuit tests

ionised gas which may be round the arc.

Turbulence due to reaction between the hot residual gasses and the cooler air stream breaks up the thread of ionised gas, thus enabling the residual arc path to regain its electric strength and to withstand the re-striking transient. Re-striking may occur between the electrodes or between the electrode associated with the arc-initiating contact and the nozzle. As the electric strength of the latter is predetermined, it forms a control gap to prevent the production of harmful re-striking voltages.

Enough compressed air is supplied to the circuit breaker from a local receiver at from 300 to 330 lb. per sq. in. to cover one make-break operation. Replenishment is automatic from a main receiver at about double the pressure for rapid recharging. A small supply of compressed air at a few pounds pressure is passed continuously over the internal insulating surplus to ensure dryness. In order to investigate the maximum voltage transients produced, the low-breaking-current tests were done at 330 lb. per sq. in. and to prove rated breaking capacity the higher breaking-current tests were done at 300 lb.

Examination of the contacts and nozzles after the tests particularised in the accompanying table, which were subsequent to seventy-two tests previously carried out, showed them to be in very good condition. The contacts are shown in the opposite page. In no test observed did the arc duration exceed 0·02 sec., though we were informed that a maximum of 0·025 sec. had been recorded earlier. Audible and visible effects of stress were slight and a study of the electromagnetic and cathode-ray oscillograms indicated an adequate factor of safety.



General assembly of one phase

A.—Upper C.B. unit; B.—Side contact and control valve; C.—Nozzle and exhaust chamber; D.—Lower C.B. unit; E.—Centre chamber; F.—Lower unit; G.—Bedplate with receiver

Making circuit was accompanied by a momentary flash due to pre-arcing with slight marking of contact faces.

Circuit-breakers of the type described are now being made for voltages up to 132 kV and for breaking capacities up to 2,500 MVA and RRRV usual at corresponding system voltages. Designs are also available for 220 and 264 kV, which can be proved by similarly sub-dividing the switchgear units.

Details of Short-Circuit Tests

Circuit-breaker fitted with 1½-in. nozzles and contact gaps set at 1¼ in. Service Voltage 132 kV. Normal Current 600 A. Breaking Capacity at 132·0 kV; Symmetrical 10·9 kA; Equivalent to 2,500 MVA. Asymmetrical 13·6 kA Making Capacity 27·8 Pk. kA, at 132 kV. Test Duty B–3–B–3–B, except for No. 6 when the duty was MB–3–MB.

P.F.	Applied kV	Recovery kV. Av. between phases	Making Pk. kA	Breaking kA	*MVA Broken	Arc Duration (half-cycles)	RRRV V/μ sec.
1. *Three-phase Tests on Full Breaker 10 per cent. rating*							
0·15	132·0	124·5	1·92	1·0	228·0	0·75	
,,	,,	,,	2·24	,,	,,	1·25	
,,	,,	,,	1·6	,,	,,	0·5	
,,	,,	,,	1·92	,,	,,	0·75	2300
,,	,,	,,	2·4	,,	,,	1·5	,,
,,	,,	,,	1·84	,,	,,	0·75	,,
,,	,,	,,	1·76	,,	,,	1·75	1200
,,	,,	,,	2·4	,,	,,	2·0	,,
,,	,,	,,	2·08	,,	,,	1·5	,,

* MVA based on R.M.S. Current.

P.F.	Applied kV	Recovery kV. Av. between phases	Making Pk. kA	Breaking kA	*MVA Broken	Arc Duration (half-cycles)	R RRV V/μ sec.
2. *30 per cent. rating*							
0·3	132·0	117·5	7·25	3·44	794·0	1·0	5200
,,	,,	,,	5·75	,,	,,	1·5	,,
,,	,,	,,	7·0	,,	,,	0·75	,,
,,	,,	,,	8·25	,,	,,	0·75	,,
,,	,,	,,	6·5	,,	,,	1·25	,,
,,	,,	,,	6·25	,,	,,	0·5	,,
,,	,,	,,	8·0	,,	,,	0·75	,,
,,	,,	,,	7·25	,,	,,	1·25	,,
,,	,,	,,	5·5	,,	,,	0·5	,,
3. *Three-phase Tests on Half Breaker 65 per cent. rating*							
0·3	71·0	62·5	16·0	7·05	1610·0	1·0	1750
,,	,,	,,	12·5	,,	,,	1·5	,,
,,	,,	,,	15·0	,,	,,	0·5	,,
,,	,,	,,	16·5	,,	,,	1·0	,,
,,	,,	,,	13·0	,,	,,	0·5	,,
,,	,,	,,	15·0	,,	,,	0·75	,,
,,	,,	,,	14·0	,,	,,	1·5	,,
,,	,,	,,	15·0	,,	,,	0·75	,,
,,	,,	,,	16·0	,,	,,	1·0	,,
4. *Three-phase Tests on Half Breaker 100 per cent. rating (symm.)*							
0·3	41·0	36·7	24·8	11·6	2580·0	1·25	1350
,,	,,	,,	23·2	,,	,,	1·5	,,
,,	,,	,,	17·6	,,	,,	0·75	,,
,,	,,	,,	26·4	,,	,,	1·0	,,
,,	,,	,,	23·2	,,	,,	1·5	,,
,,	,,	,,	17·6	,,	,,	0·75	,,
,,	,,	,,	19·2	,,	,,	1·25	,,
,,	,,	,,	25·3	,,	,,	0·5	,,
,,	,,	,,	24·0	,,	,,	0·75	,,
5. *100 per cent. rating (asymm.)*							
0·06	41·0	37·5	19·2	12·5†		1·5	1450
,,	,,	,,	29·6	15·1		2·0	,,
,,	,,	,,	26·4	15·6		1·5	,,
,,	,,	,,	18·4	12·4		1·0	,,
,,	,,	,,	31·2	15·6		1·0	,,
,,	,,	,,	28·8	15·6		0·5	,,
,,	,,	,,	24·8	13·9		1·0	,,
,,	,,	,,	22·4	13·0		1·0	,,
,,	,,	,,	29·6	15·6		0·5	,,
6. *Three-phase Tests on Full Breaker 100 per cent. rating (making)*							
0·06	38·0	30·2	25·6	8·76	2000·0	1·25	
,,	,,	,,	24·0	,,	,,	1·5	—
,,	,,	,,	23·2	,,	,,	0·75	
,,	,,	,,	20·0	,,	,,	1·5	
,,	,,	,,	21·6	,,	,,	2·0	—
,,	,,	,,	20·8	,,	,,	1·5	
7. *Single-phase Tests on Full Breaker 45 per cent. rating*							
0·15	114·0	106·0	7·2	4·66	1065·0	1·25	5000
,,	,,	,,	8·0	,,	,,	1·25	,,
,,	,,	,,	12·0	,,	,,	1·5	,,
8. *Single-phase Tests on Half the CB 66 per cent. rating*							
0·15	76·0	73·5	16·5	7·08	1620·0	1·5	1600
,,	,,	,,	15·0	,,	,,	1·75	,,
,,	,,	,,	15·0	,,	,,	1·5	,,
9. *Single-phase Tests on Full Breaker Low Reactive Breaking Current*							
0·02	116·0	107·5	0·08	0·035	8·0	1·25	550
,,	,,	,,	0·056	,,	,,	1·5	,,
,,	,,	,,	0·08	,,	,,	1·5	,,

† In No. 5 percentage DC components for the different breaking kA were:—9, 50, 55; 0, 55, 55; 36, 23, 55.

Calm Before the Storm

Suspended Discussion of Supply Industry's Future

By "Borough Electrical Engineer"

MR. SHINWELL, the Minister of Fuel and Power, has announced that the Government intends for good or ill to carry out its "mandate," which mandate of course includes bringing electricity supply under public ownership.

It seems peculiar that whilst the fate of the industry is in the balance discussion of the probable form of public ownership should have died down almost completely. This may be because there may appear to be little point in discussing the matter until concrete proposals are placed before the industry, or again, that the matter is regarded as *sub judice* and therefore that it is not proper to have any sort of discussion. I contend that both these views are based on false premises and that the electrical industry should employ the present time in discussing its possible fate.

Our legislators, having consulted the country and having received what they regard as a clear mandate, will not be in a mood to spend time discussing prospective legislation with the industry once they have given even preliminary shape to a Bill.

What Will the Benefits Be?

It is significant that so far no Government spokesman has given a name to the benefits which could be secured by nationalisation, probably because it could be demonstrated that all the benefits could be secured by less drastic means. In the past, that is, up to the outbreak of war, the electricity industry produced very complete statistics of all its operations and these were made freely available, with the result that the facts and figures of this industry became the plaything of the political economists. To this extent we can be grateful that the publication of major statistics was for a time prohibited, but this is greatly outweighed by the disadvantage that if they had been available it could certainly be proved from within the industry that any charges of inefficiency or lack of progress were completely unfounded. The aggregated figures for the industry which have already been published, show that the average price of electricity has actually been reduced during the war years and in view of the enormous rise in the price of coal and the very substantial rise in wages, this decrease is surely a most creditable achievement.

One of the principal criticisms of municipal undertakings concerns payments made in relief of rates. Were the industry to be taken over nationally these payments would presumably cease but in all probability even larger sums would be extracted by the Exchequer, as from the Road Fund and Post Office.

The need to secure unified tariffs is urged as a reason for nationalisation. With unified tariffs increases or decreases in the price of electricity would be made simultaneously throughout the country and it would be possible to make increases in the price of electricity for purposes other than a need to ensure solvency. For example, if the Chancellor of the Exchequer needed to secure an extra £10,000,000 or so he could do this by a slight increase in the cost of electricity, as was done in the matter of postage rates.

Some employees of the electricity supply industry have announced that they support nationalisation. Did they first consider the scales of remuneration which apply in the Post Office, which is the nearest model one can choose? So far as the technical grades are concerned it would appear that the Post Office scales for comparative qualifications are only about two-thirds of those paid in the electricity industry.

An Objective Report

After having carefully reviewed the many reports concerning the future of the electricity supply industry, I am most favourably impressed by the P.E.P. "Report on the Supply of Electricity in Great Britain, being a Survey of Present-day Problems in the Industry with Proposals for Reorganisation of Electricity Distribution," published in 1936. This report seems to be thoroughly objective in character, which is more than can be claimed for most of the others, and it does not make any sweeping proposals for mass integration of electricity distribution. Indeed, it goes so far as to appreciate a point which is clear to the management of most moderate-sized undertakings but one which is completely ignored in many of the reports, *i.e.*, that size in itself is not a guarantee of efficiency.

Views on the News

Reflections on Current Topics

ABOUT 70,000 people are said to be clamouring for telephones in London alone and I suppose that quite an equal number of applications are awaiting attention elsewhere in the country. The Post Office tells me that it still has 15,000 men in the Forces and apparently most of them will have to take their turn in the demobilisation queue. In the meantime numbers of these men, in the Royal Corps of Signals, are being "lent" to the Post Office by the War Office and are helping to improve the situation. The ordinary citizen will be lucky if he "gets on the 'phone" for many months for a system of "priorities," mainly concerned with the restoration of the country's vital industries and services, is being operated. I am assured that the hard-pressed P.O. Engineering Department is doing its best.

* * *

When referring to price control of domestic electrical appliances last week I might have mentioned that B.E.A.M.A. has recently been negotiating with the Central Price Regulation Committee for permission to increase its pre-war prices above the 50 per cent. already approved and that this permission has been withheld. With an increase in some cases of 300–400 per cent. in the cost of raw materials and with the limited production so far possible some B.E.A.M.A. members are finding themselves unable to market certain products at the agreed prices. In such cases the Association has come to the conclusion that, in view of the attitude of the Central Price Regulation Committee, it must be left to manufacturers to take such individual action as they feel desirable in the circumstances.

* * *

Apparently manufacturers of domestic electrical appliances in the United States are finding that reconversion to peacetime production has its difficulties. As in tnis country they too are faced with a shortage of labour, as well as of certain materials. So far as I can gather their programmes are about two months behind schedule and there is little likelihood of any of the larger appliances at any rate, such as vacuum cleaners, refrigerators and washing machines, being available in any appreciable numbers before well into next year. In this country vacuum cleaners are beginning to come on to the market in limited quantities and there may be a few washing machines available before long. With regard to refrigerators, however, the immediate future is far from hopeful. The requirements of our Forces in the Far East are still occupying practically the whole of our refrigerator manufacturing capacity and only two firms, I believe, are in a position to utilise even a small portion of their production facilities for making domestic units for the home market. Furthermore all these refrigerators are earmarked for the Government's emergency housing programme. I gather that it is likely to be the beginning of 1947 before units available for the general public will be on the market, so Mr. Dalton will not lose much by remitting the purchase tax on refrigerators.

* * *

Difficulties experienced by the electricity supply industry on account of its inability to obtain staff have frequently been mentioned in the *Electrical Review*. Shortage of housing is possibly a potent cause of this. A man who has a house nowadays thinks hard before abandoning it even if a move means considerable advancement. The solution of the problem has been found by a small electricity supply undertaking. In a recent issue this concern advertised for an engineer and immediately received over three hundred replies. No salary was mentioned but that apparently didn't matter. What counted was the magic phrase at the end of the advertisement:—"House provided."

* * *

"Council Says Put Power Stations Underground" according to the *Evening Chronicle* (Manchester). In point of fact the Council (Urmston) did not say this; it requested the Stretford and District Electricity Board to place its future substations underground or semi-submerge them so that flowering shrubs could be planted round to hide them. Underground substations are no new thing (nor are subterranean power stations if it comes to that) but many examples which have been illustrated in the *Electrical Review* prove that it is possible to adapt substations to their surroundings very successfully at far less cost than putting them below the surface. If Urmston wants cheap electricity it should not suggest expensive distribution methods.

* * *

Mr. W. C. Bexon, the engineer and general manager of the Ayrshire Electricity Board, sends me a cutting of an advertisement in a local paper. In this a gas cooker is offered for sale or exchange with an electric cooker. This is certainly a sign of the times—another indication of the growing Scottish preference for the electrical method.—**REFLECTOR.**

Industrial Motor Protection

Some Economic Aspects

By J. P. S. Pillans, M.I.E.E.

A NEW type of relay for the protection of induction motors recently described in the *Electrical Review** appears to provide the first entirely satisfactory solution of a problem which hitherto has seemed insoluble—namely the design of a reasonably compact device that affords protection against every description of potential breakdown, other than those due to internal fault. There is, however, an aspect not less important than the purely technical, namely the economic.

There is not necessarily any relationship between the technical and economic solutions of a problem, and any balance between the two seems invariably to be of an unstable character, easily altered by factors such as a change in the cost of fuel or even fashion or prejudice. The multiplicity of electricity tariffs shows this clearly, if viewed as departures from a common standard.

Cost Compared with Duplication

If the additional cost of complete protection equals the first cost of the motor, regardless of size, it is clear that every motor could with advantage be duplicated in lieu of being protected, because the relay or other device cannot of itself prevent the breakdown of the motor except in so far as it can control the external conditions that lead up to it, *e.g.* overloading or single-phasing. Internal breakdowns due to earth fault, phase fault, or short circuit cannot be eliminated by protection and here the spare motor is obviously the better choice. The cost of complete protection in relation to the cost of small motors, which form the great bulk of industrial installations, being too high to warrant its adoption, leaves only medium and large machines to be considered.

If, as seems probable, relays, rocker arms and similar fragile items are necessary for complete protection, these cannot be incorporated with the starter, as hitherto has been accepted practice, because the starter is often installed where dust, humidity and vibration would quickly ruin delicate apparatus. Consequently the protective devices would have to be mounted separately from the starter in the equivalent of a power station control room and, except in the case of power stations or large substations, the control room would have to be provided as part of the cost of the protection.

Where the installation comprises only a few medium-sized motors, the cost of housing the relays and providing skilled maintenance may outweigh the cost of spare motors. The same applies in most cases to larger installations, in which the probability of several motors of similar size being installed is increased. Complete protection for medium-sized motors would, therefore, seldom be justified.

Large Motors

Large motors are generally wound for high voltage, and present a better case for complete protection. The first cost of the motor will be many times as large as the additional cost of full protection. Except in very large installations with numerous high-voltage motors of similar size, the cost of all-round spare motors would be greater than the total cost of the protection. The use of high voltage presupposes the existence of a substation or power station in which the relay protective devices could be housed. Skilled labour and higher-grade technical supervision are more likely to be available for maintenance and adjustment of the relays which might be mounted on the circuit-breaker panels controlling the motors.

Factors adverse to relay protection of high-voltage motors are comparatively few. Among them would be the necessity for fine-wire interconnections between relays and starters, with consequent liability to failure. The interconnectors might be eliminated by associating the relays with the circuit-breakers instead of with the starters. This, however, would involve reclosing the circuit-breaker before restarting the motor should the low-voltage release or overload elements come into operation. Remote operation of the circuit-breaker would overcome this objection, but would itself necessitate certain fine-wire interconnections and would increase very substantially the cost of full protection.

High-voltage motors, often of considerable

* "Induction Motor Protection," by D. E. Bird and L. B. S. Golds, *Electrical Review*, July 13th, 1945.

size, installed in power stations for driving auxiliary plant such as feed and circulating pumps, are normally controlled from auxiliary switchboards and are not usually subject to the limitations mentioned. Furthermore, in power stations the feeder circuit-breakers, transformers and alternators are likely to be associated with relay protection. Consequently, all necessary skilled supervision will be available, irrespective of whether relays are provided for the auxiliary motors or otherwise. Clearly then these are ideal circumstances for the relay protection of motors.

The economic application of complete protection is largely a matter of relative not actual cost. Hence the suitability of power stations where the relative cost of applying or not applying full protection to large motors is a small matter in comparison with the value of the plant.

Industrial undertakings are in a different category. Generally speaking the relative cost, including housing and maintenance, would be far from small, and cases where full protection would be justified economically are few. In these cases only the large motors could be so equipped, and then only in favourable circumstances. It is not suggested, of course, that ordinary overload and low-voltage protection as now standardised is uneconomic for any industrial motor, and the reason lies in the negligibly small relative cost. Hence the first costs of relay protection, with housing and maintenance, must not greatly exceed the present cost of ordinary protection if general application is to become practicable.

Supply in Portugal

Drought Affects Hydro-Electric Output

FROM the latest annual report (for 1943) on electric power supply in Portugal it is learned that the work of the former Portuguese National Board of Electrification has been taken over by the General Direction of Electrical Services, which forms a section of the Ministry of Economics. The report shows that the year was one of great difficulty for all sections of the power industry; hydro-electric stations suffered from a severe drought, especially in the northern part of the country, while thermal plants had great difficulty in carrying on through shortage of coal and oil and many substitute vegetable fuels had to be brought into use for steam-raising.

Nevertheless, following the 3 per cent. fall in the country's output of power recorded in 1942, there was a slight increase during the year under review (477·2 million kWh compared with 465·2 million kWh in 1942). Hydro-electric output decreased from 217 million to 204·8 million kWh while the production of thermal stations advanced from 248 million to 272·4 million kWh. Of the last mentioned total 32·2 per cent. was produced from national coal, 49·2 per cent. from imported coal, 14·7 per cent. from vegetable fuels and 3·9 per cent. from imported liquid fuels.

The number of power stations in the country both hydro-electric and thermal, at the end of 1943 was 674 and their aggregate capacity 296,897 kW, these figures comparing with 657 and 282,574 kW the year before.

The most important new development was the completion and starting up of the Santa Luiza hydro-electric power station by the Companhia Electrica das Beiras. The initial plant comprises two 8,000-HP Pelton turbines coupled to 8,000-kVA, 6,000-V, three-phase alternators. A feature of the year was the great extension given to the interlinking of generating plants in order to maintain supplies to consumers in areas where drought and war difficulties were being experienced. The report shows that eleven electricity undertakings are now linked up in this way. A number of municipalities have now stopped operations at their own relatively small generating stations and have linked up with the country's high-voltage system which is steadily being developed.

The consumption of power throughout Portugal during 1943 amounted to 397·4 million kWh, an increase of 9·6 million kWh over the preceding year. A table shows that 19·3 per cent. was used for lighting, 15·9 per cent. for traction, 58·2 per cent. for industrial and agricultural purposes (in which class the textile industry taking 68·3 million kWh was the largest consumer) and 6·6 per cent. by the electro-metallurgical and chemical industries.

Tuning Forks

A PAPER prepared by Mr. H. Shorland (Muirhead & Co., Ltd.) for the London Students' Section of the Institution of Electrical Engineers deals with tuning forks. The author first outlines principles of operation and the calculation of dimensions and frequency. He mentions contact-driven types, but deals mainly with valve-maintained forks and the factors which influence their stability in service. Apart from their employment as the source of standard audio-frequencies for use in connection with accurate "bridge" measurements, tuning forks are utilised in facsimile picture telegraphy and and for synchronising long-distance telegraph circuits.

Iron and Steel Manufacture

Recent Electrical Progress

By L. Sanderson

AMONG the latest developments in the iron and steel industry is the use of electric precipitation for cleaning blast furnace gas. At a plant in the United States with blowing rates of 75,000 cu. ft. per min. on each of two furnaces and inlet gas at the precipitator containing 0·15 grains per cu. ft., the precipitator efficiency is 96 per cent. with 0·006 grains per cu. ft. in the outlet gas with all three units working and 88 per cent. and 0·018 grains with two units in use. A negatively charged electrode hangs down the centre of each of the 168 tubes (15 ft. long by 12 in. diameter) in each unit. The voltage across the 6-in. air gap is 75,000. A continuous flow of water carries the dust down the inner walls.

Temperatures in foundries are being measured by barrier-layer photo-electric cells. Research into the limitations of these cells has resulted in a basis for the design and calibration of pyrometers embodying them being laid down by Land, while Hall has done further work mainly in connection with " drift effect."

Supersonic Crack Detection

A marked advance in the application of supersonics to the testing of steel plates for the presence of cracks is represented by new apparatus in which the quartz oscillator of a transmitter is connected to a high-frequency-current generator. The quartz is cemented to a metal block which transmits its mechanical oscillations through water to the plate being tested. A supersonic receiver on the opposite side of the plate is connected to an amplifier. The waves from the transmitter on meeting an air cavity are reflected, without response in the receiver. By moving the apparatus across the plate, the location of cracks may be detected.

Electric furnaces for making high-duty cast iron employ two main processes. In one, molten metal is produced either from a cold charge or, more usually, by mixing a proportion of special electric furnace metal with cupola metal of requisite composition. The rocking arc furnace is mainly used, two units being usually employed in order to ensure a continuous supply; if a single electric furnace is used, the metal can be stored in a crucible furnace. The second method is the continuous duplexing of molten cupola metal which, as close as possible in composition to the final requirement, is melted in a cupola and transferred at ten-minute intervals to a " Lectro-melt " furnace in which a 7 cwt. cold charge has already been melted. Alloy or steel additions are made when required, and the metal is tapped, generally at ten-minute intervals, for casting. The rocking arc furnace is also being widely used for non-ferrous metals and iron and steel castings, especially for turning out small heats of steel at convenient times. Some automobile manufacturing firms are employing this furnace for the production of up to 1-ton heats of special steels.

Testing Casting Walls

A means of testing the walls of small complex castings in which it is difficult to make four suitable contacts in confined spaces has recently been developed. In this, the galvanometer contacts are not close to the current contacts. For example, in a petrol engine cylinder block, the connections to the DC battery are made at each end of the block, and the potential measuring contacts at the points to be tested. Potential readings are first taken on a casting known to be sound, the contacts being located by templates. These templates are used on all the duplicate castings for test, and differences in the readings from those at the same points on the master casting prove a variation in thickness or the presence of a flaw.

A spectographic method of analysis of stainless steels has been introduced for accurate quantitative analysis. A DC arc and a specially shaped carbon electrode enable the chromium and nickel to be determined with an accuracy of 2 per cent.

Blooming mills are being equipped with amplidyne control, allowing the use of relays carrying a fraction of an ampere instead of contactors carrying hundreds of amperes. For arc-furnace control, an amplidyne generator supplies power directly to each electrode motor giving accurate, swift and smooth electrode control.

A new continuously operated tinning plant in America introduces a halogen electrolyte, operating at 150 deg. F., with a pH value of approximately 2·7. Deposition of tin on continuously moving strip 32 in. wide at a coating weight of 0·5 lb. per base box calls for a current density of 206 A per sq. ft., with the line travelling at 1,000 ft. per min. For coatings of 0·75 and 1·0 lb. per base box, the current densities are 309 and 412 A per sq. ft.

Electrostatic "detearing" is an innovation in the flowing, stoving and drying of synthetic-resin coatings on metals, in which blobs have to be removed from drain-off points. The part after dipping, travels on a conveyor over a draining board, and is allowed to set until ,the entire flow of the coating has virtually ceased. It is then earthed and carried over an insulated grid charged at a high voltage, which attracts surplus coating material. The process has proved extremely successful in finishing coatings of phenol-formaldehyde varnish on steel cartridge cases.

Resistance Strain Gauge

The wire-wound electrical resistance strain gauge now comprises a wire coil approximately 0·001 in. in diameter, wound on a flat former, and bonded under heat and pressure between layers of resin-impregnated insulating paper, the total thickness of the assembly being only about 0·005 in. thick. When this gauge is cemented on to the surface of a stressed material with a suitable adhesive, it registers minute changes of strain, both in tension and compression, by corresponding changes in the electrical resistance of the wire. This type of gauge is being applied, for instance, by the Research Department of Lloyd's Register of Shipping for determining stresses in fireboxes and boiler drums. Three types of circuit are used. One is for static measurements. A second is for dynamic strains that vary at up to 200 cycles per sec., and a third for strains from 200 up to several thousand cycles per second.

In the flame-hardening of steel rings on the surface, a machine is being used which has an electrically-driven turntable with jigs to hold the ring in position, a push-button starting switch, automatic limit switches to stop the rotation where desired, and brackets to hold the burner and quenching heads. Low-carbon irons for electrical relays are now being heat-treated in electric furnaces with automatic control and two ammonia crackers to provide the neutral atmosphere.

A new electric dilatometer combines accuracy with reasonable sensitivity and direct reading on a chart. It has three ranges of expansion and contraction sensitivity. The test piece is heated by an electric furnace, and the expansion is transmitted by a quartz rod to a sliding contact held in a bracket of invar alloy. When contact is made, a solenoid puts one of the gear trains in operation in the recording unit, and simultaneously starts a Selsyn motor, causing a threaded contact to screw out and break the circuit. This in turn stops the solenoid from functioning and also the recording mechanism.

In one of the most modern steel mills electrical machinery is remotely controlled by relays from one central point, motor rooms being left locked and unattended except for maintenance personnel. Radio-frequency heating is being carried out by means of a motor coupled to a high-speed 12,000-cycle alternator, a spark gap oscillator to produce frequencies of 50,000 to 200,000 cycles per sec. and a thermionic valve oscillator capable of producing single-phase current of between 10^5 and 10^8 cycles per sec. Induction heating is used to carry out three operations at the same time on Diesel engine shafts, namely, to harden a bearing surface and a thrust face and to braze a collar on the shaft.

Improvement of Spot Welds

Conditions met with in welding are believed to be suitable for the application of ultrasonics as a means of refining the grain and improving the properties of the weld metal. The volume of molten and solidifying metal exposed to the vibrations at any one time would be small. As the parts to be united are solids, they provide suitable means of conducting these vibrations to the molten and solidifying weld metal. By passing a beam of supersonic vibrations into the region of the spot weld during and after its formation, the cast structure of the weld nugget or "slug" would be effectively broken up and the mechanical properties of the spot weld materially improved.

The low-shaft electric furnace is being used in Sweden to reduce iron ores because it requires only a small quantity of carbon, and Sweden has no coking coals. A typical furnace has three electrodes and three charging shafts. Owing to the low temperature of the flue gas, arch maintenance costs are low.

PARLIAMENTARY NEWS

By our Special Reporter

"Class B" Releases

ON October 30th, Sir Ian Fraser asked the Minister of Labour if he would extend "Class B" releases, to include draughtsmen and other specialists, who were essential to the development of peacetime production in the electrical accessory industry, in order to encourage export trade and provide necessary equipment for house-building.

Mr. Isaacs said that arrangements had already been made for the release in "Class B" of a number of draughtsmen and other skilled men to assist in the provision of electrical accessories.

Scottish Hydro-Electric Schemes

Sir Basil Neven-Spence asked the Secretary of State for Scotland, if he would give a list of schemes prepared, or in course of preparation, by the North of Scotland Hydro-Electric Board; and to what extent the provision of electricity supplies in the remoter parts of the Highlands and Islands, would be jeopardised if the Tummel-Garry scheme were abandoned.

Mr. Buchanan said the following schemes had been prepared or were in course of preparation by the North of Scotland Hydro-Electric Board:—Constructional Schemes—Sloy, Morar and Lochalsh; Tummel-Garry and Gairloch; Fannich; Cowal; Shira; Skye; Findhorn-Duntelchaig; Affric; transmission from Shira and Sloy to Central Scotland; transmission from Tummel-Garry to Southern Perthshire; transmission from Fannich to Inverness, Keith and Aberdeen; and staff housing for Sloy.

Surveys were now being made for schemes to supply Orkney, Shetland, Kintyre, Caithness, Ullapool and Lochinver. Where, as in the case of Orkney and Shetland water-power resources were small, it was proposed to supply distribution schemes if necessary from oil engines.

The following distribution schemes had been prepared:—Orkney, Shetland, Morar, Lochalsh, North Cowal, South Cowal, Bute, Great Cumbrae, Gairloch, Ullapool, Lochinver, Skye, the Outer Hebrides, Islay, Mull, Luing and Seil, and Arran. If the Tummel-Garry Scheme were abandoned, provision of electricity supplies to nearly one-third of these schemes would immediately be jeopardised and the supply to all of them would be seriously retarded.

Tummel-Garry Costs

Major Ramsay asked the Secretary of State for Scotland whether he could give the details of the expenditure on the Tummel-Garry scheme.

Mr. Buchanan said that the estimated cost of the mechanical and electrical work for the project was £1,172,000 and of the civil engineering works, including the power stations, £5,006,000.

Supply in the North-East

On October 31st, Mr. Grey asked the Minister of Fuel and Power what arrangements the North Eastern Electric Supply Co., in conjunction with the Central Electricity Board, was making for the provision of additional generating plant; and whether these arrangements would be sufficient to meet the needs of the Durham area.

Mr. Shinwell said that arrangements were being made for the extension of the Dunston power station by the installation of two 50,000-kW turbo-alternators with boilers and auxiliary plant. Arrangements were also under discussion for the extension of the North Tees power station by the installation of two 60,000-kW turbo-alternators with boilers and auxiliary plant. When these arrangements had been completed, additional capacity for the generation of electricity would have been provided comparable with what would have been provided at the proposed Kepier station and there should therefore be sufficient capacity to meet the needs of the North Eastern area for the next few years. Requirements of that area for electricity supplies would be most carefully watched and if, as was anticipated, the demands for electricity should continue to grow, arrangements would be made for the further provision of generating plant.

Radio Transmitters

On November 1st, Flight-Lieutenant Beswick asked the Assistant Postmaster-General if he was now able to return the radio transmitters taken from amateur operators at the beginning of the war for security reasons.

Mr. Collins asked the Assistant Postmaster-General when he proposed to issue licences for amateur radio transmission; and when, and under what conditions, he proposed to return transmission sets and instruments to the 60 000 owners who surrendered them in 1939.

Mr. Burke said that it was intended to begin returning amateur wireless transmitting equipment in about a fortnight's time; this would, however, involve a considerable amount of work and might take some weeks. The military authorities hoped to be able to release within the next two or three weeks a limited number of frequencies for amateur working; the conditions under which these sets might be operated was under consideration and licences would be issued as soon as possible after frequencies had been released.

Census of Production.

The President of the Board of Trade stated last week that it was hoped that a full Census of Production would be taken for 1947. Among the industries which would be covered was electrical engineering.

PERSONAL and SOCIAL

News of Men and Women of the Industry

RECENT changes in organisation at the British Thomson-Houston Co., Ltd., include the following. In addition to appointments already held, **Mr. H. Jack** becomes chief electrical engineer; **Mr. A. A. Pollock,** chief mechanical engineer; **Mr. G. S. C. Lucas,** O.B.E., assistant chief electrical engineer; and **Mr. K. R. Hopkirk,** assistant chief mechanical engineer. These

Mr. H. Jack

Mr. A. A. Pollock

arrangements do not affect the Turbine Engineering Department, of which Mr. R. H. Collingham remains chief engineer.

Dr. J. M. Meek has been appointed to the David Jardine Chair of Electrical Engineering (Electronics) University of Liverpool. After an apprenticeship at the Metropolitan-Vickers works, he held research positions in industry and was the author, jointly with Professor Loeb, of "The Mechanism of the Electric Spark." He has worked on the problems of radiolocation, and recently organised the teaching in the Metropolitan-Vickers research training scheme as well as lecturing in the University of Manchester. Dr. Meek is a member of the I.E.E. Council.

Mr. J. S. Parkinson, formerly deputy electrical engineer and manager St. Helens, and since October 1st, electrical engineer and manager, Leigh, has been presented by the members of the St. Helens Gas & Electricity Recreation Club with a rose bowl as a parting gift. Mr. Parkinson had been associated with the club for eight years.

Capt. A. J. Wyndham Roberts, who has been serving overseas in the R.A.S.C., has now been released from the Forces and has resumed his duties as representative of Santon, Ltd., in the London area.

Mr. William Price, originally meter superintendent and later electrical, meter and testing engineer of the Bombay Electric Supply & Tramways Co., Ltd., has now retired and has returned to England after 23½ years with the company. A silver salver was presented to him by his colleagues at a farewell lunch.

Mr. R. Stuart Pilcher, Municipal Passenger Transport Association, has been elected chairman of the National Standing Joint Committee on Road Transport Education, which was set up earlier in the year by the conference representative of the road transport industry when it approved the new scheme of road transport examinations which are to be conducted by the Royal Society of Arts. Inquiries regarding the examinations should be addressed to the Examination Officer, Royal Society of Arts, John Adam Street, London, W.C.2.

Mr. G. S. C. Lucas

Colonel G. G. Ewer, D.S.O., T.D., M.I.E.E., who was until recently Deputy Director-General Technical Services, Union of South Africa Defence Force, is now Director, Central Organisation of Technical Training, South Africa. Before the war Col. Ewer was city electrical engineer and passenger transport manager of Pietermaritzburg, Natal.

Colonel S. J. Emerson, M.Eng., A.M.I.E.E., H.M. Electrical Inspector, Manchester Area, who joined the Forces in 1939, has now returned to the Electrical Branch of the Factory Department, after service with the Royal Engineers in France, India and Burma. He has taken over the post of H.M. Electrical Inspector for the South-Eastern Area with headquarters in London.

Lieut.-Col. C. W. Pass, B.Sc., A.M.I.E.E., of the Royal Corps of Electrical & Mechanical Engineers, has been awarded the M.B.E. for distinguished services in North-West Europe. Lieut.-Col. Pass was mentioned in dispatches in January this year.

Mr. G. S. Rhoden, a teacher at Blackpool Technical College, has been appointed master-in-charge of the day continuation school of British Insulated Callender's Cables, Ltd., at Prescot.

At the opening meeting of the session of Paisley Association of Electrical Engineers **Mr. Daniel Ross,** burgh electrical engineer, delivered his presidential address on "Planning the All-Electric Kitchen."

Mr. J. B. Harris, A.M.I.E.E., F.I.E.S., has recently left the staff of the Director of Electrical Engineering, Admiralty, where he was engaged in a section dealing with special lighting problems. Mr. Harris was chairman of the Bath-Bristol Centre of the Illuminating Engineering

Society, 1943-44. Before the war he was lighting engineer with Harcourts, Ltd., and also a visiting teacher in illuminating engineering to the South-East London Technical Institute. He has now been appointed joint managing director of Philectric Installations, Ltd.

Mr. R. W. L. Harris, B.Sc., M.Inst.C.E., M.I.Mech.E., M.I.E.E., the newly appointed registrar and secretary of the Professional Engineers' Appointments Bureau, was educated at the Royal Grammar School, Newcastle-upon-Tyne, and Armstrong College (now King's College), University of Durham. He served his apprenticeship with A. Reyrolle & Co., Ltd., and was subsequently on their staff for ten years, becoming personal technical assistant to the technical director and sales manager, the late Mr. H. W. Clothier. In 1940 he joined the staff of Kenneay & Donkin as a senior engineer, and was engaged on work for the Central Electricity Board and the Government of Northern Ireland, as well as other clients, resigning this position to take up the registrar's post in September.

Mr. R. W. L. Harris

Mr. E. G. Hooper has retired from the position of chief assistant engineer with the Southampton Corporation Electricity Department. In presenting him with a cheque from the employees of the Department, Mr. W. G. Turner, the borough electrical engineer, mentioned that Mr. Hooper joined the undertaking as a pupil in 1904.

Dundee Sub-Centre has elected **Mr. S. J. Smith** as its chairman for the session. Mr. Smith was born in Edinburgh, forty-seven years ago. He was educated at George Watson's College in his native city and at the age of seventeen entered the Post Office Engineering Department. He became an inspector in 1924 and was subsequently chief inspector and assistant engineer until promoted to his present position of area engineer (Dundee Telephone Area) in 1938.

Mr. Gordon Heynes has been appointed secretary of the Institute of Distribution, the offices of which are now at 40, Pall Mall, London, S.W.1.

Lieut.-Commander H. N. Russell, D.S.C., R.N.R., recently left the Navy to rejoin the Service Electric Co., Ltd., of which he is a director. Commander Russell served as a midshipman in the 1914-18 war and was subsequently in the Merchant Navy for ten years; he is a master mariner. During the second world war he had varied experience, including the command of corvettes, a minesweeper and an anti-E-boat frigate.

Lt.-Cdr. H. N. Russell

Commander Russell's father, Mr. C. N. Russell, was chief engineer to the Vestry of St. Leonard's (now the Borough of Shoreditch). He was responsible for one of the earliest conduit wiring systems, the main feature of which was a special circular joint box. The system was described in the *Electrical Review* of June 7th, 1895.

Mr. Sidney Player, chairman of the Newall group of companies, has joined the board of E. H. Jones (Machine Tools), Ltd., and **Mr. E. H. Jones** has joined the Newall board. **Mr. C. E. Rockwell** has resigned his position as director and general manager and has been succeeded by **Mr. E. J. M. Jones,** son of Mr. E. H. Jones. **Mr. E. S. Hammett,** chief designer

Engineers with the chairman of A. Reyrolle & Co., Ltd. (Mr. G. Wansbrough) and members of the company's staff at a demonstration of 132-kV air-blast switchgear last week. (*See article on page 653.*)

of E. H. Jones, has transferred to the Motor Gear & Engineering Co., Ltd., and has been succeeded by **Mr. Brice**, assisted by **Mr. Wilson.**

Ilford Corporation has presented a gold wrist watch to **Mr. Norman Elliott,** formerly deputy borough electrical engineer, for his voluntary services during the war. Mr. Elliott went to Gravesend as borough electrical engineer in 1939 and in 1944 was appointed to a similar position at Wimbledon, but before taking up his duties there he joined the Royal Engineers with the rank of lieutenant-colonel to carry out important work in France, being later promoted colonel and appointed Deputy Director of Works, 21st Army Group.

After fifty-three years' continuous service with the General Electric Co., Ltd., **Mr. H. G. Nicholls** retired on October 31st. He joined the company in 1892 and after some years in the Electrical Accessories Department was transferred in 1902 to the newly formed Export Department where he spent the next fourteen years. He then went to the Government & Railways Department, in which he attained the position he held on his retirement, namely assistant manager.

On October 31st a small party was held at the Waldorf Hotel to mark Mr. Nicholls's retirement. Apart from members of the G.E.C. staff those present included Major-General A. W. Sproull (Ministry of Supply), Capt. T. S. Babb (Air Ministry), Mr. A. G. Ramsey (Ministry of Works), and Mr. P. Dale-Bussell (late of the Admiralty). Mr. Giggins, manager of the G. & R. Department, briefly outlined Mr. Nicholls's career with the company, and Mr. R. E. Cox, of the same department, presented Mr. Nicholls with a cheque from his G.E.C. friends.

Dr. H. E. M. Barlow has been appointed Professor of Electrical Engineering in London University.

Mr. Maurice Gorham has been appointed to take charge of the B.B.C.'s television service. He has served in various capacities with the Corporation since 1926. It has been decided that in addition to the Alexandra Palace transmitter there will be six stations in the provinces all sending out the same programme. It is estimated that the service will then be available to 75 per cent. of the population.

Mr. Noel Ker Lindsay has been appointed the first director of the British Non-Ferrous Metals Federation. He will take up his appointment on December 1st.

Mr. William Child, formerly sales manager of Westool, Ltd., has resigned, and is joining S. D. MacKellen, Ltd.

Appointments Vacant.—In this issue the City of Bath advertises for a city electrical engineer (£1,553) and the County Borough of Barnsley for a borough electrical engineer and manager (£1,157). Hull Corporation wants a power station superintendent (£724) and Harrogate advertises a similar position (£583).

Obituary

Mr. F. W. Marshall.—We regret to report the death of Mr. Francis Watson Marshall, a director of W. J. Furse & Co. (London), Ltd., at the age of sixty-seven after fifty years in electrical contracting. He joined the late Mr. V. G. Middleton in 1892 and was intimately connected with early developments in the electrical industry. Mr. Marshall was responsible for the introduction of electricity into many large country houses including Compton Winyates, the seat of the Marquis of Northampton, and many well-known London churches. In 1919 he became managing director. Mr. Marshall represented his company in the Electrical Contractors Association, had been chairman of the London Sectional Board and was on the Council at the time of his death

Mr. H. Hargreaves.—We record with regret the death, on October 29th, of Mr. Harman Hargreaves, deputy chairman of Hick, Hargreaves & Co., Ltd. The funeral took place at Bolton last Saturday and a memorial service was held on Wednesday at St. James's, Piccadilly, W.1.

Annual Reports

Walsall

THE Walsall undertaking, of which Mr. E. A. Newburn is engineer and manager, will reach its jubilee on December 14th next. During the past year a further increase in sales is recorded, the total (excluding supplies to other undertakings) being 81·6 million kWh, as compared with 77·7 million kWh in the previous year. Power and bulk supplies were lower, but there was a substantial increase in sales under the lighting heating and cooking (combined) tariff—from 27·0 million to 31·4 million kWh. Total income was £381,630 (£352,116) and working expenses were £311,341 (£284,342), there being a net profit of £15,054 (£11,570), of which £4,672 (£5,124) has been appropriated for rate relief and £2,391 (£2,467) for capital expenditure. Per kWh sold the average income was 0·941d.; this compares with 0·869d. in the previous year and 1·02d. in 1938–39.

Bridlington

During the war the Bridlington Electricity Department suffered the loss of its new offices and showrooms, which were totally destroyed by enemy action in February, 1941. The Department, of which Mr. W. M. Brown is commercial manager, is now operating from its original premises at Brett Street. The accounts for 1944–45 show a gross revenue of £51,964 against £47,121), working costs being £39,714 (£31,767) and there was a net profit of £1,513 (£8,778). Sales (excluding supplies to company undertakings) amounted to 5·2 million kWh (against 4·7 million).

CORRESPONDENCE

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

Rural Overhead Lines

I WAS interested to read that Mr. A. Kelso (Harrogate Corporation) in his inaugural address as chairman of the North Midland Centre of the Institution of Electrical Engineers recommended the fitting of automatic reclosing switchgear on overhead rural transmission lines.

In one undertaking with which I was associated where there were some hundreds of miles of rural transmission lines being put into commission, the outages during a year presented a very serious problem. An analysis of the faults over a period showed that the majority were of a transient type. The installation of automatic reclosing switchgear on all important lines proved most satisfactory, the number of prolonged interruptions being reduced to a very small percentage of the total outages. The various automatic switches were regularly inspected and it was interesting to note the number of times one or two reclosures had been recorded without any complaint or notice of the interruptions to supply.

With the extensive rural development which is anticipated during the next few years one of the most essential points will be reliability of supply. The fitting of automatic reclosing switches on all lines supplying a number of small transforming points is, in my opinion, fully justified, as apart from the saving in man-hours and the loss of revenue to the undertaking, considerable unnecessary inconvenience to farmers and other consumers can be avoided.

Brentwood, Essex. H. T. TIMBERLAKE, A.M.I.E.E., *Engineer and Manager*, Brentwood District Electric Co., Ltd.

Calling-up of Skilled Men

WHILE I was very interested to read Mr. Thomas's letter in your issue of October 26th it is poor consolation to know that all employers of labour engaged in the electrical repair industry are in the same plight. My own experience must be typical of many. I am at my wits' end filling in forms, visiting employment exchanges, writing to Government Departments and appearing before appeal boards, trying to secure the deferment of young men of military age employed on armature winding. I have tried unsuccessfully to obtain my own son's release as he would be invaluable to me, having served an electrical apprenticeship before joining the Merchant Navy 4½ years ago.

I am convinced that the Man Power Board does not know what an armature winder or an electrical fitter is. Everywhere one turns for electrical goods such as new motors, control gear or repairs to such, the answer is the same, regardless of priority, delivery is indefinite, all through labour shortage, yet even more men are being taken from the industry. How can this country hope to recover its export or home trade under such conditions?

"WAR WEARY."

Small-Motor Protection

A CONSIDERABLE amount of prominence has been given lately in the press and at meetings of many electrical societies to the protection of small motors. It would appear from a general survey that overload protection is considered advisable.

I am of the opinion that overload protection is a dangerous and unnecessary adjunct. What is actually required is a reliable no-volt release, especially in those cases where the motors are driving sausage machinery and bacon slicers and similar apparatus.

*London, W.*14. NORMAN E. CLOGG.

Registration of Contractors

TO reinforce the arguments for the compulsory registration of contractors, I may quote the case of an installation carried out by a registered contractor. This included the following breaches of regulations:—

A number of switches were in the neutral wire, causing tenants to receive shocks from radiators, etc.; two and three 15-A switch-sockets were connected to 15-A fuseways and 30-A switch-fuses were controlling four 3-kW radiators; no locking nuts were fitted where running couplings had been used and there were other minor faults.

While there is something to be said for busy contractors whose employees let them down by concealing faults, there is no excuse for openly violating the rules and leaving faults that are plainly visible. Many supply authorities make little or no attempt to even

casually examine installations and so long as the supply fuses do not blow all is obviously taken for granted. Very many contractors do not possess test instruments and some of them would actually not know how to use such things.

Having had occasion to examine several cinema installations I have found some appalling electrical work which had the appearance of having been carried out by a few irresponsible apprentices and this notwithstanding that special inspectors are supposed to examine such places.

The Regulations for the Electrical Equipment of Buildings are more often broken than obeyed and so long as no machinery exists for satisfactorily dealing with this matter electrical accidents cannot be averted. I make no excuse for criticising the system of voluntary registration and once again repeat that until compulsory registration and rules are instituted we cannot look for a higher status of contracting or proper public protection.

Glasgow. ALEX. MILNE.

IN his letter in your issue of November 2nd Mr. Munro says that "firms on the Register should be its chief unpaid publicity agents."

During my period of service with the N.R.E.I.C., 1934 to 1942, I carried out many inspections of installations, and it may interest your readers to know of the method employed by some registered contractors to bring the principles of the N.R.E.I.C. to the notice of their clients. I attach a label which many of these contractors have stuck on their letters.

Worcester Park, Surrey. E. H. WHATTON.

[The label to which Mr. Whatton refers bears the sign of the National Register and the statement:—"We are registered with the National Register of Electrical Installation Contractors and have undertaken to carry out our work free from risk of fire and shock. Any authenticated complaint alleging bad workmanship by us will be investigated by the National Register. . . ."—Editors, *Electrical Review*.]

I ENDORSE Mr. Alex. Milne's views; there has been some atrocious work executed by some members of the Register. Compulsory registration should create an efficient standard of work by virtue of the fact that the loss of a certificate would mean the loss of a practice, and in order to prevent this happening, the employment of efficient operatives and full supervision of work in progress would be essential.

The only alternative would be more powers for the supply authorities, to examine work in progress and periodically inspect existing installations for extensions and alterations made without the authority's permission and if necessary enforce penalties.

Sutton, Surrey. THOS. J. HALL.

Control in Trinidad

Division of Undertakings

DETAILS of the steps leading to the cessation of its operations after seven years' existence are given in the annual report for 1944 of the Trinidad Electricity Board. In February last year the Port-of-Spain Corporation was informed that the Governor had decided that an Island electricity supply scheme was essential in the interests of the community, and that he proposed to set up an authority to be known as the Trinidad and Tobago Electricity Commission. In August, 1944, the Port-of-Spain Corporation decided to exercise its right by which the distribution of electricity within the city limits and the transportation services would be transferred to the Corporation. As a result steps were taken to divide the properties between the Corporation and the proposed Commission, and it was anticipated that the Trinidad Electricity Board would cease to function in the first half of the current year. The report comments that, after seven years of careful nursing and building up, it is regrettable that the existing fine organisation should be disrupted by the splitting up of the undertakings.

Rapid Development

An indication of the progress made by the Board (general manager, Mr. W. J. Williams, M.I.E.E., M.I.Mech.E., M.I.Struct.E.) is given in a review of its operations. Between 1937 and 1944 the number of kWh sold per annum increased from 3·9 million to 21·7 million and the revenue from $391,506 to $1,031,867. Passengers carried by the trams in 1937 numbered 1·7 million and in 1944 the total was 16·3 million. Trolley-buses first appeared in Port-of-Spain in 1941, and the report says there is no doubt that if the Board continued to administer the transportation services trolley-buses would eventually be used entirely.

There was a surplus of $40,263 on the past year's operations of the Electricity Department, as compared with $151,079 in 1943. The net profit of the merchandise department was substantially greater—$23,792 against $1,036—the value of sales rising from $74,726 to $155,121. On the house installation department there was a net profit of $28,091 ($12,427), the value of work done rising from $138,990 to $206,168. The year's working of the transportation services resulted in a net surplus of $19,291 (against $157,614).

Radio Measurements

Equipment and Circuits

A PAPER prepared by Messrs. R. J. CLAYTON J. E. HOULDIN, H. R. L. LAMONT and W. E. WILLSHAW (G.E.C.) for the Radio Section of the Institute of Electrical Engineers deals with radio measurements in the decimetre and centimetre wavebands.

The paper is concerned with methods of making measurements of this kind as a necessary aid to the development of valves, circuits and other equipment for use within the 300 to 3,000 Mc/s (coaxial) and 3,000 to 30,000 Mc/s (waveguide) ranges of frequency. The authors' survey of applicable methods of measurement is restricted to those which have been utilised in the G.E.C. research laboratories on behalf of the Admiralty, so that reasons of security have prevented the description of certain recently developed apparatus.

The introductory review of circuit theory is followed by a short section on high-frequency oscillators. Succeeding portions deal with the measurement of the fundamental quantities of frequency, power, impedance and voltage.

Heterodyne methods of measuring frequency are described as well as wave meters of the coaxial and resonant cavity types. The design of bolometer and calorimeter circuits is discussed for powers between one microwatt and several hundred watts, determination of reflection coefficients and Q values being included in the consideration of impedance measurement.

The concluding portions of the paper are concerned with derived measurements. A standard of receiver sensitivity is established, based on thermal noise voltage; the design of suitable signal generators and means of ascertaining sensitivity are considered as well as methods of determining the polar diagram, gain and impedance of aerials. Finally equipment is outlined for the absolute measurement of field strength on centimetre wavelengths.

Public Lighting

Satisfying Future Requirements

AFTER six years of disuse all types of street lighting equipment have suffered deterioration, which will need considerable time and money to repair. More installations have been recommissioned much nearer to their pre-war state than might have been expected, but many authorities would willingly take the opportunity now (were labour and materials available) to install new equipment rather than find capital for renovating installations that will not satisfy future requirements. These views are expressed by MR. E. C. LENNOX (North-Eastern Electric Supply Co., Ltd.) in a paper prepared for the Installations Section of the Institution of Electrical Engineers.

The increasing volume of road traffic will require more and better illumination than was provided before the war, but there cannot be any radical change in the mechanics of producing adequate street lighting. So the paper first comments on methods of securing brightness contrasts and of distributing light from lanterns in the building-up of a complete installation.

Brief reference is next made to B.S. specifications and factors to be taken into account in the choice of lanterns and available types of lamps for enclosure within them.

Several means of controlling public lamps, other than hand switching, are briefly described while consideration of the type of load involved suggests that a two-part tariff is appropriate for public lighting with a fixed charge based on wattage plus a small kWh charge. The author has prepared a scale of charges on this basis (plotted to form a graph) which he has used for compiling comparative tables showing capital costs of equipment for lamps used commonly for Group A highways and annual operating costs for Groups A and B roads. These figures are, in turn, analysed and applied in more tables to indicate the estimated costs (per mile and annual) of lighting Group A through-traffic routes to show the great financial difficulties which will have to be surmounted before adequate street lighting can be extended over the whole country. It is the author's firm opinion that the illumination of such highways will be adequately dealt with only when its administration is taken over by the Ministry of Transport, or other suitable Ministry.

The author contends that agreement throughout the electrical industry is desirable on the theoretical considerations governing good visibility, the basic aim of which should be the provision of sufficient background brightness.

District Heating

Comparison of Costs

PARTICULARS relating to proposed district-heating schemes in Great Britain have been analysed in the *Architect and Building News*. In Continental climates the heating of rooms to 65 to 70 deg. F. and the provision of domestic hot water are stated to require upwards of 10 million therms per sq. mile per annum. Below these figures, capital charges on installation costs make district-heating schemes uneconomic when steam has to be produced especially.

It is considered unlikely that district heating will find scope in well-spaced housing estates in this country, where background heat to a maximum of 60 deg. is required, unless cheap steam is available from near-by electric power stations. In that case non-coincidence of power and heating demands would introduce difficulties and in the most modern plants in the United States boilers for district heating are independent of electricity supply.

Two Dundee schemes each supplying about 250 houses, a central laundry and public baths,

are said to have been working successfully for nearly twenty-five years. The annual cost to the householder in 1941 was £8.

Figures published for these new projects are criticised. In these the additional capital expenditure due to district heating as against individual heating has been estimated at one-third to one-half for 8,000 and 650 houses and one-fifth for 650 closely spaced flats. Heat consumption for district heating (about 400 therms per annum per residence) is more than 50 per cent. above that found necessary in individual plants. An estimated total cost per therm of from 8d. to 10d. has been compared with 1s. 8d. to 2s. with independent heating. The latter figure is considered excessive with usual methods, since crude heat in coal or coke at £4 per ton costs under 8d. per therm with 50 per cent. conversion efficiency. Even the unfavourable combination of open fire and domestic boiler with an average efficiency of only 30 to 35 per cent. would give the service for 1s. per therm.

It is argued that in modern blocks of flats or commercial buildings ordinary central heating may be more economical in view of the higher installation costs for district heating. Thermostatically controlled electricity or gas having advantages of convenience at point of use would cost 1s. or so per effective therm, but here installation costs were found to introduce an uncertain factor.

Switchgear Makers' War Work

Control Equipment for Many Applications

IN pre-war days Brookhirst Switchgear, Ltd., specialised in industrial, marine and machine tool control gear, as well as in electrical gear for power station, material handling and pumping schemes. From 1937 to the outbreak of war, this standard apparatus was supplied in ever-increasing quantities as part of the re-armament programme. One special line introduced before the outbreak of war was the "Steelpact" factory furniture range, there being a heavy demand for this type of gear particularly for "shadow" factories. An even greater demand is anticipated for peace-time use. With the outbreak of war an aircraft component department was established.

Large Brookhirst switchboard supplied to Russia

During the war electrical equipment was provided for over 15,000 new machine tools, and operating controls were made for auxiliary drives in over twenty power station extensions and for hundreds of new electrical heat treatment plants for special alloys. Many special equipments were developed for increasing the production of iron, steel, copper, brass, aluminium and various new materials. Transport, handling and storing of iron ore, coal, fertilisers, grain, oil and food products; outcrop coal working; ventilation of underground stores, workshops, etc.; and ship-building also required large quantities of control gear.

Equipment for the manufacture of war supplies abroad in Africa, Australia, India, etc. for ships, including anti-mine devices for American service and maintenance depots; and for aircraft, including jet types, was also produced. A considerable amount of apparatus manufactured for Russia, included gear for the control of power station auxiliaries and coal. Now that the war is over a large market is certain for equipment for both new installations and replacements, both at home and abroad.

Radio Components Exhibition

The Radio Component Manufactuerers' Federation's Exhibition of Radio and Communications Components will be held next year at Grosvenor House, Park Lane, London, from February 19th to 22nd. As in previous years the exhibition will not be open to the public and admission will be by ticket only. It is hoped to attract a considerable number of visitors from overseas.

Telephone Interference

Causes and Remedial Measures

AT the meeting of the Institution of Electrical Engineers on Thursday last week, a paper on "Practical Aspects of Telephone Interference arising from Power Systems" was read by MR. P. B. FROST and MR. E. F. H. GOULD of the Post Office Engineer-in-Chief's Department.

Before calling on the authors, the President (DR. P. DUNSHEATH) welcomed a number of delegates who were in London attending meetings of the C.C.I.F. He said there were delegates from China, Denmark, France, Italy, Mexico, Mozambique, the Netherlands, Sweden and the United States, together with representatives of the Allied Commission and of the secretariat of the C.C.I.F.

The paper by Messrs. Frost and Gould summarised investigations made in this country between 1934 and 1944, some of which could not be pursued to their logical conclusions because of the war.

Screening Effect of Conductors

A comparison of calculated and measured values of induced voltage at various sites showed that in most cases good agreement was possible with the available data on earth resistivity. Further work was required on the screening effect of various earthed conductors. The precautionary measures available for power and telephone systems to avoid damage to plant and injury to personnel from high induced voltages were discussed.

Results of tests were given which showed that noise interference was serious from faulty power lines which were maintained in operation through the use of arc-suppression coils. The propagation of harmonic currents on long power lines required further study; the results so far obtained indicated that an analysis of neutral currents was insufficient to forecast the noise interference possible. Attention was drawn to the possibility of interference from a power line supplying a large rectifier.

Tests which had enabled conditions to be laid down for authorising the multiple earthing of h.v. systems were reviewed, and it was shown that the interconnection of l.v. systems, each earthed at one point, was unlikely to cause interference.

Gas discharge tubes, noise-eliminating filters, and an improved psophometer were described, and records of damage sustained and the precautionary measures which could be taken were discussed.

Discussion

In opening the subsequent discussion MR. J. HACKING (C.E.B.) said the number of serious happenings in this country was very few. He did not like the order in which the remedial measures were dealt with in the paper and the inference that the whole onus rested on those operating power systems. Over-voltages could occur on telephone systems from lightning, or from power systems, but the paper tended to minimise the danger from lightning on the ground that it was of short duration, but it was questionable whether it was of such short duration compared with interference from e.h.v. systems.

Precautions were taken to safeguard men working on power lines and he found it difficult to accept the view that precautions could not be taken in the case of telephone linesmen. Gaseous discharge tubes had been used experimentally and gave excellent results if well designed and he believed the Petersen coil would be used more in the future, although it had limitations under certain conditions.

DR. W. G. RADLEY (Post Office) said the paper rather gave the impression that a great deal more of experimental work must be done before one could begin to calculate many interference effects with any confidence. The chief value of a series of measurements was in the building up of data from which one could deduce "factors of experience." Were the authors entirely happy that a reasonable degree of accuracy was obtained from three-electrode gasfilled tubes, always assuming that the resistance of the earth connection was low?

American Methods

DR. H. S. OSBORNE (American Telephone & Telegraph Co. and vice-president, American Institute of Electrical Engineers) expressed his pleasure at being able to attend a meeting of the British Institution for the first time and spoke of the co-operation that existed in America on interference, or

inductive co-ordination, as they called it. The use of quick acting circuit-breakers tended to obviate danger to linesmen and there had been developed in the United States protective clothing and devices for placing on overhead wires where they were known to be dangerous. But such devices were not practical for general use. For joint use of rural power lines (12 to 15 kV) a form of construction had been devised which it was believed gave protection to the telephone lines and at the same time considerably reduced the cost of construction.

MR. H. W. GRIMMITT (Electricity Commission) said that in view of the very few accidents that had occurred some of the conclusions in the paper seemed rather strong. For instance, the reference to Petersen coils might cause people not to install them when, in fact, they were great trouble savers.

Experience in Sweden

DR. G. SWEDENBORG (Swedish Posts & Telegraphs) said that in Sweden it had been impossible to avoid parallelism between e.h.v. and communication lines. A calculation of induced voltage in the telephone lines from earth fault currents showed that acceptable values could only be obtained if the earth connection of the power lines included suitable current limiting devices. The recent trend in Sweden, however, had been to adopt direct earthing of the neutral point rather than Petersen coils in order to reduce insulation costs and to obtain certain advantages in the construction of the protector equipment. He doubted whether it was possible to introduce three-electrode gas discharge tubes or earthing relays in telecommunication lines consisting of cables containing about 200 metallic circuits. The lay-out of special screening wires on either the power lines or the telecommunication cable would involve unreasonable cost and the only remedy in such cases was to retain the Petersen coils to limit the earth fault current. The need for transmitting large blocks of power from the north to the south of Sweden had led to investigations into the use of high-voltage DC.

MR. J. S. FORREST (C.E.B.) said that interference which might be caused by AC lines feeding large mercury arc rectifiers required watching in this country. There had not been any serious trouble so far, but he strongly urged that action should be taken before trouble became really serious. Earth return circuits which had caused interference had not been of the best and he hoped there would be no more trouble from that cause.

MR. S. B. WARDER (Southern Railway) gave details of further tests carried out by him on the Southern Railway and indicated that slightly divergent results were obtained for the screening factor for the system as a whole as compared with the figures in the paper for the Byfleet-Portsmouth line; the screening factor was also influenced by climatic conditions.

MR. D. P. SAYERS (Birmingham Electric Supply Department) said that while most power engineers fully appreciated their responsibility in this matter they had a feeling that the restrictions on the earth fault current were based on rather abstruse mathematical calculations not entirely supported by concrete evidence. He could not recall any case of a jointer receiving a shock due to induced effects from a power cable.

MR. E. S. RITTER expressed the view that much more interference was due to faulty operation of power systems than to definite faults or transient faults in the power system. Were all power engineers satisfied that there were no faults on their systems until somebody reported them?

MONSIEUR G. VALENSI (secretary-general, C.C.I.F.) said that now was an appropriate time to take steps to ensure the greatest possible co-operation between power supply and telephone interests because of the great improvements that had taken place in recent years in both techniques.

Mr. Gould's Reply

MR. E. F. H. GOULD, replying to the discussion, said that the fact that there had been comparatively few cases of damage, reflected the co-operation that had already taken place. Parliament had given considerable powers to the Postmaster-General but the Post Office did not rely on those powers; the approach was to find the best engineering solution. The suggestion of a break in the lines to protect the linesmen was not practicable on telecommunication circuits as it would interfere with so many communication channels. They had not tried to discourage the use of Petersen coils. There were conditions in which the coil could be used with advantage but a great deal depended on local conditions. They did not advocate removing the Petersen coil and putting an earth resistance in its place except when the fault was on the system.

COMMERCE and INDUSTRY

Revised Fair Trading Policy. Munition Making at Southend.

The Human Factor in Industry

SPEAKING at a lunch held by the newly-formed Liverpool Centre of the Illuminating Engineering Society last week Mr. J. Eccles, Liverpool city electrical engineer, declared his belief that industry must now concentrate not so much on the search for new materials and increased efficiency of machines but on the human side of the problem. Answers had to be found to such questions as to how the advantages of mechanisation could be distributed fairly among all those who had contributed to procuring them, and in what way their personal efforts could be directed to this end. For many years we should have to adopt a Spartan existence, improve manufacturing methods, organise distribution and work in a manner unknown in this country during the past fifty years. Never was there a greater need for co-operation. Mr. A. E. Darlington, the Centre chairman, presided at the lunch. A toast to the "City and Port of Liverpool" was proposed by Mr. H. C. Weston, president of the I.E.S. and was responded to by the Lord Mayor, the Earl of Sefton, who paid a tribute to the technical activities of the Society

Electrical Fair Trading

A new edition (the third) of the Electrical Fair Trading Policy is now available; the last edition was published in July, 1939. It differs from the last issue only by the inclusion of certain amendments made during the interval and the addition of new schedules covering synchronous clocks and electric discharge lamp auxiliaries. The most important amendments relate to the clauses defining special large buyers and recognised users. Lists of these compiled by the respective manufacturing sections of the electrical industry, in collaboration with other appropriate sections, will be accepted and registered by the Council. Pending the preparation of these lists the definitions remain the same. The discounts for recognised users which are related to the trade discounts are expanded by the inclusion of 20 per cent. as the corresponding rate for a 30 per cent. trade discount.

Other new points concern the forbidding of the grant of cash or settlement discounts to non-recognised purchasers; the maintenance by manufacturers and wholesalers of their price-maintained goods when selling direct to trade or other customers; settlement discounts; and purchase tax. There are certain amendments to the schedules, notably the differentiation of discounts in the two sections of that dealing with electric bells, etc., and batteries and materials.

One copy of the new Policy can be obtained gratis from the secretary of the Fair Trading Council, Mr. Felix Rogers, Kern House, Kingsway, W.C.2; additional copies cost 6d. each, including postage.

Design Competition

Equipment for the kitchen, bathroom and for general domestic use is included in the six categories for which prizes of £100 each are announced by the Central Institute of Art and Design for the best house-furnishing designs from men and women under thirty. There are second and third prizes of £40 and £20 in each section and 108 merit awards of £5, or £1,500 in all. Service men and women are specially invited to enter the competition, full details of which are obtainable from P.O. Box No. 213, 9, Kean Street, London, W.C.2.

Loughborough Window Display

During Loughborough's Thanksgiving Savings Week shop-keepers were asked to dress their windows and to emphasise "Reconstruction" as a motive for saving. Four prizes were offered by the Local Savings Committee the first being twenty-five Savings Certificates. Fifty shops dressed their windows, and thirty-six entered the competition. The public was invited to vote and

Old and New: Loughborough Electricity Department's winning window display in the Thanksgiving Savings Week competition

the Electricity Department (borough electrical engineer and manager, Mr. J. P. Tucker) secured the first place by a substantial margin.

Meter Repairers' and Testers' Wages

The National Joint Council for the Electricity Supply Industry announces that agreement has now been reached on a claim for rates to be fixed for meter repairers and Classes 1 and 2 meter testers. No change is to be made in the rate of meter repairer (mechanician), who will continue to receive the rates prescribed in the various District Schedules. Meter tester (class 1) (testing single-phase two-wire DC

meters, kVA, polyphase and summation meters and indicating and recording instruments) is to be paid the same rate as the meter repairer (mechanician), while meter tester (class 2) (testing single-phase and two-wire DC meters) is to be paid 4·5d. per hour below the rate for a meter tester (class 1), provided that the rate is not less than ½d. per hour above the District scheduled rate for an indoor labourer. These rates operate as from October 25th.

Aluminium Alloy Change-over

During the war the great Rolls Royce factory at Hillingdon, Glasgow, turned out a high proportion of " Merlin " engines for the leading types of R.A.F. machines. One of the principal units of the factory is the aluminium alloy foundry which produced castings of a total weight of 31,440 tons, enough for nearly 80,000 aero engines.

It is said that the " flexibility " of the plant is such that its conversion to peacetime production is proceeding quite smoothly and it is already turning out domestic and other civilian equipment. The foundry is being taken over by a new company, Renfrew Foundries, Ltd., which has been formed by Col. W. C. Devereux and his associates in combination with Rolls Royce, Ltd., and offers its services to all branches of industry requiring light-alloy castings.

Southend Undertaking's War Activities

Some of the wartime activities of the Southend electricity undertaking were revealed by a recent display of munition work sponsored by the Ministry of Production.

During June and July, 1940, when residents of Southend-on-Sea were evacuated from the coast, Mr. A. C. Johnson, the borough electrical engineer and manager, decided to turn over the available machine tools to the manufacture of munitions. With the nucleus of highly skilled mechanics left to the undertaking and with the training of unskilled labour, continuous employment was given to an average of eight men throughout the remainder of the war. During the early period work was carried out for twenty hours per day and credit is due to the staff and employees for the manner in which they discharged their duties, especially during the many periods of enemy action. The Transport Department of the Corporation participated in the scheme in April, 1943.

Southend Standard photograph

Southend-on-Sea Electricity and Transport Departments' display of their war products

The machine tools available were not suitable for repetition work and the main work undertaken was the making of prototype parts or assemblies and the carrying out of work which large industrial firms could not undertake without interfering with production. Repairs, too, played a big part in the work. Apparatus turned out included parts for Bailey bridges, tanks, Lancaster bombers, flame throwers, artesian wells, beach loading cranes, power presses, 21-ton naval torpedoes and 12,000-lb. bombs.

The Decca Navigator

Details were given by Sir Cyril Entwistle, chairman of the Decca Record Co., Ltd., at the company's meeting last week, of the " Decca Navigator," until a few weeks ago on the secret list. This apparatus operates on the low-frequency continuous wave carriers of synchronised radio transmitting stations and, installed in a ship or plane, continuously indicates the exact position on its two meters which give readings corresponding to a grid of red and green lines overprinted on standard maps or charts. The principle involved is radically different from that used in radar, which utilises pulse modulations and high-frequency carriers which are subject to limitations and complications and require the interpretation of a skilled operator. The world rights and patents of the apparatus are being transferred to a new subsidiary, the Decca Navigator Co., Ltd., with a share capital of £500,000. It is hoped that the first permanent chain of transmitting stations will be in operation in January.

Engineers' Appointment Bureau

The Professional Engineers' Appointments Bureau is inviting applications for registration for employment from members of the Institution of Civil Engineers, the Institution of Mechanical Engineers, or the Institution of Electrical Engineers, or persons whose engineering qualifications for election or admission to one of those bodies have been approved by the respective councils. Application forms may be obtained from the registrar of the Bureau, 13, Victoria Street, Westminster, S.W.1. Employers of professional engineers are invited to submit details of positions vacant on their staffs.

Plant and Equipment for India

The Government of India has established in the United Kingdom under the High Commissioner for India, a new organisation to assist in the supply to India of plant machinery, equipment, etc., including heavy electrical plant scheduled through the Central Technical Power Board, all other power plant, including boilers, machine tools, refrigeration machinery, wireless and telcommunication equipment. Mr. P. C. Chaudhuri is in charge of the organisation and offices have been opened at 45 to 47, Mount Street, London, W.1, where advice and assistance will be available to exporters and others interested in the Indian market. The

new organisation will take over from the Economic and Overseas Department of the India Office work in connection with the supply of goods to India, and will deal with registration, co-ordination and processing of all import licences, etc.

London District Heating Proposal

The Court of Common Council of the City of London decided last week to consider the practicability of including a scheme for district heating in the plans for the rebuilding of the city. Proposing the motion, Sir George Elliston said that this was a further effort of the Public Health Committee to remove the pall of smoke which had such an adverse effect on the health of the citizens. He said that before the war the scheme for district heating could only have been achieved in the city at a prohibitive cost. To-day the position was different. Replanning and rebuilding would compel them to simplify the maze of gas and water mains, sewers and cables which formerly left little room for piped supplies of heat and hot water. The Health Committee had in mind the conversion of four devastated areas into smokeless zones. These were (1) between Fetter Lane and Farringdon Street ; (2) between Aldersgate and Moorgate; (3) around St. Paul's ; and (4) in the neighbourhood of the Minories. In those areas nearly 3,000 separate properties must be rebuilt from the basement upwards.

Proposed Manchester Bill

At its meeting on October 31st, the Manchester City Council approved the promotion of the Parliamentary Bill to which reference was made in the *Electrical Review* of October 26th. This would, among other things empower the Corporation to supply hot water from generating stations for the heating of buildings, special mention being made of the Wythenshawe Ward of the city. It would also enable the Corporation to prescribe areas in the city in which the emission of smoke would be prohibited. The approval does not appear to have covered the original proposal that the Corporation should be empowered to prohibit the installation in houses of domestic appliances which could not be used without producing smoke.

Another clause relates to the running of trolley vehicle services.

Agricultural Demonstration

To show new methods and remind the farming community of the increasing necessity of electricity on the farm, the City of Birmingham Electric Supply Department recently co-operated in farm machinery demonstrations held by the Warwickshire War Agricultural Executive Committee at Lea Marston, near Coleshill, by staging an exhibition covering rural needs. Advantage was taken of the fact that a grid line crosses the field to locate the marquee adjacent to a "pylon" which thus formed a symbolic background to the exhibition. A propitious start was made when the first visitor to the marquee, Lord Aylesford, placed an order for a cooker. The staff was kept busy demonstrating equipment and answering questions covering all aspects of home and farm electrification. Much of the apparatus was shown working.

A 3-HP "Essex" mill was used to grind mixed cereals, while an outside exhibit consisted of a 2½-cwt. 2-way sack hoist. Among other attractions were arc-welding, water pumping, a comprehensive display of portable tools, a portable spraying equipment, sheep shearing machines, electric fencers, an incubator, dairy equipment, etc. Special display stands illustrated the many electric lighting and heating methods, and farm wiring systems were shown by means of four display boards. Four E.D.A. model kitchens were supported by a representative selection of household appliances.

Electricians' Wages

The Standing Committee of the N.J.I.C. for the Electrical Contracting Industry announces that it has granted an increase of 2d. per hour in the wages of employees in the industry as from the first pay day in December. The new basic rates will then be as follows:—Grade A, 1s. 11¼d.; Mersey District, 1s. 9¼d.; Grade B, 1s. 8¼d.; and Grade C, 1s. 7¼d. To these rates is added the cost-of-living (war) addition of 8¼d. per hour which includes the temporary addition.

Cardiff Model Kitchen

A model kitchen built by the Cardiff Corporation Electricity Department generally on the lines of the E.D.A. No. 2 kitchen, was installed at a Local Government Exhibition which was arranged at the City Hall last month and was attended by approximately 45,000 people. The kitchen included a 4·4-cu. ft. refrigerator, a Moffat cooker and the Charlesworth sink unit. This kitchen has now been erected in the electricity showrooms, possibly for a considerable period.

Battery Acid

Statistics issued by the National Sulphuric Acid Association, Ltd., with the consent of the appropriate control section of the Ministry of Supply, show that the amount of British acid used by the accumulator trade during the war years rose steadily from 6,958 tons in 1940 to 10,082 tons in 1944 and then declined to 4,750 tons in 1945, tonnage being in terms of 100 per cent. acid.

Purchasing Officers' Association

A large and representative gathering of London Branch members of the Purchasing Officers' Association welcomed Brig. General Wayne R. Allen, of the United States Purchasing Commission, and senior members of his staff at a meeting held at the Waldorf Hotel last week. Brig. General Allen promised his untiring efforts to maintain that spirit of goodwill and friendliness that had contributed so much to the victorious ending of the war and which was essential for the future prosperity and happiness of the world.

English Electric Exhibition

How the gigantic tasks undertaken in war have increased the capacity to shoulder the arduous burdens of peace is shown by the English Electric Co., Ltd., in an exhibition of photographs and models at Queen's House, Kingsway, London, which is to be open to the

public for a month from November 19th. The company has made about £60 million worth of wartime products in addition to an increased output of normal equipment and the expansion necessary will be clearly shown in the exhibition. At each fateful turn in the Empire's destiny the company made its vital contribution and its research activities have been in the forefront of the enormous technical progress of the past few years, a special section of the exhibition giving some indication of their scope and variety.

House-Service Units

Arrangements have been made by several manufacturers to supply in the near future the three-chamber house-service unit developed by the British Electrical Development Association, which was described and illustrated in the *Electrical Review* of October 26th. The names already received are British Insulated Callender's Cables, Ltd., W. T. Henley's Telegraph Works Co., Ltd., and the Revo Electric Co., Ltd.

New Zealand Import Allocations

A New Zealand import schedule just issued shows that while all imports will still be subject to licensing there will be some relaxation of the restrictions next year. Classes of goods for which the allocations (mostly from the United Kingdom) are to be increased include: electric wiring accessories; vacuum cleaners; and materials and parts for the manufacture of radio sets, washing machines, refrigerators and vacuum cleaners.

Tin in Siam

According to a provisional official report, stocks of tin concentrates in Siam are over 16,000 tons and of tin metal about 4,000 tons. The state of the mines is believed to be not unsatisfactory and some dredges have been working.

Copper Development Association

The Copper Development Association, which during the war operated principally from a temporary office in Rugby, has now acquired premises at Kendals Hall, Radlett, Herts. (telephone: Radlett 5616). All urgent communications and applications for the Association's literature should, in future, be sent there, but the Association will continue to maintain its registered address at Grand Buildings, Trafalgar Square, London, W.C.2.

Dissolution of Partnership

A. C. Mallinson and **N. F. Crossley**, manufacturing radio and electrical engineers, Truechorde Works, Bethel Street, Brighouse, Yorks., have dissolved partnership. Mr. Mallinson will carry on the business.

Calendar

A blonde in red, telephoning, with the title "Who's There?" forms the attractive subject for a calendar sent to us by Green Electrical Industries, Ltd., 44-45, Tamworth Road, Croydon.

New House Magazine

From Connollys (Blackley), Ltd., we have received a copy of the first number of "The Connollian" which it is proposed to publish quarterly. It is prefaced with a portrait of and a message from the chairman, Mr. W. Travis, and there are some notes by the production manager. The articles include the experiences of some of the company's men on active service. A great deal of "domestic" matter is included and the production and illustrations are well done.

Wellman War Achievements

As a mark of their loyal collaboration and diligent service during the war employees of the Wellman Smith Owen Engineering Cpn., Ltd., have been presented with an attractive booklet recording the company's achievements in connection with shell-making plant, "Mulberry" harbours, tank bridge layers, "Pluto" pipe lines, etc.

Trade Publications

Crompton Parkinson, Ltd., Electra House, Victoria Embankment, London, W.C.2. Brochure (F. 1083) indicating pictorially a selection of the great variety of uses on farms for electric motors, of which the company makes 2,000 types. It is stressed that successful application depends on correct choice of type as well as size.

Ferranti, Ltd., Hollinwood, Lancs.—Brochure (IS.6) technically describing, with the aid of diagrams and illustrations, summation metering equipment specially designed for bulk supply circuits composed of multiple feeders.

Equipment & Engineering Co., Ltd., 2, Norfolk Street, Strand, London, W.C.2.—Illustrated pamphlet descriptive of crack detection under ultra-violet light by means of fluorescent "Magnalite" ink.

Howard Clayton-Wright, Ltd., Tiddington Road, Stratford-on-Avon.—A leaflet describing "Clatonrite" battery terminal oilers.

English Electric Co., Ltd., Stafford.—Publication (FG/103A) containing illustrations and details of fuse-gear available for quick delivery for authorised priority work.

C. F. R. Giesler, Ltd., River Place, Essex Road, London, N.1.—Illustrated bulletin (12–X) descriptive of Davey portable instruments for the dynamic balancing of rotors.

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

Trade Announcements

Multicore Solders, Ltd., are establishing their West End offices permanently at Mellier House, Albemarle Street, London, W.1 (telephone: Regent 1411; telegrams: Dustickon, Piccy, London.)

Vacuums, Ltd. (The Bustler), Aldridge Road, Birmingham, 22b, inform us that the telephone number of their offices is now Birchfield 4793 (telegrams: "Bustler," Birmingham). For the service works, Tenby Street North, Birmingham, 1, the telephone number is Central 2124.

The Exchange Electric Co. has moved its head office, showroom and works to 41, Cheetham Hill Road, Manchester, 4 (telephone: Cheetham Hill 4273).

The Enfield Cable Works, Ltd., has opened a new depot at 2, Rockstone Place, Southampton (telephone: 2413/4).

The Acorn Machine Tool Co. (1936) is moving on November 14th to 610-614, High Road, Chiswick, W.4 (telephone: Chiswick 2362).

Works Distribution

Switchgear Arrangements in a Propeller Factory

DURING the war a dispersal factory was built by De Havilland Forge, Ltd., at Rogerstone, near Newport, Mon., mainly for the manufacture of light alloy propeller blades. Resistance furnaces provide the greater part of the electrical load, which amounts to 0·75 kW per sq. ft. of production area with a maximum demand of 1,800 kW.

Three incoming 11-kV feeders are controlled by a Crompton-Parkinson switchboard and terminate at busbars which are coupled through a circuit-breaker to further busbars, to which are connected the works transformers. The three transformer panels are owned and operated by the consumer and the other five panels by the supply authority.

One incoming feeder, direct from Pontymister power station, is equipped with a directional over-current relay which, in conjunction with an over-current relay at the sending end, is time-graded so as to be automatically disconnected on fault without affecting the other feeders. The latter are interconnectors with the public supply system and the Northern Aluminium Co.; they are protected by over-current relays set to disconnect either without tripping any other feeder. The feed to the works 11-kV busbars has over-current relays set below those of the incoming feeders. The main feeder cannot trip except for a fault on itself. Positive tripping for the feeders is ensured by energising the shunt trip coils from a 30-V battery.

Fifteen-unit medium-voltage board controlling transformer secondaries and works cable feeders. Centre unit is a busbar coupler

Transformer circuit-breakers have direct-acting over-current and earth-leakage protection, with time-limit fuses across the over-current operating coils. They consist of truck-type cubicles incorporating 150-MVA round-tank circuit-breakers tested to comply with B.S. 116/1937. Each controls a 750-kVA, 11,000/400-V outdoor unit, built by the British Electric Transformer Co., Ltd., fitted with a silica-gel breather and housed in a compartment open to atmosphere. Each transformer is provided with a safe-load indicator showing both actual and maximum permissible load at any time in terms of hot-spot temperature, permitting increased loading (B.S. 171/1936) automatically with any lowering of ambient temperature.

Transformer secondaries are connected to a "Klad" medium-voltage switchboard incorporating 25-MVA circuit-breakers tested in compliance with B.S. 936/1940. Maximum short-circuit capacity of the system is limited to that figure by the sectioning of the busbars to suit the load diversity (two transformers being normally in parallel for supplying eight outgoing feeders while the third supplies four feeders independently), by an increase of transformer reactance from the standard 4·6 to 4·8 per cent. and by the reactance of the cables between transformers and switchboard.

To each busbar section is connected a 560-HP auto-synchronous motor driving a Belliss & Morcom 250-RPM compressor delivering air at 100 lb. per sq. in. for power hammers and other air services. Operated at 0·95 leading power-factor at full load, these motors correct the overall system power-factor to between 0·98 and 0·99 lagging during peak production. The simple control gear comprises an oil circuit-breaker, a liquid starter and an excitation control pedestal. The motor half-coupling is bolted directly to the compressor flywheel to ensure equal sharing of weight between motor and compressor bearings. Large motors are fed directly from the main switchboard; otherwise supply is obtained through local or sub-main distribution boards. All feeders from the main switchboard are either three- or four-core cables laid underground. Cables crossing the floor of the main production area are enclosed in a duct large enough to meet future requirements.

At the remote ends of some of the cable feeders are located sub-main distribution boards

with angle-iron frames suitable for floor and wall mounting and carrying a busbar chamber with h.r.c. switch-fuse units for incoming and outgoing circuits. From these sub-main boards the wiring to smaller distribution boards and direct to certain larger motors (up to 50 HP) is carried out by means of v.i.r. cables in screwed-steel conduit. At the remote end of each circuit is a local isolating switch both for these boards and for motor control gear. All the installation work was carried out under the control of Crompton Parkinson's Contract Department.

Forthcoming Events

Friday, November 9th.—*London.*—Grosvenor House, 8.30 p.m. to 1.30 a.m. Victory Ball in aid of the Electrical Industries Benevolent Association.

London.—Phœnix Theatre, Charing Cross Road, 3.30 p.m. "The Scientific Consequences of Rontgen's Discovery of X-rays," by Sir Lawrence Bragg, O.B.E., F.R.S.

London.—St. Stephen's Tavern, Bridge Street, Westminster, 6.30 p.m. E.P.E.A. Meter Engineers' Group (Southern Division). "Prepayment Meters," by E. Fawssett, M.I.E.E.

London.—Feathers Hotel, Broadway, S.W.1., 5 p.m. Electrical Trades Commercial Travellers' Association. Annual general meeting.

Manchester.—Engineers' Club, 6 p.m. I.E.E. North-Western Centre Radio Group. Informal discussion on "Factory Testing of Radio Equipment" to be introduced by J. G. Heaps.

Saturday, November 10th.—*London.*—At Institution of Electrical Engineers, 3.30 p.m. Papers on X-rays: part of the jubilee commemoration of Röntgen's discovery.

Leeds.—Hotel Metropole, 3 p.m. Association of Mining Electrical and Mechanical Engineers (Yorkshire N.W. Branch). "Fluorescent Lighting," by J. H. Mollan.

Monday, November 12th.—*Newcastle-upon-Tyne.*—Neville Hall, 6.15 p.m. I.E.E. North-Eastern Centre. "Practical Aspects of Telephone Interference Arising from Power Systems," by P. B. Frost and E. F. M. Gould.

Wolverhampton. — Electricity Sports and Social Club, St. Mark's Road, 7 p.m. Electrical Power Engineers' Association (Midland Technical Group). "Aerial Cables," by J. R. Harding, B.Sc., M.I.E.E.

Bristol.—University Physics Laboratory, Royal Fort, 5 p.m. I.E.E. Western Centre. "Operational Control of Electricity Supply Systems," by W. Kidd and E. M. S. McWhirter.

Tuesday, November 13th.—*London.*—Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6 p.m. Illuminating Engineering Society. "The New Version of the I.E.S. Code," to be introduced by the president, H. C. Weston.

London.—Royal Institution, 5.15 p.m. "After the Discovery of X-rays," by Dr. Alexander Muller.

Belfast.—Queen's University (Geology Pavilion), 6.45 p.m. I.E.E. Northern Ireland Centre. "The Place of Radiant, Dielectric and Eddy-Current Heating in the Process Heating Field," by L. J. C. Connell, B.Sc., O. W. Humphreys, B.Sc., and J. L. Rycroft, B.Sc. The paper will be presented by L. J. C. Connell.

Manchester.—Engineers' Club, 6 p.m. I.E.E. North-Western Centre Measurements Group. "Planning the Future Electricity Meter," by G. E. Moore.

Nottingham.—Demonstration Theatre, City Gas Department, 6.30 p.m. I.E.E. East-Midland Sub-Centre. "Operation, Maintenance and Testing of Overhead Lines and Associated Outdoor Equipment on AC Systems," by R. C. Hatton and Dr J. McCombe.

Luton.—Luton Electrical Society. Public lecture on "Radar" by Dr. R. L. Smith-Rose.

Wednesday, November 14th.—*London.*—Institution of Electrical Engineers, 5.30 p.m. Transmission Section. "Recent Progress in the Design of the High-voltage Overhead Lines of the British Grid System," by W. J. Nicholls.

Edinburgh.—Heriot-Watt College, 6 p.m. I.E.E. Scottish Centre. "Operational Control of Electricity Supply Systems," by W. Kidd and E. M. S. McWhirter.

Sheffield.—Royal Victoria Hotel, 6.15 p.m. I.E.E. Sheffield Sub-Centre. Discussion on "The Choice of Control Gear for Works Low Tension AC Distribution Systems," to be opened by R. S. Bennett, L. H. Crowther, W. France and J. R. Phillips, M.A.

Birmingham.—James Watt Memorial Institute, 6.45 p.m. I.E.E. South Midland Students' Section. "Mica and Micanite," by W. B. Robertshaw.

Thursday, November 15th.—*London.*—Institution of Electrical Engineers, 5.30 p.m. Parsons Memorial Lecture: "High-voltage Research at the National Physical Laboratory," by R. Davis, M.Sc.

Glasgow.—University, 6.30 p.m. University Engineering Society. "Industrial Applications of Electronics," by J. H. P. de Villiers, B.Sc.

Swansea.—Guildhall, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. Address by J. B. J. Higham (chairman, Western Centre).

Friday, November 16th.—*London.*—Institution of Mechanical Engineers, 5.30 p.m. Thomas Hawksley Lecture: "The Scientist in Wartime," by Sir Edward V. Appleton, K.C.B.

Southampton.—Physics Lecture Theatre, University College, 6.15 p.m. British Institution of Radio Engineers. "Engineering Methods in the Design of the Cathode-Ray Tube," by Hilary Moss, Ph.D.

Bath.—I.E.E. Bristol Students' Section. "Brains Trust" meeting.

Saturday, November 17th.—*London.*—Connaught Rooms, W.C.2, 2.45 p.m. Institution of Engineers-in-Charge and Association of Supervising Electrical Engineers. Lecture: "Illuminating Engineering, or Putting Things in a Good Light," by R. O. Ackerley, A.M.I.E.E. The lecture will be preceded at 1 p.m. by a Victory luncheon at the invitation of the G.E.C.

Leeds.—Electricity Offices, Whitehall Road, 2.30 p.m. I.E.E. North Midland Students' Section. "Electrical Machinery for Ship Propulsion," by W. J. Belsey.

Manchester. — Engineers' Club, 3 p.m. Association of Supervising Electrical Engineers (Manchester Branch). "Pyrotenax Cables," by R. B. Barrett.

ELECTRICITY SUPPLY

War Damage at Stepney.

Barrow-in-Furness.—ALTERNATIVE SUPPLY.—The South Cumberland Electricity Supply Co., Ltd., which takes a bulk supply from the Corporation by means of a single line from Duddon Bridge to Silecroft, is pressing for the provision of an alternative connection into its network *via* the Millom town substation. The borough electrical engineer is to report on the cost of the scheme so that loan sanction can be obtained.

PROPOSED NEW TARIFF.—Regarding the proposed introduction of a new tariff for supplies to cinemas, shops and business premises, the Electricity Commissioners have informed the Electricity Committee that an alternative tariff does not call for approval, but the compulsory application of such a tariff requires the permission of the Ministry of Fuel and Power. The Committee has decided to seek the Minister's approval.

OVERHEAD LINES.—The Electricity Committee has obtained sanction to erect overhead lines to provide a supply to Coniston, Torver and Oxenpark.

Bath.—RATE RELIEF.—From the net profit of £7,998 on the Electricity Department it is proposed to transfer £5,747 to rate relief.

Belfast.—EXPEDITING EXTENSIONS.—A deputation from the Corporation last week had discussions with the Heavy Plant Committee of the Ministry of Fuel and Power with the object of ascertaining how the manufacture of the plant for the extension of the Harbour power station could be expedited.

Cardiff.—HIRE-PURCHASE SCHEME.—The Electricity Committee has adopted a hire-purchase scheme for electric cookers, limited to specified types and makes. The cash price, plus 17½ per cent., is to be paid over a period of seven years. Free maintenance will be given throughout the seven years, after which there will be a further three years' maintenance at a fixed charge. The wiring installation may be included in the hire-purchase agreement at the standard charge.

THE PENARTH UNDERTAKING.—The Parliamentary Committee has decided to promote a Bill to enable the Corporation to purchase the Penarth undertaking.

Chesterfield.—ASSISTED WIRING.—The Electricity Committee has decided that assisted wiring scheme for lighting shall be made available to consumers at a charge of 5s per quarter. For heating the charge will be 1s. per quarter per point.

Guildford. — MAINTENANCE OF DOMESTIC APPLIANCES.—As it would create a precedent and be unfair to consumers who have already purchased appliances, the Electricity Committee has decided that it cannot accede to a suggestion that the Electricity Department should maintain domestic appliances purchased outright by the Housing Committee for houses on the Stoke Hill estate. It is proposed to charge 15s. per house per annum.

Islay.—USE OF R.A.F. POWER PLANT.—The Islay Divisional Committee of Argyll County Council is suggesting to the North of Scotland Hydro-Electric Board that it should consider acquiring R.A.F. power stations in Islay from the Air Ministry to give electricity supply to the whole island.

Tynemouth Off-Peak Tariff.

London.—WAR DAMAGE.—In a statement by the Stepney Electricity Committee at the last meeting of the Council the provisional estimate of war damage claims in respect of the electricity undertaking was given as £328,422. Of this, £105,000 has already been paid by the War Damage Commission. At the end of March last a sum of £141,898 had actually been spent on war damage repairs and replacements.

Mansfield.—COAL CLAUSE CHARGE.—The coal clause charge of 0·015d. per kWh for each shilling a ton increase in the cost of coal is being amended to 0·013d.

Monifieth (Angus).—STREET LIGHTING INSTALLATION.—The authority of the Scottish Home Department has been obtained to the provision of street lighting at an estimated cost of £4,750. The contract has been placed with the General Electric Co., Ltd.

Norwich.—DEPARTMENT'S ACTIVITIES.—A new 33-kV overhead line has recently been constructed by the Electricity Department at a cost of £30,450. Arc-suppression coils and a compensometer have been installed on the rural networks at a cost of £3,600, and a scheme of reconstruction of the rural system costing approximately £13,500 is in hand. The Department is also converting five gas street lighting installations (involving 700 lamps) to electrical operation. Sanction has been obtained to loans of £11,140 for supplies to temporary houses, £10,000 for unspecified mains and services, £5,000 for unspecified substations and £5,000 for meters. It is interesting to learn from the city electrical engineer (Mr. J. A. Sumner) that the Department is at present erecting about a mile of overhead line each week and commissioning a new substation every ten days. Application has further been made for sanction to loans of £80,000 for cooker replacements, £10,000 for new hired cookers, £24,000 for "Ripple" control and £5,000 for meter testing equipment.

At the Thorpe power station a new de-aerator costing £2,000 has been installed and all h.p. boiler superheater soot-blowers are being changed to electrical operation at a cost of £2,890, while in addition one of these boilers is to be equipped throughout with this type of soot-blower as a test control boiler, at a cost of £3,500. A new superheater has just been installed on one of the l.p. boilers at a cost of £3,320 and after tests in conjunction with the makers and the N.P.L., all secondary superheater tubes on the h.p. boilers are to be replaced with molybdenum steel tubes at a cost of £6,000. A new steam manifold is being installed at a cost of £1,000 to replace a h.p. steam receiver that has failed through corrosion fatigue.

Ossett.—EXTENSION OF TIME.—The General Purposes Committee has decided to seek a further extension of the period within which the Corporation may purchase the electricity undertaking.

Paisley. — LOAN FOR EXTENSIONS. — The Electricity Advisory Committee has received

permission to borrow £23,200 for mains, plant and meters required for new housing developments.

Scotland.—OBJECTIONS TO FANNICH SCHEME WITHDRAWN.—The Secretary of State's Order confirming the North of Scotland Hydro-Electric Board's Constructional Scheme No. 3 (Fannich Scheme) has been laid before Parliament. All objections having been withdrawn, it has not been found necessary to hold an inquiry. Under the scheme a power station with an installed capacity of about 24,000 kW, at Grudie Bridge, in Strath Bran, will be fed by tunnel and pipeline from Loch Fannich. The estimated cost of the project is £960,000.

Sedgefield.—Overhead Line.—The Rural District Council has withdrawn its opposition to the erection by the North-Eastern Electric Supply Co., Ltd., of a 20-kV overhead line between Fishburn and Bishop Middleham.

Stafford.—CHANGE-OVER.—Having considered a report by the electrical engineer on supplies from the DC distribution system, the Electricity Committee reports that preliminary steps are being taken, with the concurrence of the Electricity Commissioners, to proceed with a scheme of compulsory change-over to AC supply as soon as circumstances permit. Presenting the report Mr. H. Joynes (chairman) referred to the recent breakdown in the electricity supply on the DC circuit and said that the Committee had failed in the past in not replacing these mains, which were over 40 years old; it might surprise some members to know that they were laid not more than 18 inches under the road surface.

Staveley.—FRINGE ORDER.—At a meeting of the Urban District Council, consent was given to an application by the Notts & Derby Power Co., to the Electricity Commissioners for a Fringe Order enabling the company to afford a supply to 78 houses in course of erection at Hartington. The consent was without prejudice to the opposition of the Council and other local authorities to the application of the company for the North Derbyshire Electricity (Extension) Special Order, and also without prejudice to any application by the Chesterfield Corporation for the right to supply and distribute electricity within the urban district of Staveley.

Tynemouth.—OFF-PEAK SUPPLIES.—The electrical engineer recently reported that with the reversion to Greenwich time the peak load might be anticipated to occur again between the hours of 4 and 5 p.m. He therefore recommended that the cut-off tariff should be reintroduced, thus enabling consumers previously supplied on this tariff to obtain electricity at a cheaper rate, provided they were in a position to curtail their consumption during the hours of the peak load. The Committee agreed to the proposal.

PURCHASE OPTION.—After discussions with the North Eastern Electric Supply Co., Ltd., with regard to the proposed purchase by the Corporation of that part of the company's undertaking within the borough at New York, the Electricity Committee has decided to seek an extension of the time for the exercise of the purchase rights.

Wallasey. — LOANS. — The Electricity Committee is seeking sanction to borrow £2,538 for mains and services to the Moreton housing estate and £2,500 for substation equipment.

Wigan.—NEW POWER STATION.—The Town Council has received directions from the C.E.B. to proceed with a new generating station.

Wrexham.—FARM SUPPLIES.—The North Wales and South Cheshire Joint Electricity Authority proposes the extension of supplies of electricity to forty more farms.

Overseas

Australia.—MUNICIPAL TRADING PROPOSAL.—Melbourne City Council is recommended by the Finance Committee to approve a proposal that the Council should sell electrical appliances.

HUME PROJECT.—At a recent conference of Federal and State Ministers in Melbourne a decision was made to electrify the Hume area at a cost of between £900,000 and £1,250,000. The work will be undertaken in conjunction with the enlargement of the Hume weir and the proposed new hydro-electric plant will be linked up with the Kiewa and Burrinjuck systems and the existing Victorian network.

STANDARDISATION OF SUPPLY.—The Western Australian Electricity Advisory Committee has recommended that all electricity supplies shall be standardised at 440/250 V, 50 cycles.

Belgium.—POWER FROM GERMANY.—Electric power from Germany will be available shortly to Belgian and Dutch industries and homes by a reversal of a scheme planned by the Germans during the war to supply electricity generated in Belgium to Germany. With the approval of the British Military Government a Belgian firm has now constructed the major portion of the missing links in the transmission lines which the Germans were building from Brauweiler power station, near Cologne, *via* a station at Jupille, to the Belgian power system.—*Reuter.*

Canada.—DE CEW PLANT EXTENSION. — Enlargement of the De Cew Falls generating plant is to be undertaken immediately at a cost of $7,000,000. The extension, one of the major post-war projects of the Hydro-Electric Power Commission of Ontario, will double the capacity of the plant, which is located in the Niagara Peninsula south of St. Catharines. A second unit of 70,000 HP will be installed and put into service by the autumn of 1947.

TRANSPORT

Rotherham. — TROLLEY-BUSES. — The Town Council proposes to promote a Bill in Parliament to revive the Corporation's powers under the Rotherham Corporation (Trolley Vehicles) Order Confirmation Act, 1934, with reference to certain trolley-bus routes and to authorise further trolley-bus routes.

Sheffield. — COLOUR-LIGHT SIGNALS. — Colour-light signals have been installed at Sheffield (Bridgehouses) on the L.N.E.R. Manchester-Sheffield main lines which is eventually to be electrified.

Tyneside.—A TUBE RAILWAY ?—A committee representing various trade unions on Tyneside, has been set up to consider making representations to the Government for the construction of a tube railway on Tyneside.

Technological Education

The Percy Committee's Recommendations

IN April last year a committee was appointed under the chairmanship of Lord Eustace Percy to consider the needs of higher technological education in England and Wales and the respective contributions to be made by the universities and technical colleges. The report of this Committee (of which Sir George Nelson and Sir Lawrence Bragg were members) has now been issued by the Ministry of Education (Stationery Office, price 6d.).

The Committee considers that the need on the part of industry for men of high quality and qualifications is of extreme importance. To meet it, not only must the best products of the secondary schools be encouraged to enter industry, but there must be close co-operation between industry and education on the one hand hand and between universities and technical colleges on the other.

The Numbers Needed.

During the war the annual " output " of these institutions has risen to about 2,700 and the Committee estimates that this figure must be maintained for the next ten years. The universities are estimated to be able eventually to produce 1,200 engineering graduates per year which would leave some 1,500 to be produced by the technical colleges. It is considered that there is a need for a new type of technical college course demanding substantial periods of full-time study; the remainder of the working year should be occupied by a planned course of works practice. The standard of this course should be equivalent to that of a university degree but its content should be different.

To achieve this and other necessary reforms, the Committee recommends :—1. The establishment of eight Regional Advisory Councils in England and Wales to co-ordinate technological studies in universities, colleges of technology and other technical institutions. Each Council should establish an Academic Board to ensure co-ordination on the teaching level and there should be arrangements for adequate representation of and consultation with industry on both the Council and the Board. 2. The establishment by the Minister of Education of a National Council of Technology to advise on national aspects of regional policy. 3. The selection of a limited number of colleges as colleges of technology to provide full-time courses, as well as facilities for post-graduate studies. For engineering, about six colleges are suggested, excluding the London area.

The report is unanimous, except on the question of the title of the award to be given at the end of the courses. Some members think that the National Council of Technology should be empowered to confer degrees with the title of Bachelor of Technology (B. Tech.); other members hold that, as the technical training to be given is to be different from, though comparable with, that given in universities, it should lead to a different title, such as Diploma in Technology. Both parties agree that two or three years' post-graduate study, culminating in a piece of original research, done under supervision, should lead to a higher award, corresponding with the Ph.D., which might be entitled Tech.D. The chairman, in a separate note, suggests that some, at least, of the selected colleges of techology should be developed into university institutions, granting their own degrees but that, for the present, they should be designated as Royal Colleges of Technology with courses leading at first degree level to an " Associateship of the Royal Colleges " and at post-graduate level to a " Fellowship."

The Regional Advisory Councils should associate themselves with a national campaign to increase the prestige of the technical professions; that industry should enable promising employees to take full-time courses at universities and technical colleges, including those who entered industry at an early age, and that there should be an easy path for such boys to return to full time education, no matter how young they may enter industry; that the national scholarship system should be adopted so as to help the student returning to full-time education from industry and that the State bursary scheme, overhauled as necessary, should be continued; and that arrangements should be made to enable teachers to keep up-to-date in industrial technique by returning to industry for substantial periods and by securing teaching or industrial experience abroad.

Women and Electricity

TO mark twenty-one years of progress the Electrical Association for Women has just published a book entitled " Electricity and Women " (price 5s.). Its author is Mr. Wilfrid L. Randell, who was present at the inaugural meeting of the Association in 1924 at the house of Sir Charles and Lady Parsons, and who has closely followed the E.A.W.'s activities ever since. After reviewing the early days of electrical science and the origin of the Association, its aims and objects, the author details some of its numerous achievements not only in the field of electrical education and training but in social and domestic progress generally. A chapter on the E.A.W.'s activities during the war emphasises the variety of services performed, while with regard to the future the investigations undertaken in connection with the electrical requirements of the housewife should prove of inestimable value. The concluding chapter gives an insight into the remarkable personality of the director, Miss Caroline Haslett. Mr. Randell has included a number of amusing anecdotes, together with humorous sketches by Edgar Spenceley.

Industrial Design

Plans for Next Year's Exhibition

THE president of the Board of Trade (Sir Stafford Cripps) was the principal guest at a luncheon organised in London last Friday by the Council of Industrial Design. Those present represented many branches of industry and Sir Thomas Barlow, chairman of the Council presided. In introducing Sir Stafford Cripps, the chairman said that the coming of peace had given the Council many practical opportunities the principal of which was the possibility of holding a big exhibition in 1946, a year earlier than they had hoped. The project would have the support of British manufacturers although they had emphasised the urgent need of securing skilled craftsmen back from the Forces and keeping those they had.

Sir Stafford Cripps proposed the toast "British Industry—Success through Good Design," saying that the exhibition mentioned by Sir Thomas Barlow was a "well-calculated act of national policy, of first-class importance to the export trade and to the home consumer alike." He asked every industrialist present and the entire civilian goods industry of the country to accord the exhibition every possible support. There had been talk of 1951, the centenary year of the Great Exhibition. But that was six years off and we could not wait that long to give our country a lead or to offer British industry a chance to show its achievements to the world.

Design was a factor of crucial importance to British industry. It was good business at home and most certainly abroad. Even mass-produced goods should not be ugly. We should have plenty of competition from other countries but we had the designers and they should be given their chance. He promised that his Department would afford all possible assistance to firms which were preparing for the exhibition.

Replying to the toast, Lord Woolton said that he was satisfied that if in other fields of production the Government gave the same encouragement to designers as had been given during the war to the engineering industries there was in the British race the innate talent which would develop the capacity to meet all requirements. Sir Allan Gordon-Smith also replied.

The Exhibition

Some details of the Exhibition proposals were made available at the luncheon. It will open not later than July 1st next year and will be on a considerable scale. It will represent the best that modern British industry can produce both new designs and good established models. It will be sponsored by the Council of Industrial Design and financed by the Government. Space will not be sold and individual firms as such will not be exhibitors; all the goods shown will be selected by the Council through expert committees. The purpose of the Exhibition will not be primarily commercial but the catalogue will give the names of the manufacturers of each article shown and interested inquirers will have facilities for getting into touch with them. Manufacturers will be asked to allow the name of the designers of articles shown to be published wherever possible.

An attractive and logical method of grouping the exhibits will be employed. Among the commodity groups which will be included are domestic and kitchen equipment and machinery; heating and cooking appliances; and radio and television.

Public Ownership of Communications

THE Chancellor of the Exchequer announced in the House of Commons last week that the Government had decided to accept the recommendations of the Commonwealth Telecommunications Conference recently held in London, following upon a report on the subject by Lord Reith. The Conference recommended that all the Commonwealth overseas telecommunications services should be taken over by the respective Governments and that a new board with wider functions should take the place of the existing Commonwealth Communications Council. The members of the Commonwealth would provide financial contributions for the maintenance and use of the cable system. Mr. Dalton pointed out that this would mean the transfer of the overseas communications services now operated by Cable & Wireless, Ltd., to public ownership.

Combine's Statement

Consequent upon the Chancellor's announcement the board of Cable & Wireless (Holding), Ltd., has informed shareholders that they had strongly opposed the scheme as inimical to the interests of the peoples of the Empire and to all classes of telecommunications users. The directors contend that no complaint has been made of the way in which the operating company and its associated companies have operated their services; in fact the general efficiency of the undertaking has attracted most favourable comment.

Nevertheless as the Government has decided to act upon the recommendations the directors have no option but to explore informally the question whether it will be possible to reach agreement on the price to be paid for the operating company's shares. They emphasise that the proposals do not envisage a change to Government ownership of Cable & Wireless (Holding), Ltd., or other companies of the group.

Dutch Government to Assist Philips

In appreciation of the Philips lamp and radio organisation's wartime services and its efforts to prevent the deportation of Dutch workmen to Germany, the Netherlands Government is to grant the company important credits to aid its recovery, it is learned.—*Reuter.*

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Philco Radio & Television Corporation of Great Britain, Ltd.—Mr. L. D. Bennett, chairman and managing director, in a statement circulated with the report and accounts, said that since 1938, under difficult wartime conditions, they had produced goods to the limit of their capacity, recovered the whole of their deficit of over £318,000, restored preference dividends and funded all arrears, inaugurated the preference capital redemption fund, and provided for two years' dividends on the ordinary shares. This had been achieved as a result of relatively large-scale manufacture, rather than by a high rate of profit on turnover. Illustrative of their war-time products, he mentioned radar and radio apparatus, components for Browning, PIAT, Sten and A.A. guns, cable for degaussing as well as for other purposes, and electric motors and generators for all the Services.

Dealing with points raised by the auditors, the chairman said that it had been the considered policy of the board since 1939 to expand and diversify the nature of the company's activities. They felt that this could best be achieved by acquiring, during the war, interests in established businesses. They had every confidence that the prices paid would be more justified by the results to be obtained. Regarding advances to an associated company, he said that the directors felt there was every reason to expect full recovery of the amounts involved. On the realisation of stocks acquired in connection with Government contracts, he saw no reason whatever to anticipate a loss.

After dealing with the bank loan, new capital issue, activities of subsidiaries and other matters, the chairman said that the directors considered that future prospects were good, bearing in mind the equipment, manufacturing resources and technique which the company and its subsidiaries now possessed. He mentioned that they had felt it necessary to reorganise the export side by forming an export sales company for the world-wide distribution of all their products.

The London Electrical & General Trust, Ltd.—Presiding at the company's annual meeting the chairman, Mr. A. R. Guinness, said that the market value of their investments showed an increased appreciation on the book value, and taking this into account their capital and surplus were intact with a margin of £216,000, or approximately 34 per cent. Regarding E.P.T., he said that the reduction would give satisfaction on all sides, but the limit placed upon the period during which deficiencies could be set against past payments might result in the disappearance of part of what had come to be regarded as a "cushion" against transitional losses.

The Atlas Electric & General Trust, Ltd., held its annual meeting in London last week. Mr. D. M. Touche, chairman, said that the general investments stood in the balance-sheet at their cost price of £5,756,223, and showed an appreciation at the date of the balance-sheet, when taken at market prices, of £1,018,554, which was 17·69 per cent. on their book cost. This was an improvement of £627,767 on the year, which worked out at just over 10 per cent. on their market value at the beginning of the year. With regard to the affairs of La Sociedad Comercial de Montevideo, this was the sixteenth year that the Atlas Electric and General Trust had received no return whatever on its vast investment in the tramway system of Montevideo.

Erinoid, Ltd.—Mr. W. G. Waldron (chairman) stated at the annual meeting that the demand for the company's products had been intensified and was considerably greater than the available supply. Despite the company's appreciable contribution to the war effort, every endeavour was made throughout the war to keep alive the export connections in other than occupied countries and it was gratifying to note that exports for this year had increased by approximately 15 per cent. They were, however, still a long way short of the pre-war proportion of over 50 per cent. of the total output.

Regarding the Erinoid Societe Anonyme, he said that the French factory was intact and recommenced operations in June. Apart from France, they had not yet been able to establish any contact with their agents in any of the formerly occupied countries.

Cinema-Television, Ltd., reports a trading profit for the year ended April 30th amounting to £113,678 (£95,908). The net profit is £50,372 (£42,177), and the carry-forward £84,181 (£33,809). The chairman states that the current liabilities are amply covered by liquid assets and it is not expected that this margin of cover will be reduced as a result of operations for the current year.

Sydney S. Bird & Sons, Ltd., have called a meeting for November 12th to consider an increase in the capital of the company to £65,000 by the creation of 150,000 new ordinary shares of 2s. each.

Drake & Gorham, Ltd., are repeating the dividend of 5 per cent. in respect of 1944-45. The net profit rose from £10,173 to £12,104.

The Metropolitan Electric Cable & Construction Co., Ltd., is again paying an interim dividend of 5 per cent.

Burco, Ltd., reports a net profit for the year ended September 30th of £21,969 (against £16,478). The dividend for the year is raised from 15 to 20 per cent.

Glenfield & Kennedy, Ltd., propose to pay an interim dividend of 5 per cent., the same as last year.

New Companies

Sydney Nott & Co., Ltd.—Private company. Registered October 9th. Capital, £5,000. Objects: To carry on the business of electricians, mechanical engineers and manufacturers of radio and television, etc. Directors: J. G. S. Nott and Mrs. Grace E. Nott, both of 7, Highland Road, Bromley. Secretary: Grace E. Nott. Registered office: 7, Highland Road, Bromley.

Arthur F. Tobbell, Ltd.—Private company. Registered October 10th. Capital, £2,000. Objects: To carry on the business of manufacturers of, and dealers in, electrical goods, etc. First directors: F. Moore, Vesper Gate Hotel, Abbey Road and A. F. Tobbell, 20, Vesper Gate Crescent, both Leeds, 5. Registered office: 19, Park Place, Leeds, 1.

Rolamatic, Ltd.—Private company. Registered October 26th. Capital, £5,000. Objects: To carry on the business of general mechanical and electrical engineers, etc. First directors:—C. Anderson, Courtlands, 2, Stapleford Road, Wembley, Middlesex, and three others. Registered office: 3-4, Clements Inn, Strand, W.C.2.

Luminax (1945), Ltd.—Private company. Registered October 23rd. Capital, £1,000. Objects: To carry on the business of wireless and electrical engineers and contractors, television sets and accessories, etc. Subscribers: Daphne Liff, 30, Wellesley Court, W.9 and J. Casson, Callard House, 74a, Regent Street, W.1. Secretary: Daphne Liff. Registered office: Callard House, 74a, Regent Street, W.1.

William Hartley & Co. (Swansea), Ltd.—Private company. Registered October 17th. Capital, £500. Objects: To carry on the business of mechanical, assembling, electrical, radio, lighting, telephone, mechanical and general engineers, wireless experts, etc. Permanent directors: A. W. M. Hartley and Catherine M. Hartley, both of The Cedars, London Road, Shrewsbury, Salop. Registered office: 20-21, Orchard Street, Swansea.

Mortgages and Charges

Trans-Heat, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated August 30th, to secure all moneys due or to become due from the company to Martins Bank, Ltd.

Westool, Ltd. — Mortgage on 77, High Seymour Street, Bishop Auckland, Co. Durham, dated October 6th, 1945, to secure £550. Holders: Bishop Auckland Rock Building Society.

Liquidations

Anglo-American Electrical Appliances, Ltd.—We regret that in our October 26th issue the liquidator's name was incorrectly given. It should have been: Mr. Maurice Grose, Cliffords Inn, Fetter Lane, E.C.4.

Leominster Electric Supply Co., Ltd.—Particulars of claims to the liquidator, Mr. A. M. Scott, 24-30, Gillingham Street, London, S.W.1, by November 20th.

NEW PATENTS

Electrical Specifications Recently Published

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

ABBEY (G. Halldorsson).—"Dish-washing and like machines." 6296. April 4th, 1944. (572623.)

Aircraft-Marine Products, Inc.—"Connectors for electrical wiring." 15925/43. September 25th, 1942. (572620.)

R. C. Braithwaite and Metropolitan-Vickers Electrical Co., Ltd.—"Mechanical relays of the fluid jet type." 14724. September 30th, 1940. (572631.)

British Thomson-Houston Co., Ltd.—"Electric circuit-breakers having arc extinguishing compression chambers." 9811/43. June 23rd, 1942. (572603.) "Butter conditioners or receptacles in refrigerators." 14424/43. September 3rd, 1942. (572608.) "Automatic reclosing circuit-breaker systems." 10036/43. June 23rd, 1942. (572709.) "Methods of treating materials and articles to render them water repellent." 14705/41. November 16th, 1940. (572740.)

D. F. Campbell, S. G. King and Electric Furnace Co., Ltd.—"High-frequency heating systems." 18917. November 13th, 1943. (572692.)

Ferranti, Ltd., E. Grundy, E. S. Cluderay and P. B. N. Nuttall-Smith.—"Integrating mechanisms." 1731. January 29th, 1940. (572598). "Integrating mechanisms." 12852/41. January 29th, 1940. (Divided out of 572598.) (572733.)

General Electric Co., Ltd., and D. C. Espley.—"Impedance transformers comprising transmission lines." 14502. November 11th, 1941. (572739.)

General Electric Co., Ltd., P. E. Ackland-Snow, I. L. Fairen and R. S. Rivlin.—"Electrical calculators." 12707. October 1st, 1941. (572731.)

Hoover, Ltd., and A. W. G. Goode.—"Electric motors." 1101. January 21st, 1943. (572743.)

Jackson Boilers, Ltd., and C. W. Mustill.—"Thermostatic control of self-feeding water heaters." 14609. September 7th, 1943. (572610.)

E. W. Mortimer and Garrard Engineering & Manufacturing Co., Ltd.—"Gramophones, radiograms and the like." 18409. November 5th, 1943. (572688.)

Sangamo Weston, Ltd., and M. S. Snell.—"Instrument type relays." 7378. April 21st, 1944. (572754.)

Siemens Bros & Co., Ltd., T. H. Larke and F. G. Kny-Jones.—"Manufacture of dry cells." 6984. April 15th, 1944. (572658.)

Simmons Development Corporation, Ltd.—"Telemetric system and transmitters therefor." 19187/43. November 17th, 1942. (572716.)

Soc. Anon. Vitos.—"Starting and regulating rheostat for small electric motors." 3380/40. February 22nd, 1939.

Svenska Turbinfabriks Aktiebolaget Ljungstrom.—"Radial flow elastic fluid turbines." 6669/44. April 27th, 1943. (572657.)

Telephone Manufacturing Co., Ltd., R. St. G. Terry and J. W. Holt.—"Shock-resisting relays and switches." 18239. November 3rd, 1943. (572686.)

STOCKS AND SHARES

TUESDAY EVENING.

SINCE the advent of the Labour Government to power, Stock Exchange business has been steadily on the increase, week by week, almost day by day. Prices have shown an all round disposition to improve. Ironical as it may appear, conditions under the Labour Government have favoured recoveries, substantial in many cases, in prices of industrials and gilt-edged securities. Mining markets are, of course, a law unto themselves and are little affected by domestic politics.

Stock Exchange Activity

One day last week the number of recorded transactions in Stock Exchange markets reached the highest touched for several years past. This gives an indication of the activity that prevails in most of the markets round the House. During the past month it has become more and more difficult to move about the floor of the Stock Exchange, the numbers of returning members and clerks having greatly increased since demobilisation started in earnest. The expansion of population has a direct effect upon business, because the returned Service men are all eager to justify their civilian existence by presenting investment opportunities to the public. In this they are assisted by the cheap money policy of the Government.

Cable & Wireless

Cable & Wireless stocks have been centres of lively activity on the decision of the Government that the telecommunications services of Cable & Wireless, Ltd., shall be transferred to public ownership. The stocks held by the public and the Government are those in the Cable & Wireless (Holding). The price of the ordinary less than a month ago was 90, when the preference stock was standing at 112. The latter fell to 108 ten days ago on a hasty assumption that if the combine were to be liquidated, the preference stock would be paid off at 100. A day later, the Government decision was announced, and the price of the preference shot up to 120. This brought in immediate sellers whose realisations reduced the price to 116; the ordinary stock held fairly firmly around 99. Globe Telegraph & Trust ordinary shares rose in sympathy to 45s., and the preference shares to 31s. 6d.

The directors of Cable & Wireless have vigorously protested against the Government action and there, for the moment, the matter rests.

Home Electricity Supply

Recent improvements in the prices of the ordinary shares of electricity supply companies have been carried further. The ordinary shares in such companies as Metropolitan Electric, Midland Counties and Yorkshire Electric, show yields of a little under 4 per cent. on the money, while in other cases where the return is higher, difficulty prevails in obtaining any reasonable supply of shares. The opinion is frequently heard in the Stock Exchange that it will be a long time before the Government is able to bring forward any tangible scheme for nationalisation of the electricity supply companies, and that when it does, the proposals, so far as can be judged at present, will not necessarily penalise holders of the ordinary shares.

Good Markets

Equipment and manufacturing shares are mostly higher where alterations have taken place. High priced shares such as Consolidated Signal 6⅞, Tube Investments 5¾, and International Combustion 8½ fully hold their gains. Ransome & Marles 96s. 3d., Johnson & Phillips 83s. 6d., Ever Ready 45s., Hopkinsons 86s. 3d., Revo 48s. 9d. and Reyrolle 76s., are amongst other that show improvments. In the list of lower-quoted shares, Newman Industries rose to 8s. 6d.; Allen Wests at 8s. 9d. and Veritys at 8s. 3d. have gained 6d. each. H.T.A. at 28s. recovered the 1s. lost a fortnight ago. Crabtree and Christy Bros. at 46s. and 77s. 6d. are harder. Westinghouse Brake recovered to 80s. De La Rue lost 2s. 6d., going back to 11⅛, and Associated British Engineering ordinary are dull at 51s. 3d.

Telephone Shares on Offer

Attention recently called to shares in the telephone and telegraph section has led to a rise in prices, which had the effect of tempting a few shares to market. For example, there are on offer at the present time 3,000 Telegraph & General Trust at 41s. 6d., paying 4½ per cent. on the money, income tax being deducted at 8s. 6d. in the £. The useful block of 4,000 Anglo-Portuguese Telephones has become available at 30s. returning £5 6s. 8d. Telegraph Manufacturing at 14s. 6d. afford about £3 2s. per cent. and Telephone Properties at 23s. 6d. pay £5 2s. 2d. Ericssons at 58s. give £1 14s. 6d. per cent. net. Automatic Telephone ordinary cost 73s., and the " B " 70s. 6d., at which the respective yields are £3 8s. 6d. and £3 11s. per cent.

Radio Companies

Pye deferred are a good market, at 36s., the company having announced a new invention in the field of television. The 5s. shares on the present-paid 25 per cent. dividend give a return of £3 10s. per cent., which is more than can be obtained from shares in most of the other companies in this group. Prices, apart from Pye deferred, are heavy. The fall started with a sudden drop to 9s. 6d. in Philco. This was followed by falls to 41s. 6d. in Cossors and to 32s. in E.M.I. The slant in the shares brought in support and a partial rally occurred in Philco to 10s. 6d. E. K. Cole held their previous price of 37s. 6d.

Television Equipment

System Which May Lower Cost

THERE was a demonstration last week at the Cambridge factory of Pye, Ltd., of a system differing materially, in so far as the transmission of accompanying sound is concerned, from those hitherto employed. It was deemed expedient publicly to announce the invention at once because of the belief that experiments on somewhat similar lines are proceeding in America.

The " Videosonic " system has been designed and developed in the company's laboratory at Cambridge. The apparatus demonstrated (constructed during the last six months) utilised a " live " broadcast from the factory studio and transmitter; the receivers (built during the preceding ten days) were about half the overall size of their predecessors.

Hitherto it has been necessary to provide transmitting equipment composed of two distinct single-purpose elements, one for conveying the picture and the other for the accompanying sound; viewers have likewise had to operate separate reproducing sets, usually accommodated within one cabinet. The Pye apparatus introduces a means of enabling a single dual-purpose element to perform both functions, as it were, so promising a material reduction of cost both to authorities conducting television services as well as to the public.

Use of Idle Intervals

The " Videosonic " system does not need a separate sound component; instead it utilises the short idle intervals of the scanning swing-back between the transmission of picture elements. Each of these periods represents rather more than one-tenth of the total transmission time, each lasting for ten millionths of a second, so just over ten thousand of them occur every second. Without interfering with the present degree of picture definition 10,125 of these sound interjections can be transmitted per second, being injected in the form of pulses of a similar character to those comprising a " Radar " beam.

Modification in this manner of the transmitted wave form enables both vision and sound signals to be accommodated on a single carrier. Separation in the receiver is done by electrically " clipping " the pulses and filtering them before they are made to operate the loudspeaker.

Modulation of the injected pulses in conformity with the sound waves may be likened, diagrammatically, to variation of their width (but not height) within the limits of one-millionth and five-millionths of a second, with a mean of three-millionths. Since the level of the sound pulses does not need to vary, additional modulation " in height " could be employed for conveying a third set of signals for operating automatic gain control to compensate for picture fading.

Other advantages claimed for the Pye system include elimination of the possibility of interference between vision and sound pick-up, thus rendering it simpler to make a more efficient receiving aerial. Less frequency space would be required for television services, since it would not be necessary to allocate two frequencies to each transmitter. Simplification of reception should improve fidelity of sound, because of a substantial reduction of noise.

Lincoln Extensions

Foundation Stone Laid

THE foundation stone of the extensions at St. Swithin's power station, Lincoln, was recently laid by the Mayor (Councillor H. Bennett), using a silver trowel presented to him by the chairman of the Electricity Committee (Alderman J. W. Rayment). The company, including Lord Barnby (Central Electricity Board), were then taken on a tour of inspection of the works by the city electrical engineer, Mr. F. Newey.

Later Lord Barnby, proposing the toast of " The Electricity Undertaking," said that the extensions were to have been completed in 1946, but owing to delays they would not now be finished until the following year. During the pre-war and war years the load in Lincolnshire had shown a phenomenal growth and the extensions were urgently required to meet the increased demands. Speaking of the country's industrial future, he said that if we were to keep pace in production with the rest of the world mechanisation of industry would have to be carried out on an unprecedented scale. The horse-power per operative worker in our factories in 1938 was only 3·5 compared with 6·3 in America in 1939. To reach the American figure some 25,000,000 HP of electric motors would be needed in factories, and the immediate task would be to double the horse-power of industrial equipment in this country.

Alderman Rayment, responding, said that the ultimate cost of the extensions would be nearly £1,500,000. He paid tribute to the work of Mr. Newey and his staff, pointing out that the specifications and drawings for the mechanical and electrical engineering work had been carried out by them, which had resulted in a substantial saving. Part of the plant would be available during the early months of 1947 and, if humanly possible, the whole scheme would be ready by the winter of that year.

Iron and Steel Institute

The autumn meeting of the Iron and Steel Institute is being held at the Chartered Surveyors' Institute, 12, Great George Street, London S.W.1, on November 22nd and 23rd. The papers will include one on " Dolomite Linings for Basic Electric Arc Furnaces," by E. C. Brampton, H. Parnham and J. White.

Invention and Patents

Suggestions for Improving Present Procedure

By W. E. Burnand, M.I.E.E.

ALL patents should start as inventions, but not all inventions are patentable. An invention may be defined as "anything differing from what has previously existed that is produced as the result of *active* thought." As a result of personal experience with inventions and patents extending over fifty years, including their first inception and development to a commercial form including the collection of the money, I am convinced of the truth of the dictum that "invention is 10 per cent. inspiration and 90 per cent. perspiration." So-called inspiration ("the idea flashed into my mind") is usually the result of someone else's previous mental work and gives no solid ground for applying for a patent. The failure of our patent system is largely due to non-recognition of this fundamental truth. Reward should therefore be for perspiration rather than for inspiration which is passive.

Anticipated Ideas

The commonest experience of an applicant for a patent is to find that his invention has been anticipated in whole or in part. Developments and combinations resulting from experimental *work* and experience beyond the original idea are not so likely to be anticipated. If the development is merely a further "inspiration" it is just as likely to have been anticipated as the initial idea. Normally far more work and thought is required in devising jigs, tools and processes before an invention can be put on the market than was needed for the invention itself.

The starting point of an invention is a mental and psychological process that always precedes the physical structure. It constitutes the main source of "inspiration" that is no more the passive observer's invention than ideas culled from a book. Just as these may be the starting point for further mental progress, so may an inventor's idea be developed into physical progress which results in real invention.

If ideas not of one's own creation can be picked up from the surrounding mental atmosphere, it would appear that the function of the brain in this is only to aid their expression in tangible form. It is therefore not unreasonable to expect thought at times to be ahead of the brain and to arrive at correct conclusions, although the intermediate steps escape definition. This type of "jumping to conclusions" involves extra-mental work which is differentiated by correctness of results from guessing.*

Defects of Existing System

The fundamental defects of the present patent system are the uncertainty of securing any protection and the cost of enforcing or proving validity. Taking the latter first, the defect is mainly due to technical matters being dealt with by a legal Court. This causes delay arising out of the introduction of irrelevant matters that would not be brought in if cases were tried before a specially constituted Court. The retaining of eminent counsel and expert witnesses is often suspected to be due to their ability to impress the Court rather than their special knowledge of the matters in dispute.

The remedy appears to lie in the provision of a special Court to deal with patent matters with arbitrary powers going right back to first principles. In the early days of Letters Patent, the monarch at his discretion, granted patent rights, more or less exclusively to persons or associations, giving them control over specified manufactures at his discretion. While these manufactures were few and not complex this system worked well—much better in fact than the present system, and greatly encouraged the development of industry. However, in course of time complexity increased, abuses crept in, and patents or monopolies were in many cases granted to the great detriment of the general community. Finally the whole system was swept away and the beginning of the present system substituted and modified from time to time.

Invention Discouraged

Now again the system is outgrown—in fact we should, in my view, be better off without it, since a part of the costs of litigation and patent fees might then be spent in real development with corresponding

* See also paper read by the author before the I.E.E. Sheffield Sub-Centre, January 21st, 1925.

benefit to the community. The system as a whole discourages invention by high patent fees, uncertainty as to the protection afforded, certainty of heavy expense in upholding this very uncertain quality of protection and the ever-present apprehension that, if an invention is successfully developed, some prior patent may be discovered that will deprive the parties responsible for this development of their due benefits.

Powers of Special Court

As a means of improving the position I would tentatively suggest that, while retaining the present patent specification and search for priority, a Court should be set up with absolute power to deal exclusively with patents and monopolies. The Court would consist of *technically* trained persons, *assisted* by legal persons in an advisory capacity and by technical advisers nominated by the leading scientific and technical societies. There would be a permanent staff to keep records and to keep in touch with latest developments.

The cost of the Court should be borne by the State as being for the encouragement of invention, manufacture and commerce for the benefit of the community. The Court should have powers to grant patents, make awards to inventors, adjudicate on licence disputes, decide priorities, apportion royalties and grant monopolies (with a time limit).

Perhaps the most valuable function of such a Court would be its control over the working of patents and monopolies. Having these powers, it could grant a monopoly to a competent firm for a certain number of years for a new process or manufacture untrammelled by the question of prior patents. If the prior patentee or inventor is not able to give the public the benefit of his invention, through inability to manufacture or put it on the market (directly or otherwise), the firm able to deliver the goods should be given a monopoly, exclusive of the original inventor, or otherwise, according to circumstances.

Award to Original Inventor

Bearing the fact in mind that, but for the original inventor, the bringing out of the new device or process might have been much delayed, the Court should make what it considers a suitable award, either by a direct grant or by fixing a royalty, to be paid by the working company. The royalty would be reviewed, say, every four years to preserve as near as possible a fair balance between the public, the working body and the inventor.

In time the Court might gain sufficient experience to draft a series of rules governing the manner in which the benefits arising from an invention should be divided, but in view of the great diversity in character and value of inventions this looks remote. A division that would suit a certain proportion of cases would be 50 per cent. to the public, 20 per cent. to the manufacturer, 15 per cent. to the organisation developing the invention to marketable form and 15 per cent. to the inventor. In many cases the last two or three would overlap. These percentages relate to financial benefit arising from the invention, which would be one-half to one-tenth of the selling price.

Patent fees ought to be greatly reduced, particularly the annual renewal fees, which might well be kept substantially at a constant figure instead of rising £1 per year annually. The cost to the Government is slight, consisting in sending a receipt for the money paid, so that total income would doubtless be increased, since at present few are kept up for the full period of sixteen years.

Under such a system the taking out of patents with a view to blocking a competitor's progress would lose some of its attractions. In the event of the working of any patent being discontinued, it would be open to anyone who thought that he could make something of it to obtain some limited monopoly if this appeared desirable in the interests of the community, due acknowledgment being made to the originators.

Regional Boards for Industry

THE Regional Production Boards have now been reconstituted by the President of the Board of Trade as Regional Boards for Industry, and will in future exercise their activity over the whole field of productive industry instead of being chiefly concerned with the production of munitions. The Boards each consist of an impartial chairman, together with three representatives of employers and trade unions, and the senior regional representatives of the Board of Trade, Admiralty, Ministries of Labour and National Service, Supply and Aircraft Production, Food, Fuel and Power, Town and Country Planning, War Transport, Works, and in Scotland, the Scottish Office. Representatives of other Departments will attend meetings when necessary. The Boards will advise Ministers on steps which may be necessary to bring regional resources in productive capacity or labour into fuller use. Other duties will include those of keeping local industry advised of Government policy in relation to industry, and keeping headquarters informed of the views of industry.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

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

Australia.—NEW SOUTH WALES.—December 13th. Sydney County Council. Electrically operated overhead travelling cranes for Pyrmont "B" power station. Spec. 784.

VICTORIA.—February 4th. Melbourne and Metropolitan Tramways Board. Transformer for operation with 600-kW B.T.H. pumpless rectifier (tender 1362); time relays (tender 1363); and power-driven earth boring machine (tender 1364).

Bury.—November 19th. Electricity Department. Two 750-kVA transformers. (See this issue.)

Kettering. — November 28th. Electricity Department. E.h.v. and l.v. paper-insulated, lead-covered armoured cables. (November 2nd.)

Manchester.—November 26th. Electricity Department. Capstans and bollards; surge and make-up water cast-iron tanks, etc., for Stuart Street generating station. (November 2nd.)

New Zealand.—November 29th. Trolley-bus overhead equipment. Wellington City Council.

North West Midlands.—November 26th. Joint Electricity Authority. Outdoor type static transformers, electricity supply meters, painting of chimney stacks and spraying of cooling towers. (November 2nd.)

Scotland.—North of Scotland Hydro-Electric Board. Creosoted wood transmission line poles. (November 2nd.) December 10th. H.v. and l.v. overhead lines in Lochalsh area. (See this issue.)

Sheffield.—December 31st. Electricity Department. Two 600-kVA transformers. (See this issue.)

Southend-on-Sea.—December 3rd. Electricity Department. L.v. cable. (See this issue.)

Southwark.—November 14th. Electricity Department. Paper-insulated lead-covered steel-tape-armoured and unarmoured cables. (November 2nd.)

Woolwich.—November 14th. Electricity Department. H.v. and m.v. cables, electricity meters and transformers. (November 2nd.)

Orders Placed

Bournemouth.—Baths Committee. Accepted. Electric lighting fittings for Pier Approach Baths (£55).—Aish & Co.

Hastings.—Electricity Committee. Recommended. Switch pillar (£2,771).—English Electric Co.

Liverpool.—Passenger Transport Committee. Recommended. Electrical equipment for tramcars:—Motor armature coils (£744) and field and interpole coils (£2,720)—G.E.C. Motor standard bakelised field coils (£915), motor regulating field coils, bakelised (£800), standard series type bakelised armature coils (£318) and regulated field type bakelised armature coils (£378)—Crompton Parkinson. Main, field and interpole coils (£579) and armature coils (£265).—B.T.H. Co.

Electric Light and Power Committee. Accepted. Replacement of motor testing equipment damaged or destroyed by enemy action (£353).—Elliott Bros. (London).

Manchester. — Electricity Committee. Accepted. Coal-wagon tippers, Stuart Street station.—Mitchell Engineering. Pumping plant, Stuart Street.—Mather & Platt. Coal chutes, Barton station.—Dilworth & Carr. Two 10-cwt. electric vans.—A. E. Morrison & Sons.

Middlesbrough. — Corporation. Accepted. Transformer.—Electric Construction Co. Substation panel and switch pillars.—English Electric Co. Cables.—Hackbridge Cable Co. and Britannic Cable Co.

Rotherham. — Electricity Committee. Accepted. Spare exciter armature (£845).—C. A. Parsons & Co.

Salford.—Light, Heat and Power Committee. Accepted. Electric motor and control panel for Regent Road gasworks (£980).—W. H. Smith & Co. Three-phase transformers (about £5,000).—Bryce Electric Construction Co.

Worthing.—Electricity Committee. Accepted. 250-kVA transformer (£218).—Lindley Thompson Transformer & Service Co.

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.

Abram.—Houses, for U.D.C.; J. C. Prestwich & Sons, architects, Bradshawgate Chambers, Leigh.

Ashton-under-Lyne.—Houses (50), Rayner Lane No. 1; J. Ridyard & Sons, builders, Railway Saw Mills.

Atherstone (Warwickshire). — Fire station, for N.F.S.; D. C. Smith, R.D.C. surveyor, Council Offices.

Barry.—Semi-detached houses (52), Gladstone Road; borough engineer, Town Hall.

Bellingham (Northumberland).—Houses (72); R.D.C. surveyor.

Bideford.—Art gallery and museum, Pill Ground; borough surveyor.

Blyth.—Additions, shipyard, for the Blyth Shipbuilding & Dry Docks Co., Ltd.; Mouchel & Partners, engineers, New Bridge Street, Newcastle-on-Tyne.

Bolton.—Welfare block, Holden's Mill, Blackburn Road; Combined Egyptian Mills, Ltd.

Cheltenham.—Factory, Priors Road; Montal Watch Fittings, Ltd.

Factory, The Runnings (£20,000); Taylor Nash & Co.

Coventry.—Restoration, St. John's Church (£45,000); Rev. Ralph Clayton, The Rectory, Barras Lane.

Croydon.—Factory, Mill Lane, Waddon; Jablo Propellers, Ltd.

Permanent houses (76), Longheath and Mitcham Road estates; and secondary school, New Addington] estate (£97,000); borough engineer.

Cwmbran.—Houses (88), for U.D.C.; J. T. Price, surveyor, Council Offices, Cwmbran, Mon.

Dalton-in-Furness.—Central kitchen (1,000 meals) for Lancashire E.C. (£3,855); C. Townson, builder.

Dartford.—Houses (78), Princes Road; Kent & Sussex Contractors, Ltd., Erith, Kent.

Doncaster.—Houses, for R.D.C. (£33,594); W. Frith, Ltd., builders, Armthorpe Road.

Dumfries.—Houses (80); burgh surveyor.

Durham.—Houses (50); J. W. White, Ltd., builders, Sunderland.

East Suffolk.—Hutted technical institute, Lowestoft; E. J. Symcox, county architect, County Hall, Ipswich.

Guildford.—Block of offices, London Road; Home Counties Dairies (Southern), Ltd.

Ilford. — Factory rebuilding, New North Road; Vernon Booth & Co., Ltd.

Ilkeston. — Factory, Corporation Road; Charmos Hosiery Co., Ltd.

Keighley.—Permanent houses (50), Bracken Bank; E. G. Felgate, borough architect, Housing Department, College Street.

Kenley.—Flats (12), Kenmore Road; W. R. Smith, 20, Warren Road, Purley.

Leigh.—Installation of electricity in four houses; J. Barrow, builder, 23, Pilling Street.

Maltby.—Houses (30), with electric fires; U.D.C. architect, Council Offices.

Market Drayton.—Houses, Adderley and Dorrington, for R.D.C. (£14,730); Tideswell Bros., builders, 6, Hollins Street, Shelton, Stoke-on-Trent.

Middlesbrough.—Houses (24), Glendale Road; N. Thompson, Ltd., builder, Stonehouse Street, Linthorpe.

Houses (24), Town Farm Estate, for Premier Dwellings, Ltd.; H. C. Garbutt, architect, 18, Albert Road.

Houses (17); J. H. Crawford, builder, Middlesbrough.

Motherwell.—Four-apartment houses (176); secretary, Scottish Special Housing Association, Ltd., Edinburgh.

Newcastle-under-Lyme.—Secondary school, New Ashfields; priest-in-charge, St. Patrick's Catholic Church.

Orrell.—School kitchen (1,000 meals), Lamberhead Green, for Lancashire E.C.; county architect, County Offices, Preston.

Patricroft.—Works extensions, Cawdor Street; Cruickshank & Seward, architects, 16, Princess Street, Manchester, 2.

Riddlesdown (Surrey).—Houses (31), Laings estate; Hooker & Rogers, 29, High Street, Croydon.

Salford.—Flats (144), Regent Road; Moston Brick & Building Co., Ltd., Manchester.

Salop.—Schools at Harlescott and Coleham, Shrewsbury; county architect, 5, Belmont, Shrewsbury.

South Shields.—Prefabricated houses (400); borough engineer.

Houses (184), for T.C.; G. Bailey, Ltd., builders, King Street.

Factory, for Lamb's Products, Ltd.

Modernisation of transport depot, including new machinery, tools, etc. (£3,350); borough engineer.

Stretford.—Development, Firs Farm estate; borough engineer.

Surbiton.—Extensions (£250,000), at Surbiton Hospital, clerk to the Board of Management.

Surrey.—Secondary school, Woodhatch Lodge estate, Reigate; county architect, County Hall, Kingston-on-Thames.

Swadlincote. — Permanent houses (64), Meadow View Road, Newhall, for U.D.C.; S. A. Storey, clerk, Council Offices.

Swinton (Yorks).—Houses (60); U.D.C. architect, Council Offices.

Tynemouth.—Factory, for De La Rue Plastics, Ltd.; Sir R. McAlpine & Co., Ltd., builders, Newcastle-on-Tyne.

Wallsend.—Houses (20), Westmoreland Estate; borough engineer.

Warrington.—Permanent houses (36), Long Lane, Gough's Avenue; J. Y. Hughes, borough engineer, Town Hall.

Whitley Bay.—Houses (28), Roker Avenue; U.D.C. surveyor.

Wick.—New depot (£15,000), for North of Scotland Milk Marketing Board (plant, etc.); manager.

Wigan.—Motor body building works, Sandbrook Road, Upholland; J. Cross, 1, Sunny Drive, Orrell.

TRADE MARKS

THE following applications have been made for trade marks. Objections may be entered within a month from October 31st.:—

STAR (designs). Nos. 631,031-2, Class 7. DC electric motors, not for land vehicles.—Star Electric Motor Co., 135, Bloomfield Avenue, Bloomfield, New Jersey, U.S.A. Address for service: c/o Marks & Clerk, 57/8, Lincoln's Inn Fields, London, W.C.2.

AGILUX. No. 635,101, Class 9. Electrical apparatus and instruments not included in other classes; scientific, nautical, signalling, checking (supervision), etc. instruments and apparatus.—Aeronautical & General Instruments, Ltd., Purley Way, Croydon.

MAXICAP. No. 635,797, Class 9. Electric condensers, resistances, wave filters, apparatus for testing electrical insulation and electrically operated thermostats and thermometers.—Dubilier Condenser Co. (1935), Ltd., Ducon Works, Victoria Road, North Acton, W.3.

AJAX-NORTHRUP. No. 629,455, Class 11.—Electric furnaces.—Ajax Electrothermic Cpn., Ajax Park, Trenton, Mercer, New Jersey, U.S.A. Address for service: c/o Jensen & Son, 77, Chancery Lane, London, W.C.2.

STYPTILENE. No. 635,506, Class 17. Insulating varnish.—J. M. Ratcliffe, Lilian M. Ratcliffe and Lilian I. Willington, trading as J. H. Ratcliffe & Co., 135a, Linaker Street, Southport.

CLASSIFIED ADVERTISEMENTS

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

THE CHARGE for advertisements in this section is 2/- per line (approx. 7 words) per insertion, minimum 2 lines 4/-, or for display advertisements 30/- per inch, with a minimum of one inch. Where the advertisement includes a Box Number there is an additional charge of 6d. for postage of replies.

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

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

Original testimonials should not be sent with applications for employment.

OFFICIAL NOTICES, TENDERS, ETC.

METROPOLITAN BOROUGH OF WOOLWICH

Electricity Department

H.V. and M.V. Cables

TENDERS are invited by the above Council for the supply of H.V. and M.V. Cables required during the year 1st January, 1946, to 31st December, 1946.

Specification and form of tender may be obtained from the undersigned upon receipt of a deposit of £1 1s., which will be refunded within one month of the receipt of a bona fide tender.

Tenders, enclosed in a plain sealed envelope and endorsed "Tender for Cables," must reach me not later than 12 noon on the 14th November, 1945.

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

DAVID JENKINS,
Town Clerk.

Town Hall,
Woolwich, S.E.18.
18th October, 1945. 3215

METROPOLITAN BOROUGH OF WOOLWICH

Electricity Department

Electricity Meters

TENDERS are invited by the above Council for the supply of Electricity Meters required during the year 1st January, 1946, to 31st December, 1946.

Specification and form of tender may be obtained from the undersigned upon receipt of a deposit of £1 1s., which will be refunded within one month of the receipt of a bona fide tender.

Tenders, enclosed in a plain sealed envelope and endorsed "Tender for Meters," must reach me not later than 12 noon on the 14th November, 1945.

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

DAVID JENKINS,
Town Clerk.

Town Hall,
Woolwich, S.E.18.
18th October, 1945. 3216

COUNTY BOROUGH OF BURY

Electricity Department

THE Corporation invite tenders for the supply and delivery of 2 750 kVA, 6,500/400/23 volt, 3-phase transformers.

Forms of specification, etc., may be obtained from Mr. J. G. Potts, Engineer and Manager, Electricity Department, Market Street, Bury.

Tenders endorsed "Transformers" are to be delivered to the undersigned not later than noon on Monday, the 19th November, 1945.

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

EDWARD S. SMITH,
Town Clerk.

Municipal Offices,
Bank Street, Bury.
2nd November, 1945. 3333

SHEFFIELD CORPORATION ELECTRICITY DEPARTMENT

Contract No. B.M. 149

THE Electricity Committee are prepared to receive tenders for the supply and delivery of the undermentioned transformers: TWO, 600 kVA, 11/.440 kV 3-phase Double Wound Self-Cooled.

Contractors desiring to submit tenders may obtain Specification and Form of Tender at this office on making a deposit of £2 2s. 0d., which sum will be refunded on receipt of a bona fide tender.

To meet the convenience of Contractors, two copies of the Specification will be furnished; additional copies may be purchased at a cost of £1 1s. 0d. per copy.

Any person or firm sending in a tender will be required to comply with the Standing Orders of the Council relating to the "Prevention of Corruption" and to the standard rates of wages and proper hours and conditions of labour. A print of the Standing Orders may be obtained from the Department.

The tender and accompanying documents, filled up as directed, must be enclosed in the official envelope supplied with the Specification, which shall not bear any name or mark indicating the sender, to be delivered to the Town Clerk, Town Hall, Sheffield, 1, not later than the first post on Monday, 31st December, 1945. Tenders received after the time stipulated herein will not be considered.

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

JOHN R. STRUTHERS,
General Manager and Engineer.

Commercial Street,
Sheffield, 1.
October, 1945. 3334

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD DISTRIBUTION SCHEME No. 1

High Tension and Low Tension Overhead Lines (Wood Pole) in Lochalsh Area, Ross and Cromarty.

THE North of Scotland Hydro-Electric Board invite Tenders for the supply, delivery and erection of high tension and low tension distribution lines.

Copies of the Specification and Form of Tender may be obtained from the Offices of the Board on application to the undersigned on or after 12th November, 1945, on payment of a deposit of Two Guineas, which will be refunded on receipt of a bona fide Tender.

Tenders on the Form supplied must be delivered to the Offices of the Board not later than 10th December, 1945. The Board do not bind themselves to accept the lowest or any Tender.

T. LAWRIE,
Secretary.

16, Rothesay Terrace,
Edinburgh, 3.
2nd November, 1945. 3332

COUNTY BOROUGH OF SOUTHEND-ON-SEA

Electricity Department

TENDERS are invited for the supply and delivery of LOW TENSION CABLE for a period of 12 months commencing 1st January, 1946.

Specifications, etc., from the undersigned.

Tenders to be delivered to the Town Clerk, Municipal Buildings, Southend-on-Sea, not later than Monday, 3rd December, 1945.

A. C. JOHNSON,
Engineer and Manager.

Electricity Works,
London Road,
Southend-on-Sea. 3331

METROPOLITAN BOROUGH OF WOOLWICH

Electricity Department

Supply of Transformers

TENDERS are invited by the above Council for the supply of Transformers required during the year 1st January, 1946, to 31st December, 1946.

Specification and form of tender may be obtained from the undersigned upon receipt of a deposit of £1 1s., which will be refunded within one month of the receipt of a bona fide tender.

Tenders, enclosed in a plain sealed envelope and endorsed "Tender for Transformers," must reach me not later than 12 noon on the 14th November, 1945.

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

DAVID JENKINS,
Town Clerk.

Town Hall,
Woolwich, S.E.18.
18th October, 1945. 3217

SITUATIONS VACANT

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

BOROUGH OF ROYAL TUNBRIDGE WELLS

Electricity Department

Appointment of Junior Shift Charge Engineer

APPLICATIONS are invited for the position of Junior Charge Engineer to carry out the normal duties of assisting the Shift Charge Engineer in the Generating Station.

Applicants must be between the ages of 25 and 40 years and should have experience in a modern Power Station. Preference will be given to those who have passed the Graduateship examination of the Institution of Electrical Engineers or an approved equivalent. The salary will be in accordance with Class F, Grade 8a, of the National Joint Board Schedule, commencing salary £371 per annum.

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

Applications, accompanied by copies of three recent testimonials, to be addressed to the Borough Electrical Engineer, Town Hall, Tunbridge Wells, by 26th November, 1945.

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

JOHN WHITEHEAD,
Town Clerk.

Town Hall,
Tunbridge Wells.
November, 1945. 3325

EAST GRINSTEAD URBAN DISTRICT COUNCIL

Substation Attendant

THE above-named Council invite applications from qualified persons for appointment to the above permanent position at their Electricity Undertaking. Wages in accordance with D.J.I.C. Schedule, No. 11 Area, at present £4 11s. for a 48-hour week.

Applicants must have good experience and knowledge of glass bulb rectifiers and switching operations up to 11,000 volts.

Applications, stating age, present appointment, and experience, with copies of two recent testimonials, to be forwarded to the Deputy Clerk to the Council, Norton House, London Road, East Grinstead, Surrey, not later than the 16th day of November, 1945, and endorsed "Substation Attendant."

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

23rd October, 1945. 3206

SHEFFIELD CORPORATION

Electricity Department

Appointment of Repairs and Maintenance Engineer

APPLICATIONS are invited for the position of a Repairs and Maintenance Engineer. Applicants must have had a thorough mechanical training in a large engineering works with practical workshop experience, and be in possession of a degree or technical qualification admitting to Corporate Membership of a recognised Professional Institution.

The successful candidate must also have had experience with the routine maintenance of Power Station Plant, including high pressure boilers, turbo-alternators and their associated auxiliaries, and be capable of organising such work and carrying it out with expedition.

The salary will be in accordance with Class L, Grade 6, of the National Joint Board Scale, supplementary Schedule B, commencing at £643 per annum, rising to £674 per annum.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and candidates must have previous Local Authority Service carrying a transfer value within the meaning of the Act, or otherwise be not more than 40 years of age. The selected candidate will be required to pass a medical examination.

Form of application may be obtained from the undersigned.

Canvassing of any member of the City Council, either directly or indirectly, is prohibited, and will be a disqualification.

The latest date for the receipt of applications is 3rd January, 1946.

The Ministry of Labour and National Service have given permission under the Control of Engagement Order, 1945, for the advertising of the above vacancy.

JOHN R. STRUTHERS,
General Manager and Engineer.

Commercial Street,
Sheffield, 1.
November, 1945. 3335

STRETFORD AND DISTRICT ELECTRICITY BOARD

Appointment of Junior Shift Engineer

APPLICATIONS are invited for the above appointment from suitably qualified engineers, with modern generating experience.

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

The salary will be in accordance with Class G, Grade 9, of the National Joint Board's Schedule, at present £340 per annum, rising to £354 per annum.

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

Applications, endorsed "Junior Shift Engineer," giving details of training, experience and qualifications, together with copies of testimonials, should reach the undersigned not later than Saturday, the 10th November next.

C. TREWAVAS,
Clerk to the Board.

Town Hall, Stretford.
22nd October, 1945. 3212

ST. AUSTELL & DISTRICT ELECTRIC LIGHTING & POWER CO. LTD.

Assistant Mains Engineer

ASSISTANT Mains Engineer wanted, with experience in the erection of overhead and laying of underground 11-kV lines and cables and erection of 11-kV switchgear.

Salary £361 per annum, in accordance with N.J.B. Schedule.

Applications, stating age and giving particulars of training and experience, to be forwarded to the undersigned.

The Ministry of Labour and National Service has given permission under the Control of Engagement Order, 1945, for the advertising of this vacancy.

C. CULMER HODGES, M.I.E.E., M.I.Mech.E.,
Chief Engineer and Manager.

Electricity Offices,
St. Austell, Cornwall. 3293

COUNTY BOROUGH OF ST. HELENS

Electricity Department

Appointment of Junior Engineer

APPLICATIONS are invited for the above position with salary and conditions in accordance with Grade 9, Class G of the National Joint Board's Schedule, at present £340 per annum.

Candidates must be experienced in the operation of the control board in a modern Generating Station and must possess theoretical qualifications equivalent to the Higher National Certificate in Electrical Engineering.

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

Applications, accompanied by copies of not more than three testimonials, must be made on the form obtainable from the address given below and be received not later than 19th November, 1945, endorsed "Junior Engineer."

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

P. BREGAZZI, A.M.I.E.E.,
Electricity Works, Electrical Engineer and Manager.
Carlton Street,
St. Helens, Lancs. 3294

CITY OF BATH

Appointment of City Electrical Engineer

THE Council invite applications for the appointment of City Electrical Engineer from applicants who are Members or Associate Members of the Institution of Electrical Engineers and experienced in the management and administration of an Electricity Undertaking. The salary will be in accordance with the scale of the National Joint Committee of Local Authorities and Chief Electrical Engineers.

In accordance with Clause 10 of the Agreement, the salary for the first year will be £1,553, being 85% of the full salary, and for the second year 92½% thereof, the full salary being payable in the third and subsequent years.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and to determination by three months' notice in writing on either side. The successful candidate will be required to pass a medical examination.

Applications (on a form to be obtained from me) must be delivered to me not later than 12 noon on the 24th November, 1945, and must be accompanied by copies of two testimonials.

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

J. BASIL OGDEN,
Guildhall, Bath. Town Clerk.
2nd November, 1945. 3328

BOROUGH OF HARROGATE

Electricity Department

Power Station Superintendent

THE Council invite applications for the position of Power Station Superintendent from applicants who have a sound technical and practical training and experience in the operation, running and maintenance of a modern Generating Station.

The salary will be in accordance with Grade 3, Class F, of the National Joint Board Schedule, commencing at £583 per annum.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and to termination by the giving of one month's notice on either side.

Applications, on the forms provided, enclosed in an envelope endorsed "Power Station Superintendent," should be forwarded to the Borough Electrical Engineer, Municipal Offices, Harrogate, and received not later than Saturday, 24th November, 1945.

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

J. M. DODDS,
Municipal Offices, Town Clerk.
Harrogate.
26th October, 1945. 3312

COUNTY BOROUGH OF BARNSLEY

Appointment of Borough Electrical Engineer and Manager

APPLICATIONS are invited for the appointment of Engineer and Manager of the Council's Electricity Undertaking, incorporating the Public Lighting Department, from Corporate Members of the Institution of Electrical Engineers experienced in the management and administration of an electricity undertaking.

The salary for the position will be in accordance with the Agreement dated 9th July, 1941, made by the National Joint Committee of Local Authorities and Chief Electrical Engineers for the Electricity Supply Industry, namely, for the first year 85% of the full salary and for the second year 92½%, the full salary being payable for the third and subsequent years. The full approximate salary for the financial year ending 31st March, 1946, will be £1,157.

The appointment will be determinable by three months' notice in writing on either side and will be subject to the provisions of the Local Government Superannuation Act, 1937, and to the successful applicant passing satisfactorily a medical examination to be conducted by the Council's Medical Officer of Health.

Applications, on forms to be obtained from the undersigned, must be accompanied by copies of three recent testimonials, and delivered to my office not later than the 24th November, 1945, in envelopes endorsed "Electrical Engineer and Manager."

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

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

A. E. GILFILLAN,
Town Hall, Barnsley. Town Clerk.
October, 1945. 3311

MID-LINCOLNSHIRE ELECTRIC SUPPLY CO. LTD.

Two Junior Mains Assistants

APPLICATIONS are invited for the above appointments from candidates who must have had experience in the operation of a high voltage system and are conversant with the erection and maintenance of E.H.T. and L.T. overhead lines, underground cable and static substations. Preference will be given to those having a technical qualification.

Salary commencing £300 per annum, plus a temporary war bonus, at present £62 8s. per annum.

The successful candidates will be required to participate in the Company's Superannuation Scheme.

Applications, appropriately endorsed, should give age, education, details of training, experience and technical qualifications, and be accompanied by copies of recent testimonials, and should be addressed to the undersigned not later than the 23rd November, 1945.

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

N. F. MARSH, M.A., M.I.E.E.,
North House, Engineer and Manager.
Grantham, Lincs. 3324

COUNTY BOROUGH OF WALLASEY

WANTED: Plumber-Jointers. Rate 26.45d. per hour, £5 3s. 7d. per week of 47 hours. Applications, stating age and experience, to Borough Electrical Engineer, Wallasey Road, Wallasey.

This advertisement does not relate to men between the ages of 18 and 50 inclusive, unless they are excepted from the provisions of the Control of Engagement Order, 1945.

EMRYS EVANS, Town Clerk.
3233

RAWLINGS BROS. LIMITED

(Established 1887)

REQUIRE Radio Service Engineers and Electricians. Class A ex-Servicemen and those not subject to Control of Engagement Order invited to apply to—

H. J. Rickman,
RAWLINGS BROS. LIMITED,
85, Gloucester Road, S.W.7
(opposite Gloucester Road Station). 3302

CITY OF LONDON ELECTRIC LIGHTING CO. LTD.

Distribution Department

Appointment of an Assistant Engineer

APPLICATIONS are invited for the position of an Assistant Engineer who must be capable of superintending the installation and maintenance of high voltage and low voltage underground mains, substation plant and distributing equipment. The applicants must have had a proper theoretical and technical training, and practical experience, and be familiar with drawings and estimating.

The salary will be in accordance with Grade 8, Class H, of the N.J.B. Salaries Schedule.

Applications, giving full details of age, training and experience, together with copies of three testimonials, are to be endorsed "Assistant Engineer," and must reach the undersigned not later than Wednesday, 21st November, 1945.

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

G. H. FOWLER, M.I.E.E.,
C.L.E.L. Co. Ltd., Distribution Superintendent.
Falcon House, Aldersgate St.,
London, E.C.1. 3285

CITY AND COUNTY OF KINGSTON-UPON-HULL

Electricity Department

Power Station Superintendent

APPLICATIONS are invited for the above position from persons available from civilian positions, or from those serving in H.M. Forces.

Applicants should possess a sound knowledge and experience of steam-electric power plant operation, maintenance and control.

Salary in accordance with the N.J.B. Schedule, Grade 3, Class J, at present commencing at £724 per annum.

The appointment is subject to a medical examination. The person appointed must reside within the city boundary (waived during present conditions), and after three months' satisfactory probation will be required to contribute to the Local Government and Other Officers' Superannuation Scheme.

Applications should give names of references who may be consulted, and should be submitted to the General Manager, Electricity Offices, Ferensway, Kingston-upon-Hull, by 21st December, 1945.

The advertisement is published by permission of the Ministry of Labour and National Service, Technical and Scientific Register, under the Control of Engagement Order, 1945. 3309

COUNTY OF THE CITY OF WORCESTER

Hylton Road Power Station—Power Station Chemist

APPLICATIONS are invited for the above appointment. Salary and conditions of service in accordance with the National Joint Board Schedule, Class G, Grade 8a (at present £393 per annum).

Candidates should possess a University degree or equivalent and have had general chemical and metallurgical experience with Boiler Feed Treatment.

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

Applications, stating age, and giving full particulars of technical qualifications and experience, and accompanied by not more than three testimonials, should be addressed to the City Electrical Engineer, Electricity Works, Hylton Road, Worcester, to be received not later than first post on Monday, 19th November.

The Ministry of Labour and National Service have given permission under the Control of Engagement Order, 1945, to advertise this vacancy.

C. H. DIGBY-SEYMOUR,
Guildhall, Town Clerk.
Worcester. 3320

ARMATURE Winders required. Experienced in all classes of repair work, A.C. or D.C. Class A, or otherwise exempt from Control of Engagement Order.—E. I. Ltd., Faraday Works, Stoney Stanton Road, Coventry. 3153

WARWICKSHIRE EDUCATION COMMITTEE

Rugby College of Technology and Arts

A full-time Lecturer, highly qualified in Mathematics, is required for advanced Engineering Courses preparing for Final B.Sc. and Higher National Certificate. Salary according to the Burnham Technical Scale. Application form and further particulars may be obtained by sending a stamped addressed envelope to the undersigned, by whom applications should be received as soon as possible.

P. I. KITCHEN,
Organiser of Further Education in Rugby.
College of Technology and Arts,
Eastlands, Rugby.
29th October, 1945. 3310

A Manager required for small progressive Electrical Wholesale business London and Eastern Counties area. Permanency and excellent prospects for capable man with good wholesale trade experience, wiring accessories and appliances. Successful applicant should have initiative to develop and expand a business which has been comparatively dormant during war to ultimately become director. Replies treated in strictest confidence. State experience, age, suggested commencing salary.—Box 7851, c/o The Electrical Review.

ADVERTISING Department of large engineering firm offers progressive position to young man with experience in catalogue lay-out work, including ability to write or edit text. Some knowledge of lighting engineering an advantage, but not essential. Write in the first instance to—Box 3289, c/o The Electrical Review.

ARMATURE Winders, experienced all classes A.C. and D.C. jobs. Class A ex-Servicemen or otherwise exempt M.O.L. control. Permanencies for suitable men. —Service Electric Co. Ltd., Abbey Mfg. Estate, Alperton, Telephone, Wembley 0194. 49

ARMATURE Winders required for all types of A.C. and D.C. rewinds, permanent position, tip-top rates for first-class men, good working conditions with paid holidays. Class A ex-Servicemen or otherwise exempt M.O.L. control. Write particulars of experience, etc. to —Box 7935, c/o The Electrical Review.

ARMATURE Winder required to take charge and to act as Foreman in fractional h.p. repair dept. Good prospects for right man. Applications from those over 51 or Class A ex-Servicemen only. Write—Box 3304, c/o The Electrical Review.

ARMATURE Winders used to repair work, for S.W. London. All classes A.C. and D.C. jobs. Good conditions. Permanency for right type of men. Class A ex-Servicemen or over 51.—Box 7852, c/o The Electrical Review.

ASSISTANT Chief Engineer required by oil company in Trinidad. Age 35-40, healthy. Qualifications: Electrical and/or mechanical degree required, good knowledge of modern steam plant, power station and steam and electrical distribution work. Apprenticeship or equivalent workshop training for at least two years, followed by practical and technical experience with manufacturer, power company, large construction contractor or consulting engineer. Must have been in control of department for at least five years and been responsible for staff administration, correspondence, reports, estimates and costs. Initiative, drive, tact, ability to handle men required. Salary, to commence £1,500 per annum. Write, quoting C.2881XA, to Ministry of Labour and National Service, Appointments Department, Technical and Scientific Register, Room 670, York House, Kingsway, London, W.C.2, for application form, which must be returned completed by 24th November, 1945. 3305

BUYER, able take charge stock control and stores, required by electric control gear manufacturers, London area. Some technical knowledge essential. Write, giving age, experience and salary required, to—Box 3303, c/o The Electrical Review.

CHIEF Electrical Engineer required for large modern Collieries. Applicants should have had first-class practical experience at collieries covering electric winders, generating plant and various classes of electrical equipment and be familiar with mining regulations. Apply—Pearson and Dorman Long Ltd., Richborough, Sandwich, Kent. 3201

CLERICAL Assistant, Class A ex-Serviceman, for Stores Office. Must have thorough knowledge of all electrical material. Apply—London Electrical Company, 92, Blackfriars Road, S.E.1. 24

COUNTER Assistant, essential good knowledge of the trade, Class A ex-Serviceman. State experience, age, salary, etc., to—General Manager, Sloan Electrical Co. Ltd., 41, Kingsway, W.C.2. 3156

CLASS A release ex-Servicemen who are qualified Electrical Draughtsmen are invited to communicate with the Personnel Officer, Foster Transformers & Switchgear Ltd., South Wimbledon, S.W.19. Apply by writing in first instance. Good prospects for the right men. Salary according to qualifications and experience. 3224

COMPETENT Armature Winder wanted. Able to teach others and take control of small works. Suitable man would eventually have complete control of department and, when proved satisfactory, house would be provided Rotherham area. Must be exempt from M.O.L. control.—Box 3270, c/o The Electrical Review.

COSTING and Invoicing Clerk required, with first-class knowledge of electrical contractors' office routine. Apply by letter only, giving details of age, training, experience and remuneration, to F. H. Wheeler & Company Limited, Imperial Buildings, Oxford Road, Manchester, 1. Immediately the present employment restrictions are removed applicants will be considered. 3319

DESIGNER Draughtsman required, experienced in design and development of light electro-mechanical apparatus; experience of communications laboratory gear preferred; knowledge of workshop practice and production problems essential; must be capable of working on own initiative. Applications only from those over 51, Class A ex-Servicemen and others exempt from M.O.L. control. Apply stating age, qualifications, salary, etc.—Box 3347, c/o The Electrical Review.

DESIGNER required by Lighting Firm (manufacturers), experienced in design of lighting apparatus involving the use of lenses and reflectors. Applications from Class A ex-Servicemen or those over 51 only. Write full particulars to—Box 944, Rays, Cecil Court, London, W.C.2. 3322

DRAUGHTSMEN, under 18, over 51, or Class A ex-Servicemen, wanted for N.W. London. Some experience with electric motors desirable.—Box 3281, c/o The Electrical Review.

ELECTRIC Motor Manufacturer has vacancy for Assistant Designer immediately the present employment restriction is removed. Applications will now be considered. State age and experience.—Higgs Motors Limited, Witton, Birmingham, 6. 3330

ELECTRICAL and Mechanical Engineers (manufacturing) have vacancy for outside representative, fully conversant with power plant. Application, with age, references, salary required, to—Box 3314, c/o The Electrical Review.

ELECTRICAL manufacturers require for London Lighting Department an energetic, well-educated man. Lighting and electrical training and commercial experience essential. For technical commercial office work with all types of lighting fittings and illumination. Correspondence, specifications, sales, etc. British National. Medical examination. Applications from Class A ex-Servicemen or those over 51 only. Detailed particulars and salary required to—Box 3147, c/o The Electrical Review.

ELECTRICAL Sales Engineer required for West Indies and Central America. Knowledge of Spanish desirable but not essential. Write full particulars to—Box 3291, c/o The Electrical Review.

ELECTRICIANS and Assistants required for London and Provinces. Class A ex-Servicemen or over 51.—Geo. E. Taylor & Co. (London) Ltd., 36, Denmark Avenue, Wimbledon, S.W.19. Wim. 5021. 3062

ELECTRICIANS and Assistants wanted, Class A ex-Servicemen or over 51. Permanency to right men.—J. H. Plant Ltd., 99, St. Martin's Lane, Charing Cross, W.C.2. 7946

ELECTRICIANS and Mates (exempt from M.O.L. control) wanted Central London, for general installation and repair work. Every consideration and permanent job to reliable and conscientious workers.—Waddington & Goodwell Ltd., 34/35, Hatton Garden, E.C.1. 7945

ELECTRICIANS, Class A ex-Servicemen or otherwise exempt from M.O.L. control, required for Midlands and South Wales.—John Richards & Co. Ltd., 9, High Street, Burton-on-Trent. 7885

ELECTRICIANS, Class A ex-Servicemen, or over 51, required by electrical contractors, Central London. Permanency to right men. Best conditions.—Box 3205, c/o The Electrical Review.

ELECTRICIANS required by small established contractors for good class installation and maintenance work. Screwed: L.C.; T.R.S. Good conditions. Permanent employment. Class A ex-Servicemen or otherwise free.—Winfield & Co., 32, High Street, Boston, Lincs. 7895

ELECTRICIANS required, general hands, all systems, single men preferable. Applicants should be Class A ex-Servicemen or otherwise exempt from labour control. Apply — Boston & District Electric Supply Company Limited, Besco House, Market Place, Boston, Lincs. 3273

ELECTRICIANS required for industrial installation and maintenance work. Must be used to screwed conduit. Class A ex-Servicemen or otherwise exempt M.O.L. Control. Permanencies for suitale men.—Service Electric Co. Ltd., Abbey Manufacturing Estate, Alperton, Telephone, Wembley 0194. 48

ELECTRICIANS required immediately, permanency for suitable men. Class A ex-Servicemen or otherwise free.—Ive, 29, Clarendon Road, Watford. 7942

ENGINEER-Inspectors required for India by accumulator manufacturers. Applicants should be single and not more than 30 years of age, and have experience with self-contained lighting plants and accumulators. Apply—Box 3286, c/o The Electrical Review.

ENGINEERS and Draughtsmen, becoming available for civil employment under Class A demobilisation, are invited to apply for positions in the heavy electrical plant departments (comprising electrical machines and transformers of all kinds) of a large electrical engineering manufacturer in the Midlands. Applications, stating age, appropriate technical qualifications and industrial experience, and order of salary required, to—Box 71, c/o The Electrical Review.

ENGINEERS and Draughtsmen, becoming available for civil employment, under Class A demobilisation, are invited to apply for positions in the Switchgear Department of a large electrical engineering manufacturer in the Midlands. Applications stating age, appropriate technical qualifications and industrial experience, and salary required, to—Box 69, c/o The Electrical Review.

ESTABLISHED London manufacturers have vacancy for good Sales Representative. Must have experience in electrical wholesale trade. Class A ex-Serviceman given every consideration. Write in confidence to—Box 3274, c/o The Electrical Review.

FIRST-class Working Foreman required to take complete charge of mechanical and electrical plant in large works. Good salary paid to competent man. Applications only from those over 51 or Class A ex-Servicemen. Reply, giving age and experience to—Box 3269, c/o The Electrical Review.

FULLY qualified Fitter and Turner, used to setting up of capstan. Good prospects and salary. Applications from those over 51 or Class A ex-Servicemen only. Apply—Box 3340, c/o The Electrical Review.

HIS Majesty's Colonial Service. In addition to vacancies in Colonial Engineering Service already advertised there are now further vacancies in Malaya and Hong Kong for Engineers—Civil, Mechanical and Electrical. Professional qualifications entitling applicants to consideration are Corporate Membership of I.C.E., I.M.E. or I.E.E., or, alternatively, possession of Engineering Degrees or Diplomas recognised by those bodies as granting exemption from Sections A and B of their examinations. Candidates for Civil Engineering appointments should have had experience of construction of railways or open line maintenance; alternatively, they should have had experience of construction and maintenance of roads, or of urban water supply and drainage, or of irrigation and land drainage (Ref. E.2097A). Candidates for Mechanical Engineering appointments should have had experience of locomotive running or of maintenance of heavy electrical generating plant or of general workshops organisation (Ref. C.2904A). Candidates for Electrical Engineering appointments should have had practical experience of power generation and distribution and manufacture of plant used therein; whilst candidates for Telecommunications appointments should have had training in telegraph, telephone and radio engineering (Ref. D.1535A). Candidates must be British subjects, physically fit, and should normally be between the ages of 25 and 40 years, though contracts appointments may be offered to men whose age exceeds this upper limit. Salary scale for candidates appointed to pensionable posts on permanent staff rises from £560, by annual increments of £35 to £1,120 p.a., but initial salary offered will depend on age and experience. Promotion to a number of higher salaried posts may subsequently be made on merit. Those selected for contract appointments at special rates of salary will be entitled to gratuities on completion of their contracts. Write, quoting appropriate reference number, to Ministry of Labour and National Service, Appointments Department, Technical and Scientific Register, Room 670, York House, Kingsway, London, W.C.2, for application form, which must be returned completed by 30th November, 1945. 3278

IVERSON Electrical Ltd. will welcome the return of all their former Electricians and Electrical Assistants. Work available to all Class A ex-Servicemen, and those over 51, in all parts of London and in most areas of England. Apply personally, or in writing, to—Personnel Manager, 346/352, Kilburn High Rd., London, N.W.6. 3164

LIGHTING Fittings Designer, British, required for Central London by large manufacturers. Commercial and industrial lighting equipment for tungsten, fluorescent and discharge lamps. Electrical and illumination training and experience essential. Medical examination. Applications from Class A ex-Servicemen or those over 51 only. State salary and full particulars to—Box 3148, c/o The Electrical Review.

LINAGLOW Limited require a Sales Manager for their mail order trade and in connection with the sale of test equipment to manufacturers, etc. Applicants must have technical or good practical knowledge of test equipment and all types of radio components. Previous experience of mail order trade an advantage. Will also be required to assist in buying of raw materials. A connection with manufacturers will be an asset. Good salary. Permanent and progressive post. No callers please. Apply in first instance, in writing, with full qualifications to—No. 2, Highgate High Street, London, N.6. 3283

MAINTENANCE Electrician required by London contractor. Applications only from those over 51 or Class A ex-Servicemen. Apply giving full particulars to—Box 3268, c/o The Electrical Review.

MANAGER required for wire drawing department of electric cable factory. Applicants must have first-class experience and possess initiative. Applications, which will be treated in strictest confidence, to state age, experience and salary expected.—Box 3301, c/o The Electrical Review.

MANAGER to take complete charge of transformer department (units up to 30 kVA), capable of design, production and correspondence, required urgently. State full qualifications.—Box 3297, c/o The Electrical Review.

METER Repairer required for Class A non-polyphase station, single man preferable. Applicants should be Class A ex-Servicemen or otherwise exempt from labour control. Apply—Boston & District Electric Supply Company Limited, Besco House, Market Place, Boston, Lincs. 3272

OVERHEAD Linesmen required for erection and maintenance of overhead lines on wooden poles in the counties of Berks., Bucks, and Oxon. Wages and conditions of employment as per No. 9 D.J.I.C., present rate of pay 2s. an hour, 47-hour week. Apply Wessex Electricity Company, Oxford Road, Newbury. This advertisement appears by permission of the Ministry of Labour and National Service under the Control of Engagement Order, 1945. 7912

PLUMBER Jointer required. Used to mains up to 11,000 volts, single man preferable. Applicants should be Class A ex-Servicemen or otherwise exempt from labour control. Apply—Boston & District Electric Supply Co. Limited, Besco House, Market Place, Boston, Lincs. 3271

PRODUCTION Controller required by progressive London Company manufacturing scientific and electrical measuring instruments. To be responsible for purchasing, production planning, progress, stores and stock control. Commencing salary £500-£600, according to qualifications.—Box 3188, c/o The Electrical Review.

PROMINENT radio and electrical factors require Stockkeeper and Packers. Good salary. Permanent and progressive post. Applications only from those under 18, over 51, or Class A ex Servicemen.—Box 3282, c/o The Electrical Review.

SALES Engineer, preferably with connection, required by large English electrical manufacturing concern for their Scottish Branch. State education, technical qualifications, age, and salary required.—Box 3336, c/o The Electrical Review.

SALES Engineer required by prominent London instrument company, to take charge of sales office and to handle all correspondence and contracts (home and export). Must have sound knowledge of industrial and laboratory indicating instruments and electronic test gear. Our staff have been notified of this vacancy.—Box 3237, c/o The Electrical Review.

SERVICE Man. Rapidly expanding electro-mechanical engineers require live man to train for service managership. Good all-round experience necessary. Knowledge of medical, F.H.P., optical or dental equipment an asset. Commencing salary £175-£250, with opportunity rapid promotion. W.1 area. This applies only to those persons excepted by the Restriction of Employment Order, 1945.—Box 3275, c/o The Electrical Review.

STOREKEEPER and Stores Assistant with knowledge of general electrical supplies. Vacancy (permanent) occurs owing to death. Applications from Class A ex-Servicemen or those over 51 only. Details of experience and salary required to—W. E. Co. Ltd., 37, Vauxhall Bridge Road, S.W.1. 3158

SHIFT Charge Engineer required by large manufacturing company in S.E. England. Applicants must be conversant with P.F H.P. boilers. Experience with turbo-alternators of not less than 30 m.W. an advantage. Commencing salary £525 per annum. Pension scheme operating. The Ministry of Labour and National Service has given permission under the Control of Engagement Order, 1945, for the advertising of this vacancy.—Box 3288, c/o The Electrical Review.

SIMPSON Brothers (of Hapton) Ltd. are desirous of manufacturing a range of domestic appliances, and wish to appoint a versatile Designer with sound technical knowledge, capable of supervising production from his designs. Applications invited from Class A ex-Servicemen or those not subject to Control of Engagement Order, 1945, with full details of experience (in confidence) and salary required, to—Smith & Smith, Solicitors, 2, Elizabeth St., Burnley. 3300

SUPERVISING Engineer required with technical and practical knowledge of all types of first-class electrical power and lighting installations. Considerable experience in preparation of tenders, costing and office routine essential. Apply by letter only, giving details of age, training, experience and remuneration, to F. H. Wheeler & Company Limited, Imperial Buildings, Oxford Road, Manchester, 1. Immediately the present employment restrictions are removed applicants will be considered. 3318

TECHNICAL Assistant and Secretary to Manager wanted by firm of Electrical and Mech. Engineers. Some knowledge of power plant and good office routine required. Excellent prospects for well educated, energetic young man willing to be specially trained. Applications only from Class A ex-Servicemen and others exempt from M.O.L. control. State experience, age, salary.—Box 3313, c/o The Electrical Review.

TECHNICAL Assistant to Electrical Engineer required in Central London architects' office. Applications only from Class A ex-Servicemen and others exempt from M.O.L. control. Give details of technical education, experience and salary required to—Box 7917, c/o The Electrical Review.

TEST Room Assistants. Two juniors required for testing electrical transformers and mercury arc rectifiers. Progressive position. Applications only from Class A ex-Servicemen or under 18. Apply—Box 3174, c/o The Electrical Review.

TWO Armature Winders, conversant with split phase winding of A.C. stators. Good prospects and salary. Applications from those over 51 and Class A ex-Servicemen only. Apply—Box 3341, c/o The Electrical Review.

VACANCIES are available for men released in Class A who have had experience on Instrument Work. Preference will be given to those who possess some theoretical knowledge. Apply, stating experience, training, age and wages required, to—Cambridge Instrument Company Ltd., Sydney Road, Muswell Hill, N.10. 46

VACANCIES for Class A men and others exempt from Ministry of Labour control, as Instrument Makers, Test Room Assistants and Junior Draughtsmen. Also semi-skilled and unskilled operators for training. Apply—Everett Edgcumbe & Co. Ltd., Colindale Works, Hendon, London, N.W.9. 3339

WANTED, enterprising Electrician-Wireman with tact and initiative, experienced mainly in suburban work, good all-round hand, for Finchley district. Over 51 years or otherwise exempt from M.O.L. control. Apply, stating age and experience to—Box 7916, c/o The Electrical Review.

WANTED immediately in Glasgow district, good class Benders used to neon sign work. Good conditions and permanent positions for the right men, free from M.O.L. and National Service obligations. Address—23X0, Wm. Porteous & Co., Glasgow. 7921

WAREHOUSEMAN, essential good knowledge of the trade, Class A ex-Serviceman. State experience, age, salary, etc., to—General Manager, Sloan Electrical Co. Ltd., 41, Kingsway, W.C.2. 3157

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.

BOROUGH of Chepping Wycombe—Foreman and Mains Assistant; Chudleigh Electric Light & Power Co. Ltd —Electrical Engineer; R.C.A. Photophone Ltd.—Progress Clerk. Applicants are thanked.

SITUATIONS WANTED

A POST WITH SCOPE FOR A YOUNG ENGINEER

B.Sc. Tech. Electrical Engineer specialised in Instruments Ex Metrovick Apprentice. Production experience. Eight years' responsible training, administrative and intelligence work in R.A.F. Squadron-Leader for last 4 years. Twice mentioned in despatches. Excellent references. I wish to re-enter the electrical industry in a responsible post with opportunity for advancement and improving a keen engineering aptitude.—Box 7932, c/o The Electrical Review.

ACTIVE Sales Engineer (Technical) invites contact with manufacturers seeking representation, London and South. Specially interested in motors (all sizes), rectifiers, gear units and spraying equipment. Wide experience and live contacts. Free from control. Car & phone.—Box 7902, c/o The Electrical Review.

ADVERTISER seeks post as Supervisor, Representative, or Head Foreman. 25 years' experience on installations elect. & mechanical survey, planning, and maintenance.—Box 7865, c/o The Electrical Review.

A.M.I.E.E. (34), E.H.V. Switchgear and Motor Control, specialist complete distribution schemes, 17 years sales, contracts, publicity with leading manufacturers, inside or outside position. £650 minimum.—Box 7862, c/o The Electrical Review.

AN Electrical Engineer requires post. Experience in practical mechanical engineering, design, costing, estimating, manufacturing and sales of all types rubber and paper cables, contracting, M.V. and E.H.T., underground and overhead, installation of transformers, switchgear and generators, testing, fault location. Accustomed to supervision of staff, jointers, linesmen and labour. Welfare, mains records, wages and accounts, etc.—Box 7889, c/o The Electrical Review.

ARMATURE Winder (44), desires change; would seek release for suitable job. Thorough, practical, experienced repair shop man. A.C. and D.C. repairs, rewinds up to 3,000 kW. Able to take charge. 11 years present situation.—Box 7896, c/o The Electrical Review.

ASSISTANT Demonstrator seeks position. E.A.W Electrical Housecraft Diploma, Chelsea Polytechnic First-Class Domestic Science, within 40 miles Bedford. Write—Box 7884, A.K. Advg., 212a, Shaftesbury Avenue, W.C.2. 3321

B.Sc., aged 38, first-class references, returning to France, wishes to represent British firms.—Box 7937, c/o The Electrical Review.

BUYER (35), experienced with radio manufacturers, also general office management, seeks change.—Box 7928, c/o The Electrical Review.

CHIEF Engineer instrument firm desires change. Production, design, sales. Fully conversant modern methods. Write—Box 7876, c/o The Electrical Review.

CORNWALL. Electrical Engineer, age 36, requires executive position in Cornwall area. London trained, experienced installation and maintenance, lighting, heating, power, lifts, neon signs and radio. Moderate salary for suitable situation.—Box 7874, c/o The Electrical Review.

DRAUGHTSMAN (37), 16 years' experience on electrical design work, electrical engineering diploma, seeks position in illuminating engineering or allied work.—Box 7915, c/o The Electrical Review.

ELECTRICAL Engineer, M.A.S.E.E., age 35, free Nov. 1st, widely experienced in factory layout and installations, design and production of control gear resistances, test gear, etc., seeks executive post. Reply—Box 7872, c/o The Electrical Review.

ELECTRICAL Engineer, Power Repair Specialist, desires executive change. Exempt M.O.L. control, experienced windings, designs, tests, plant purchase.—Box 7875, c/o The Electrical Review.

ELECTRICAL Engineer (45), desiring change, requires responsible position. Experienced in installation and works maintenance for general engineering and steel works, used to control of labour. At present in position of responsibility. Write—Box 7924, c/o The Electrical Review.

ENGINEER, Electrical, Mechanical, Maintenance, or Assistant to Contractor, long experience erection and upkeep various installations and plant, work planning, supervision, records, estimating, knowldge steam, H.W and cooking plants, over 51.—Box 7859, c/o The Electrical Review.

ENGINEER with personality and good contacts, 7 years in charge contracts dept. of London electrical engineers and contractors, four years consulting, wide experience private, industrial and Ministry work. Anxious to join established concern with prospects.—Box 7873, c/o The Electrical Review.

ENGINEER, over twenty years' manufacturing and technical experience paper, rubber and plastics insulated electric cables, requires managerial appointment with progressive company.—Box 7923, c/o The Electrical Review.

ENGINEER (29), electrical, practical experience machining, inspecting, winding, maintaining, instrument work, trouble shooting, expert D.C. motors, generators, also alternators, considerable test bed experience, plant layout, design of special equipment, used to control of labour, seeks administrative or progressive post with go-ahead firm. Free now.—Box 7879, c/o The Electrical Review.

FLUORESCENT Tubes. Engineer (32), with detailed knowledge of manufacturing processes and plant design, offers services. Only genuine authoritative position acceptable. Minimum salary £600.—Box 7934, c/o The Electrical Review.

FOREMAN Electrician, 20 years' exper. all systems contracting and maintenance. London or Lancs.—Box 7854, c/o The Electrical Review.

GLASSWORKS Foreman; 20 years' experience, fully conversant mixing, smelting; specialist in hand-blowing of bulbs, familiar machine blowing.—Box 7899, c/o The Electrical Review.

GRAD. I.E.E. (30), 14 years' experience A.C./D.C. equipment and installation, seeks responsible position. Free R.A.F. Jan., 1946.—Box 7926, c/o The Electrical Review.

ILLUMINATION Engineering and Lighting Fittings. Draughtsman designer (32), wishes to enter electrical side of above industry, preferably street lighting, after 8 years' break. Minimum salary £500 London, £450 Provinces. Release obtainable, but M.O.L. approval of position essential.—Box 7933, c/o The Electrical Review.

LIGHT-current Engineer, 12 years' experience in telephony, carrier current equipment, research, design and administration, high academic qualifications, seeks responsible and progressive position in England.—Box 7844, c/o The Electrical Review.

MAN with specialised knowledge of Stores Systems, urging of bought out material and progress control of manufacturered parts, seeks position witth company engaged in the manufacture of domestic heating and cooking appliances.—Box 7860, c/o The Electrical Review.

PAPER Insulated Cables. Production Manager (36), with 18 years' experience, desires change, and seeks responsible position requiring organising ability, drive and personality. Highly qualified in efficiency, modern manufacturing and production control methods.—Box 7903, c/o The Electrical Review.

PLANNING Engineer (32), A.M.I.Ec.E., fifteen years' experience machine and assembly shops, production control, D.O., planning, time study and estimating on electrical and electro-mechanical devices, desires change. Nat. Inst. of Engineering Diploma, Works Apprenticed. Any firm in the London area desiring to have a Planning Dept., organised on sound modern lines under a keen and competent technical man with wide workshop experience at a salary of £750 p.a., is invited to communicate with—Box 7931, c/o The Electrical Review.

PLASTIC Moulding Foreman or Manager, with long practical experience, seeks progressive position. Would start up new concern. Excellent references.—Box 7878, c/o The Electrical Review.

POSITION required as Manager, Working Manager or Sales Manager with electrical or radio concern. Fully competent, sound technical knowledge and excellent administrative ability, 14 years' experience. Now released from R.A.F. Age 34. Home or abroad.—Box 7925, c/o The Electrical Review.

PROGRESSIVE man, age 35, with specialised knowledge of electrical engineering stores sections, stores systems, stock control, purchase progress, etc., requires administrative position.—Box 7922, c/o The Electrical Review.

RADIO and Electrical Sales Engineer seeks position as Representative to firm of radio and electric appliance manufacturers or wholesalers, N. of England preferred; 16 years' experience. Plenty of initiative and progressive man.—Box 7850, c/o The Electrical Review.

RELEASED from Admiralty, Production Engineer (nearly 6 years), Electrical and Mechanical, seeks permanent post, previously electrical switchgear development designer, practical and theoretical training, capable organiser, flexible, energetic. Salary £700. Write—BM/RJMR, London, W.C.1. 7943

SENIOR Electrical Draughtsman and Engineer (36), qualified, experienced, and with good references, seeks permanent position of trust. Industrial or public works installation, design, etc., and maintenance of plant. Good experience in field, office management, correspondence, specification, etc.—Box 7901, c/o The Electrical Review.

SALES Engineer, A.I.E.E. (40), successful pre-war record at home and abroad with C.M.A. and others; contracts, cables, transmission lines and accessories. Now returned from commissioned service with the Forces. Will consider senior position of trust and responsibility, such as Sales Manager or Foreign Representative, that justifies £1,500 p.a. and prospects, as the reward of initiative and enterprise in post-war development.—Box 7920, c/o The Electrical Review.

TELECOMMUNICATION Engineer, B.Sc., A.M.I.E.E., A.C.G.I., age 31, five years' R.E.M.E. experience in charge of radar and wireless workshops, seeks executive position in progressive industrial undertaking. Speaks French, German, Italian.—Box 7911, c/o The Electrical Review.

WORKS Manager desires change, 35 years' experience in design and production of small electrical units. London district preferred, but not essential. Excellent references. Write—Box 7887, c/o The Electrical Review.

YOUNG Engineer (22), B.Sc., 2½ years' experience in design and manufacture of power transformers, seeks interesting post.—Box 7929, c/o The Electrical Review.

YOUNG Man (27), at present serving H.M. Forces, seeks progressive post; 6 years as electrician R.A.F., studying electrical engineering. Due release approx. Jan. 1946. —Box 7845, c/o The Electrical Review.

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26

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63

MODERN DIESEL GENERATING PLANT

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

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150-b.h.p. CROSSLEY VERTICAL 3-CYLINDER COLD STARTING DIESEL; new 1939, speed 500 r.p.m., vee rope driving 170-kVA BRUSH 400-volts, 3-phase, 50-cycles Alternator with switchgear, new 1939.

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NEWMAN INDUSTRIES LIMITED, YATE, BRISTOL

3173

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HUDDERSFIELD Corporation have for disposal, and offers are invited for the purchase of, a 34-panel Metropolitan-Vickers, type K2 and K2C, Moulded Stone Cellular Duplicate Busbar, 3-phase, 6,600-volts Switchboard, consisting of 4 incoming 1,500 amp. units, 3 air break bus-section units, 4 busbar couplers, 26 100/400-amp. feeder units, fitted with O/C and E/L protection; remote mechanical and solenoid operation.

These units are at present in commission and may be examined at the St. Andrew's Road Generating Station by appointment.

Eight Units will be available in November of this year and the remainder from time to time during the next 12 months.

Further particulars on application to—

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3337

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1 G.E.C., input 460 volts D.C., output 12 kW, 400 volts, 3-phase, 50 cycles (four wires).
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Two	25,000 lbs.	..	175 lbs. ..
Three	20,000 lbs.	..	175 lbs. ..
Two	16,000 lbs.	..	190 lbs. ..
One	12,000 lbs.	..	200 lbs. ..
One	9/10,000 lbs.	..	200 lbs. ..

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

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½	h.p.	3-phase	400	volts	1,460 r.p.m.
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½	..	3 ..	400	..	950 ..
1	..	3 ..	400	..	1,460 ..
1½	..	3 ..	400	..	1,460 ..
2	..	3 ..	400	..	1,460 ..

Also a quantity of D.C. Starters in stock.

HURST ELECTRICAL INDUSTRIES LIMITED,
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28 s.w.g., single silk covered, on reels approx. 3 lb. at **6s.** lb.
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Also Strip Copper

Size .1 × .085 D.C.C., on 1-cwt. drums at **1s. 3d.** per lb.
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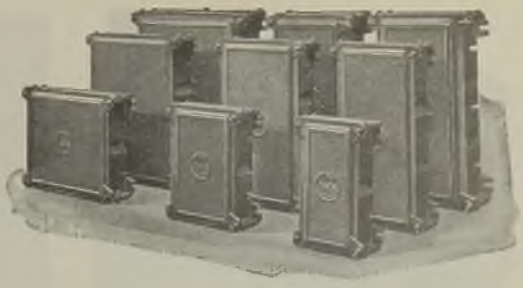

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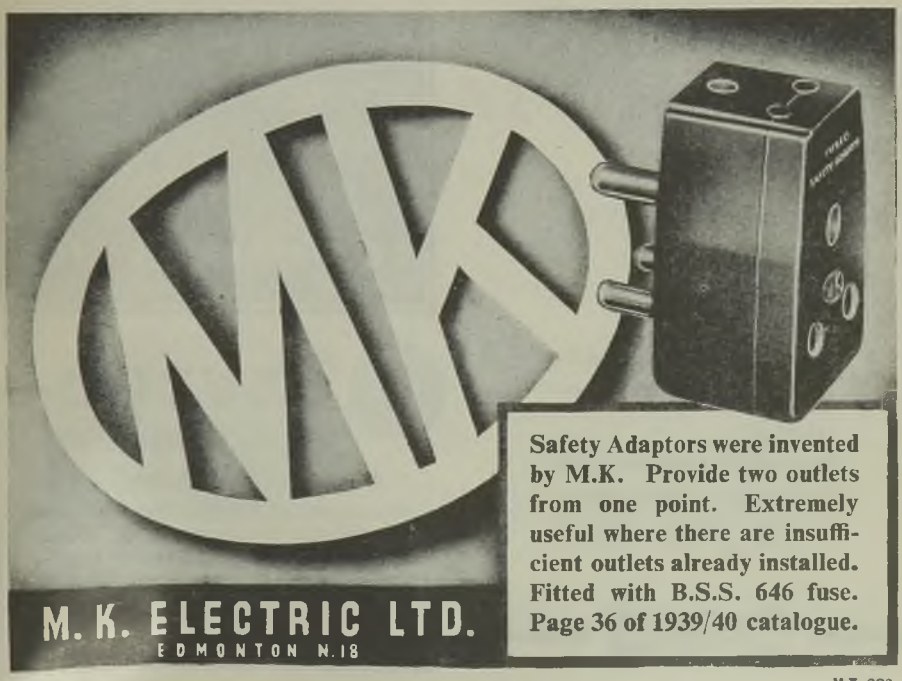

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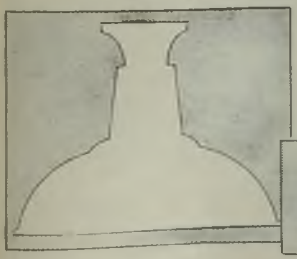

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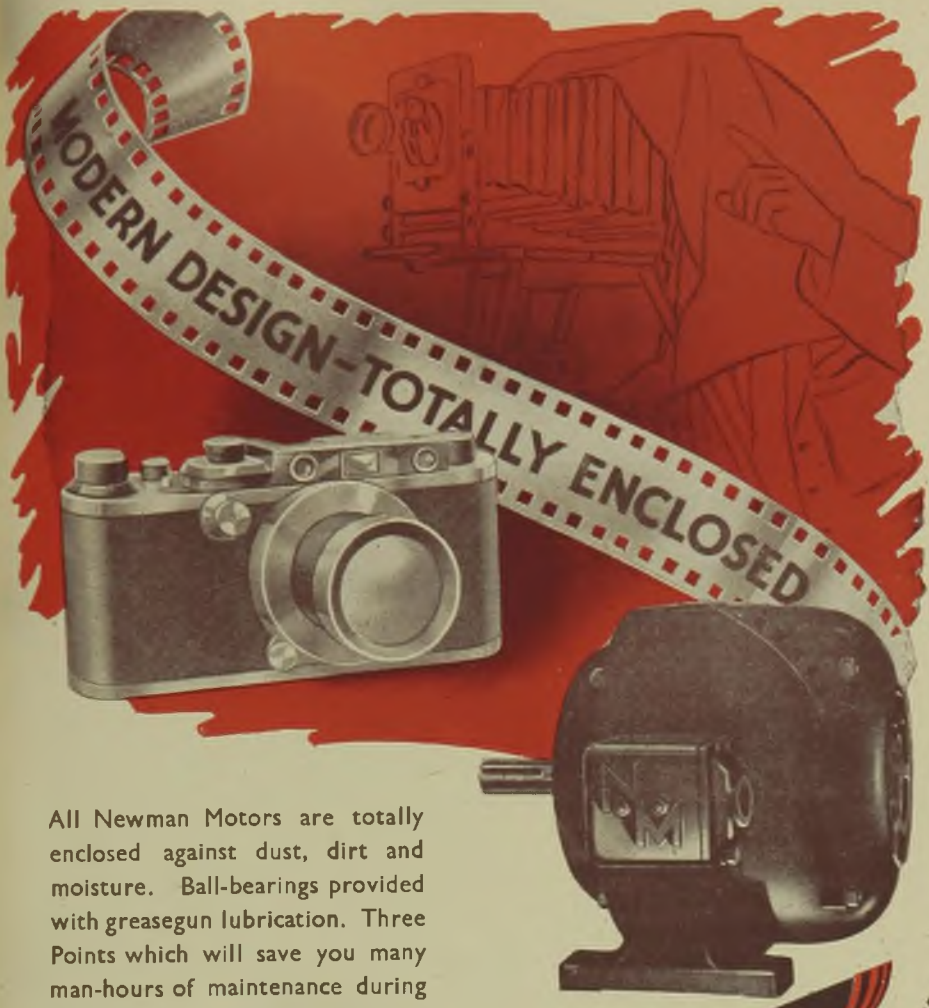

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