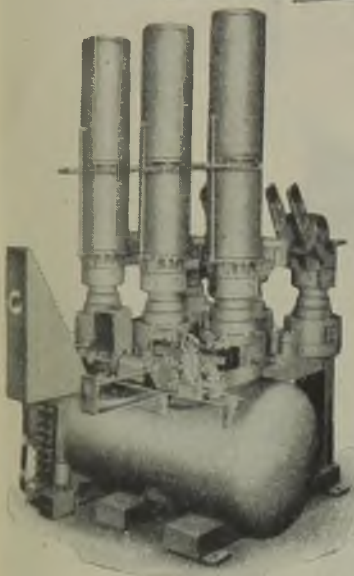
ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXV. No. 3483 AUGUST 25, 1944 9d. WEEKLY

'ENGLISH ELECTRIC'

Air-Blast SWITCHGEAR



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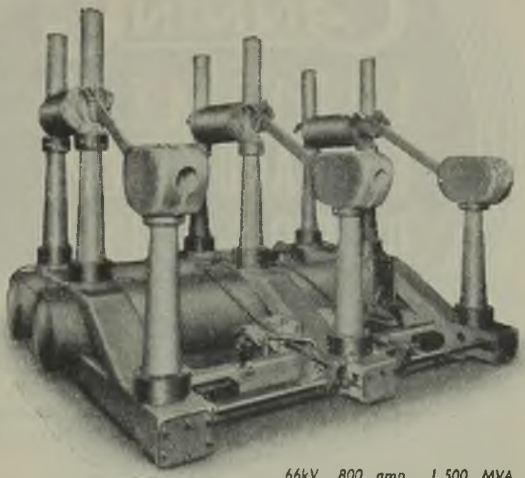

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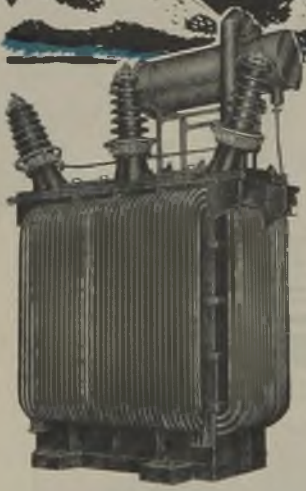

RELAX for one refreshing moment ; call back the memory of joys that will return—the quiet of the countryside, the bright lights of Town, the glory of white sails against the blue waters. . . .

See that sleek beauty rounding the mark buoy in a flurry of foam. Hear the laughing voices and the cry of gulls. . . .

How significant that two boats can be as like as two peas to the outward eye ; yet one, **thanks to greater skill and experience,** is always ahead.

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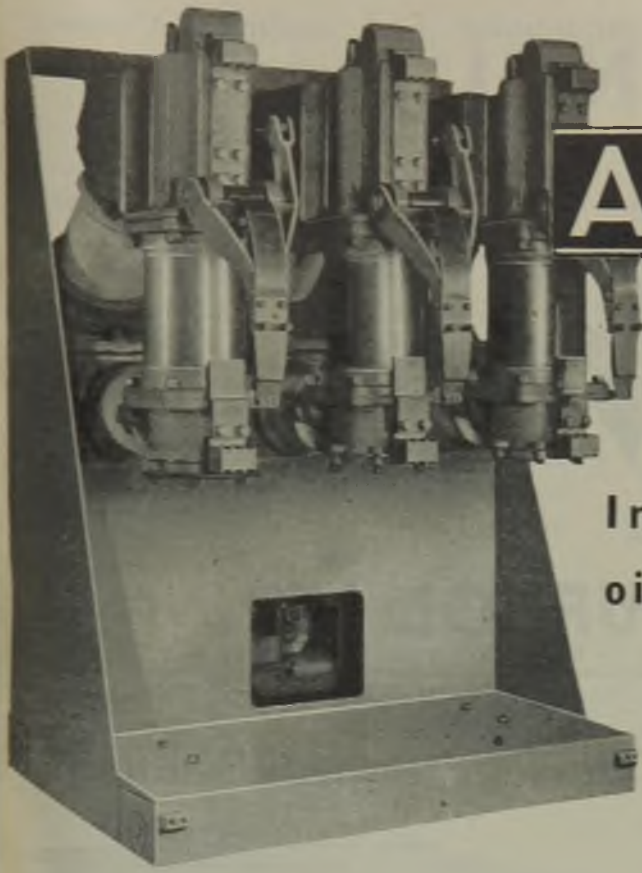

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Indoor type oil minimum circuit breaker

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ELECTRICAL REVIEW

August 25, 1944

Contents :—

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Telegraphic Address : "Ageekay, Sedist, London." Code : ABC. Telephone No. : Waterloo 3333 (35 lines).

Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage. Entered as Second Class Matter at the New York, U.S.A., Post Office.

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

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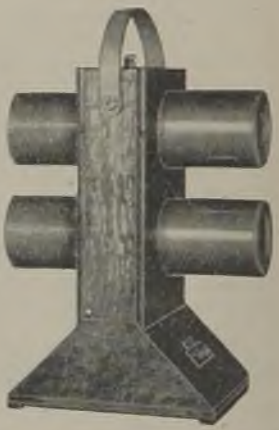

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ELECTRICAL REVIEW
THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXV. No. 3483. AUGUST 25, 1944 9d. WEEKLY

Terms and Definitions

Importance of Correct Nomenclature

ELECTRICAL engineers have been accused by the lay public of an addiction to jargon. The dictionary definition of jargon is confused talk and the right reply to the charge ought to be that every word employed in a technical sense has its precise meaning, irrespective of its context, to all practitioners and that the idea it seeks to convey could not be stated briefly in any other way.

Unfortunately that answer would not invariably be accurate. One reason is the number of words in ordinary use to describe technical ideas and devices; another is the persistence of expressions, once in currency (possibly with authoritative sanction) but now obsolete as a result of scientific developments. The latter was the aspect emphasised in an article on "Electrical Terminology" contained in our issue of June 2nd. Although some of the examples cited may appear at first glance to possess a somewhat theoretical interest, they exercise an influence on mental processes that is none the less profound because it is not immediately obvious.

Pressure and Tension

Correct nomenclature, however, has often a direct bearing on day-by-day practical affairs. A case in point is presented by the terms used to denote potential difference (in which departures from standard are comparable with those that exist in the case of declared voltages at consumers' terminals). Voltage is often referred to indifferently as pressure or tension. Pressure already has its well established field in mechanical engineering or it might be intended to refer to pressure cables, the dielectric of which is subject to super-atmospheric pressure. Tension also has its prior mechanical associations in addition to those connected with various items of overhead line construction and equipment. A similar objection on the ground of disparity of competitive meanings might be entered against the use of "unit" as an abbreviated form of the old Board of Trade unit of electrical energy (although officially accepted) instead of kilowatt-hour, which is favoured outside this country.

Classification of Voltages

Next we have incorrect references to the categories into which supply voltages are legally separated—low voltage up to 250, thence medium voltage up to 650 and high voltage above that. Distinction between extra-high-voltage (above 3,000 V) and high voltage is still made, but the significance of this has long ceased to exist. The common misuse of low (instead of medium) voltage to describe 400-V distribution is of practical significance, since certain statutory safety measures are prescribed for voltages above 250. Similar considerations are involved in the term phase voltage, which is frequently applied indiscriminately to voltage between lines and to voltage from line to neutral.

The examples cited are only a few of the many discrepancies which crop up in speech and writing and which appear to justify condemnation as jargon. Even if the context appears to remove any chance of

confusion, some amount of effort is entailed in mental adaptation which is something to be avoided. The process does not help clear thinking. For the lack of universal terminology the builders of the Tower of Babel came to grief, and the first attempts at standardisation should be to endeavour to ensure that the same words mean the same things to different people. In case of doubt recourse should be had to the "Glossary of Terms used in Electrical Engineering," in which the aim is clearly to use direct and as far as possible self-explanatory forms of expression and, in addition, to establish logical basic relationships between scientific concepts.

Scotland Points the Way

As we noted when it was issued, the report of the Scottish Advisory Committee on Housing expressed a very definite preference for electricity in new houses based upon extensive inquiry among those concerned. The soundness of its conclusions is receiving practical proof in the shape of decisions of Scottish local authorities. The Rutherglen Council is adopting the all-electric idea in houses which it is building at Berelands, and the Clydebank Council demonstrated a week or two ago the first of many rapidly-constructed "Duplex" houses in which adequate electrical facilities are perhaps the chief attraction, particularly a generous supply of outlets. We may hope that the rest of the houses which the Council is erecting (the total need is for over eight thousand) will be similarly equipped.

Gas Reorganisation

PROPOSALS for the reorganisation of the gas industry follow very closely those which have been put forward by various interests for the future of electricity supply. The term "interests" is used here with particular meaning, for each set of proposals is coloured by the views of the section responsible. Thus, as the I.M.E.A. represents municipalities it advocates the continuance and extension of public ownership (in particular local authority ownership). On the gas side local-authority gas undertakings are represented by the Association of Municipal Corporations and so naturally the Association is for public ownership. It thinks that the present "mixed" system constitutes a barrier to voluntary rationalisation and co-operation and no improvement is likely while it continues to exist.

Joint Boards

IT is suggested that municipal joint gas boards should be set up in some localities, but the British Gas Federation has already stated that the setting-up of the gas boards would be substituting "an experiment for a well-tried system of company and municipal enterprise." Here are two apparently irreconcilable points of view for the Minister of Fuel and Power to consider. In the electricity supply industry there has at least been an attempt to find some common measure of agreement. Whatever may be thought of the White Memorandum it does show a certain measure of willingness on the part of private and public interests to get together. And already the electricity supply industry is much better organised than its gas rivals.

Permanent Exhibition

WRITING to the *Daily Telegraph* last week Mr. Raymond Berry referred to the inadequate facilities afforded in connection with past British Industries Fairs and said that this lack could be got over by the provision in London of a permanent exhibition (and amusement) centre in one of the parks—Regent's Park, for instance, where there appears to be plenty of available space. There is no doubt that London needs something better in the way of exhibition arrangements than exists at present and the question is one that should interest the electrical industry which would have to play a leading part in any such scheme. Mr. Berry's suggestion reminds us of the late Lord Hirst's advocacy of a permanent electrical centre in London which is another idea worth considering when post-war electrical plans are being prepared.

South African Commission

FOR the first time since 1931, the South African Electricity Supply Commission has to report a slight decrease in output and sales last year, owing to a lessening of the demand for bulk supplies for the mines and for direct supplies for traction and industry. There were substantial increases in municipal bulk supplies and in sales for domestic purposes and street lighting. As 1943 saw the completion of twenty-one years'

operation the report for the year contains a brief history of the Commission's activities. The importance to which it has attained is evident from the fact that it is now responsible for about two-thirds of the Union's electricity supply. Much of the credit for the progress made is due to Dr. H. J. van der Bijl, who has been chairman of the Commission since its inception and to whom his fellow Commissioners pay a tribute in an addendum to the report.

Cheap Coal

As we have mentioned on previous occasions, an outstanding feature of power production in South Africa is the cheapness of the coal. The average cost per short ton (2,000 lb.) for the whole of the Union was less than 7s. 5d. This low figure was due largely to the fact that at the Klip station, which produces something like 37 per cent. of South Africa's electricity, and Witbank (10 per cent.) the cost of coal is (to English minds) ridiculously low —3s. 9d. and 2s. 1d. per short ton respectively. In view of Home experience it is worth noting that the price of coal at Klip has only risen by 7d. a ton since 1926, when it started, while at Witbank there has actually been a decline of 1d. since 1930. To complete the story the consumption per kWh generated should be given: in 1943 it was 1·64 lb. at Klip and 1·73 lb. at Witbank.

Tramway-point Freezing

EXPERIMENTS in protecting tramway points from frost through the adoption of permanent electric heating installations on the tracks are reported to have been carried out in Nürnberg during recent severe winters. These are said to have been successful enough to justify the attention of manufacturers to the subject, while they afford the opportunity of devising improvements. Difficulties encountered include shocks occasioned by heavy traffic and hot spots as a result of the thermal insulation provided by mechanical protection. Energy consumption has been given as upwards of 3·5 kWh with 35 W per ft. of heater tube.

Continuous Heating

RECONCILIATION of the apparently inconsistent views that more heat energy is required to restore the temperature of a building than to maintain it and that the supply can be economically switched off or varied to suit atmospheric conditions was furnished by Mr. J. L. Musgrave in the paper which he read recently before the Institution of Heating and Ventilating Engineers. Where heat is applied continuously, he said, about 60 per cent. of the energy is used during the night. Low-temperature heaters, assuming adequate thermal insulation, can be switched off for three hours with a fall in temperature of only $\frac{3}{4}$ to 1 deg. F. and thermostatic control enables full advantage to be taken of any casual heating, e.g., from occupants, intermittent sunshine, lamps and fabric warmed by radiation. After that period the temperature drop is much more rapid and inner wall surfaces become cold.

Cosmic Rays

FURTHER knowledge of the charged particles that enter the earth's atmosphere from outer space and take part in electrical activities could be obtained as a result of slowing them down for study at leisure. That is a possible future function of the cyclotron, which, according to *Science*, is envisaged by Professor Laurence Dodd, of the University of California. For this purpose the cyclotron would, however, have to project particles at speeds as high as those of the cosmic rays—very much higher than values at present obtainable. Another obstacle is that the path taken by cosmic rays is not now determinable and consequently the correct direction of pointing the cyclotron would be a matter of chance.

Civilian Supplies

IN spite of the opposition of the Director of War Mobilisation, Mr. Donald Nelson, chairman of the United States War Production Board, is going ahead with his plans to permit manufacturers to proceed with a limited production of goods for civilian purposes. He contends that this is necessary to "take up the slack" resulting from a gradual easing off of the production of war supplies. Among the articles on the list are many which have been unobtainable for some time, including electric cookers, water heaters and vacuum cleaners. Permission to make these goods will be given on a local basis, that is, only in districts where the supply of materials and manpower is found to be surplus to war requirements.

Transformers for Russia

A 15·75/242-kV, 120,000-kVA Bank

FOLLOWING up our recent articles, prepared with the collaboration of the Ministry of Supply and many of the leading British electrical and allied equipment manufacturers, recording some of the excellent work which is being done by the manufacturers to help the U.S.S.R. in its magnificent reconstruction work, we are now able to give an account of a 120,000-kVA bank of transformers which has been produced by the British Thomson-Houston Co., Ltd., for feeding a 242-kV 50-cycle three-phase transmission system. Consisting of three single-phase transformers, the bank is believed to be the largest yet produced in this country. The input (low) voltage is 15,750, and the low-voltage windings are delta-connected.

Two of the transformers were transported separately from the factory on a 100-ton lorry, assisted by a steam-tractor

Such large and special-purpose transformers created unusual interest among those who had to meet, in producing them, the Russian engineers' special requirements, the principal of which were as follows:—Each core, complete with its coils, had to be dried and shipped, without oil, in its own tank, hermetically sealed and with the permanent covers in position, and to be within the limits imposed by the existing British road and Russian rail vehicles and loading gauges. The high-voltage winding had to be star-connected, with the neutral ends insulated, and suitable for operation when earthed through an impedor. They also had to embody series-parallel connections to give the full rated output at either 242 kV or 121 kV, with plus and minus 2½ per cent. and 5 per cent. tappings on each connection. They were to be insulated for the following tests: (a) an induced over-voltage test producing 485 kV to earth at the line end of the windings; (b) a separate source test of 242 kV to earth on all parts, including the neutral terminals; (c) an impulse test level in accordance with the A.S.A. Test Code of one million volts peak on a full wave of 1 × 50 microseconds and 1,210 kV on a "chopped" wave. An inherent reactance of not more than 10 per cent. at the full rated current was also called for.

The design which was evolved to meet these major requirements embraces some novel features, and probably the low height of the transformers, as built, constitutes a world record having regard to the transformer ratings. The relative low overall height fixed by the British loading gauge made it impracticable to get an inherent reactance as low as that required on a two-legged core, so it was decided to adopt a four-leg construction which was investigated experimentally some 20 years ago, but had never before been used commercially. The two outer legs enabled the depth of the yokes to be reduced, and thus permitted the provision,

within the gauge limits, of a taller "window" for the accommodation of the windings. The manufacture of these large cores, each of which weighs over 60 tons, to the specially evolved design was accomplished by the B.T.H. Co. without difficulty.

The manufacture of the large cores, each of which weighed over 60 tons, to the special design was accomplished without difficulty

Liberal ventilating ducts are provided on the centre of each main leg at right angles to the plane of the laminations. On all the legs numerous parallel ducts in the plane of the laminations are also provided, and are maintained by H-section steel spacers welded to adjacent core plates. The laminations are insulated on both sides and all the edges (after completion of shaping) by standard core-plate flash enamel, and the core is sub-divided into sections by means of asbestos sheet.

The core bolts are covered with special insulation of asbestos bonded with synthetic resin, moulded directly on to the bolts under high pressure and high temperature.

By utilising the outside legs for the neutral end of the h.v. windings on each connection, and by locating the tappings on these legs, it was possible to obtain a neat and symmetrical arrangement for series-parallel connections, combined with a balanced set-up of the main windings, giving great mechanical and electrical strength.

The high-voltage coils on the main legs are of the disc type and are arranged concentrically with the low-voltage helical windings.

The high-voltage windings are provided with electrostatic capacity-compensating shields to give an approximately sinusoidal initial voltage distribution under surges due to lightning and other causes, and to reduce to the minimum the subsequent internal winding voltage stresses. On the outer legs the high- and low-voltage coils are interleaved in groups, and are both of the twin-section disc type which embodies features offering great mechanical strength and rigidity. The high-voltage coils on these outer legs contain the tappings which are connected to standard off-circuit switches arranged for external manual operation.

The tanks are of unusually strong construction to withstand the repeated handling

Consisting of three single-phase transformers, this 120,000-kVA bank is believed to be the largest so far produced in this country

to which they must be inevitably subjected under war conditions during the long journey to the site by road, sea and rail. The attachments provided for lashing to prevent movement of the equipment while it was on board ship under severe weather conditions or sudden evasive action are a special feature. To permit vacuum drying on site, should this ever become necessary, the tanks are designed to withstand a 28-in. vacuum, and when they were tested under this condition in the factory they showed no distortion. It will be noted from the illustrations, however, that a bottom gasketed joint is involved as well as the usual top joint between the tank body and the cover. An unusual requirement for such a large transformer is the rollers which permit movement either in line with or at right-angles to the long axis of the tank.

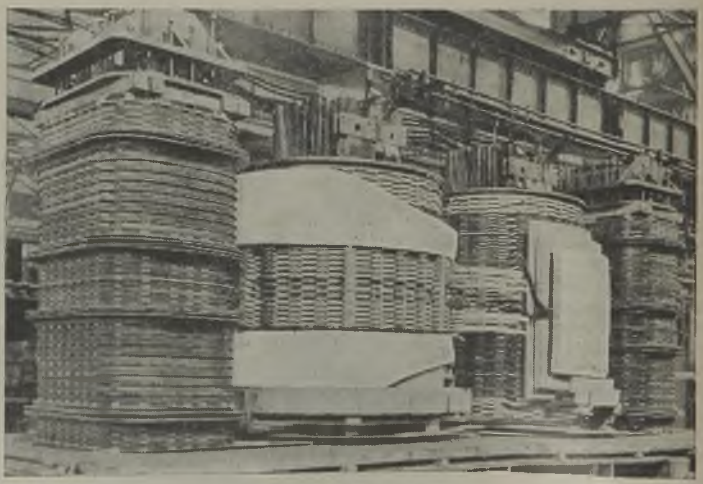
The air end porcelains of the bushings, which are considerably taller than the average man, were fired in one piece

Mounted in pockets and removable for transport purposes, the high-voltage bushings are of the makers' standard oil-filled construction, but apart from their unusual physical size they embody no special features. An interesting point about their production bearing in mind their size, however, is that the air end porcelains, which are considerably taller than the average man, were fired in one piece. When mounted on the transformers they are somewhat dwarfed by the huge tanks. The 50-cycle, dry and wet, flash-over values, without arcing horns, are 690 kV and 470 kV respectively.

Each single-phase unit is provided with two coolers consisting of vertical steel headers accommodating numerous cooling tubes. The complete unit is cylindrical in shape and is mounted on a steel framework, about 10 ft. above ground level, to prevent its being buried in a heavy snowfall. Air passes upwards and downwards between the tubes. The coolers are designed to dissipate the heat losses corresponding to half the rated load, with the oil and air circulation due solely to the natural thermal head. Under full-load conditions, however, forced oil circulation and air-blast on the coolers are automatically brought into operation by an internal winding-temperature indicator.

Special arrangements permit immediate loading of the transformer after it has stood "idle" for a long time with an ambient temperature of −40 deg. C., at which temperature cooling oil is very sluggish. The oil pumps, one of which is provided for each cooler, are of the glandless type with the motor submerged in the oil. The fans are situated under the domed top covers in the centre of the cooler units.

The location of the coolers was determined by the site conditions, and it is understood that the three transformers of the group are installed at 45-ft. centres. Two separate conservators are provided and are placed above the coolers with two Buchholz relays, one in each oil connection. The high-voltage neutral and bushing are situated on the tank cover, and this arrangement, with the pocket-mounted and

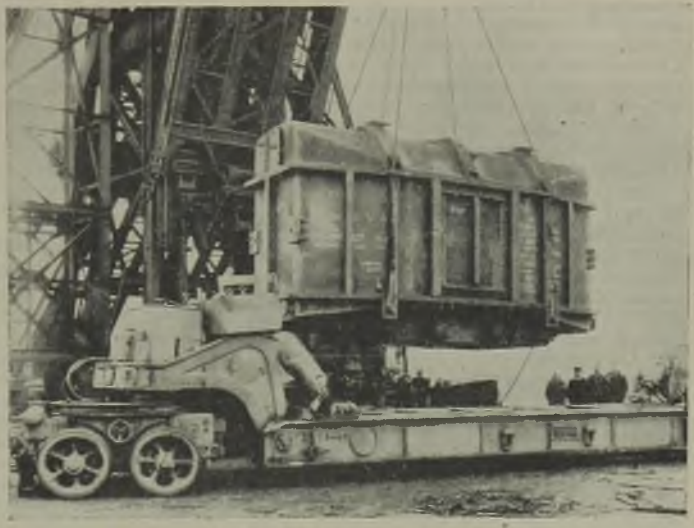


The high-voltage coils on the main legs are of the disc type and are arranged concentrically with the low-voltage helical windings

removable high-voltage bushings, affords liberal clearances throughout. The whole of the control apparatus for the oil pumps and air blowers is contained in a cubicle fixed to the low-voltage side of the transformer. This cubicle also contains two dial thermometers for indicating locally the temperatures of the oil and the windings. The installed overall dimensions of each single-phase transformer are:—Length, 37 ft. 8 in.; width, 28 ft. 2 in., and height, 25 ft. 7 in.

The total weight of the complete transformer bank as installed is a little short of 500 tons, while the installed weight of each single-phase transformer, complete with its oil and coolers, is 164 tons. The windings, core and clamps of each single-phase transformer weigh 76 tons, each high-voltage bushing weighs 1½ tons, and each cooler weighs 11 tons. The efficiency at full load and unity power factor of the transformer bank on test was 99·1 per cent. The no-load line exciting current on test was 5·9 per cent. of the rated full-load current. The impedance at the normal tap rated output was 8·9 per cent. When stripped for transport the overall dimensions of each transformer were 23 ft. 4 in. long, 10 ft. 8 in. wide and 30 ft. 7 in. high; the unit weighed 100 tons.

The route between the factory and the port of embarkation was specially surveyed to secure accurate data of road and bridge limitations, and the transformers were transported to a programme prearranged with police and highway authorities. The first and third transformers to leave the factory were each transported on a 100-ton Scammell lorry which was assisted by a steam tractor, while the second one was transported on a 140-ton trailer propelled by two Diesel tractors, one in front and one at the rear. This trailer was only recently commissioned and was at the time of this formidable transportation undertaking the largest and only one of its size. Shipment between the British and Russian ports was made in U.S. "Liberty" ships, one transformer per ship.



One of the transformers stripped for transport—a hundred-ton load

Canada's Power Output

Still on Upward Grade

THE Dominion Bureau of Statistics reports that central stations in Canada produced 3,585 million kWh in May, the highest output in any month to date and an increase of 9·4 per cent. on May, 1943. During the first five months of this year production totalled 17,204 million kWh compared with 16,312 million kWh in the corresponding period of last year. The figures show that the ratio of Quebec's power production to the total for the Dominion is increasing. During the first five months of the year the province produced nearly 10,030 million kWh, representing 58·3 per cent. of the entire Canadian output. In the corresponding period of last year the proportion was 56·5 per cent. and in 1942 55 per cent.

Toronto Commissioners' Report

In their report for the year 1943 the Toronto Electric Commissioners comment on the effect of the abnormal operating conditions on load factor. For the six years immediately preceding the war the average was 48 per cent., whereas for 1943 the figure was 57 per cent. Thus over a sixth more use is at present being made of available capacity, but these artificial conditions, the Commissioners say, may be expected to disappear when the war ends and a reversion to normal load factor is to be anticipated. In 1943 the Toronto hydro-electric system sold 1,312 million kWh as against 1,321 million in the previous year. Total revenue amounted to $13,063,476 and the net profit was $82,494. During the year consumers received a special temporary concession by the halving of the normal charges for one accounting period; in the aggregate this amounted to $736,000.

Progress in South Africa

Electricity Supply Commission Comes of Age

THE report just received from the South African Electricity Supply Commission marks the coming-of-age of the Commission, which was established on March 1st, 1923. An idea of the present importance of the organisation can be gathered from the fact that at December 31st last its assets amounted to nearly £31,000,000 and its total liabilities were slightly over £24,000,000. The Commission now owns seven main power stations, with a total installed capacity of 872,650 kW of generating plant (including 66,000 kW under construction in the Vaal power station), which will be increased to 1,084,150 kW by plant now on order.

The Commission's licensed area of supply in the four provinces of the Union is now over 34,000 sq. miles and it owns over 2,470 route miles of overhead lines and 100 route miles of underground cables, the total transformer capacity of the systems being more than 1·5 million kVA. Along the 1,229 track miles of electrified railway lines in the Union, the Commission owns fifty-one substations for traction purposes.

The total number of consumers of all classes supplied at December 31st was 12,285. These include the South African Railways and Harbours Administration, many municipalities taking bulk supplies and also the Victoria Falls and Transvaal Power Co., Ltd., which takes the bulk of the output of the Witbank station and the whole output of the Klip station for supply to the gold-mining and other industries along the Reef. The output of the Vaal power station will also be supplied to that company.

Sales Decrease in 1943

During its twenty-one years' existence the Commission has sold more than 35,500 million kWh and in 1942 its sales represented nearly 64 per cent. of the total sales of electricity in the Union. For the first time since 1931 the Commission records a decrease in its total output and sales of electricity. The total kWh generated in 1943 was 4,420,651,109, which was 53,998,145 kWh less than in the previous year. Sales of electricity decreased by 45,218,564 kWh to 4,275,629,854 kWh compared with the sales for 1942. Bulk supplies for mining, etc., totalled 3,257,442,242 kWh (2·03 per cent. dec.) and bulk supplies to municipalities 350,563,136 kWh (9·61 per cent. inc.), while direct supplies for traction amounted to 418,110,549 kWh (1·35 per cent. dec.), mining 53,862,125 kWh (4·31 per cent. inc.), industrial purposes 172,448,134 kWh (3·75 per cent. dec.), and domestic and street lighting 23,203,668 kWh (8·00 per cent. inc.). Capital expenditure during the year (£1,405,430) brought the total capital expenditure at December 31st to £23,286,754. The expenditure on capital account will amount approximately to £24,600,000 on completion of all works to which the Commission is at present committed. Total revenue for 1943 amounted to £3,189,782, as compared with £3,138,147, while production costs, including interest, redemption and reserve fund charges, totalled £3,185,146 (£3,134,331). The average price per kWh sold was 0·1743d. (0·1697d.), the average revenue per kWh sold (including sundry revenue) was 0·1790d. (0·1743d.) and the average cost per kWh sold was 0·1787d. (0·1741d.).

Extensions Delayed

An additional 25,000-kW turbo-alternator set was placed in commercial operation on July 1st, 1943, and has afforded much needed relief as operating conditions were becoming very difficult. A further 25,000-kW set for this station is now being ordered. The expectations that the new Vaal Power station would be in partial operation towards the end of 1943 did not materialise as certain essential equipment was lost at sea through enemy action and the first set is not expected to be in service until towards the end of 1944. Completion of the Congella power station extensions, which were commenced early in 1939, is still being held up pending replacement of the turbine (also lost at sea last year) of the partially erected 40,000-kV set. An order for a duplicate turbo-generator set is now being placed for a further extension.

In addition to its generating and distributing duties the Commission reports to the Administrators of the several Provinces upon proposals for the institution or extension of municipal electricity schemes, stating whether the Commission can itself furnish a supply with advantage to ratepayers and consumers. While this function is purely advisory, in a number of instances it has been the means of bringing about co-ordination of electricity production and supply, although the widespread character of the towns has limited the scope for co-ordination.

An appendix to the report gives statistics relating to the production and supply of electricity in the whole of the Union in 1941-42. It shows that the total number of consumers was 369,349 (including 311,565 domestic) and the total consumption 6,767·7 million kWh (797 million domestic) of which the Transvaal accounted for 5,321·7 million. 2,560 kWh per domestic consumer was sold

Heat Dissipation *from* Substations

By T. D. Oswald, B.Sc.

Calculating Ventilator Areas for Naturally Cooled Buildings

THE effect of excessive ambient air temperature upon substation equipment has recently come under notice by the resulting acidification of Class A transformer oil. In many cases the restriction of ventilation openings due to black-out fittings has contributed to the overheating.

Part of the heat is removed by conduction through the walls and the roof to the outside atmosphere, being proportional to the difference in temperature between the air inside and outside the building and the area of the exposed surfaces and depending on the thickness and character of the structural materials. The following are typical values in kW per deg. F. per sq. ft. of the heat transmitted through various materials: 12 in. brickwork, $1{\cdot}0 \times 10^{-4}$; 18 in. brickwork, $0{\cdot}75 \times 10^{-4}$; 4 in. concrete, $1{\cdot}6 \times 10^{-4}$; 8 in. concrete, $1{\cdot}2 \times 10^{-4}$; 1 in. pine door, $1{\cdot}5 \times 10^{-4}$.

The rate of dissipation, in kW per deg. F., may be determined in any particular case, knowing the nature of the material and the respective areas (see table). For this building the heat dissipated by conduction is 0·0693 T kW, where T is the difference in temperature between the air inside and outside the building. With a temperature difference of 35 deg. F. the power dissipated in this way is 2·4 kW.

Item	kW per deg. F. per sq. ft.	Area, sq. ft.	kW per deg. F.
8-in. concrete roof	$1{\cdot}2 \times 10^{-4}$	243	0·0292
14-in. brick wall	$0{\cdot}9 \times 10^{-4}$	302	0·0272
1-in. pine door	$1{\cdot}5 \times 10^{-4}$	86	0·0129
Total			0·0693

For all practical purposes the remainder of the heat is removed by ventilation. Cold air drawn in at ventilators placed low in the walls is warmed in the building and leaves *via* ventilators placed in or near the roof. The heat removed by a given quantity of air is proportional to the temperature rise. With natural ventilation the air flow itself is dependent upon the rise in temperature, which produces the necessary pressure differential. The volume of air flowing through an opening may be estimated by means of the theory of flow through an orifice.

Assuming that the area of the ventilator opening is small compared with the area of the space into which it discharges, the flow may be written: $V = CA\ 20{\cdot}84\ \sqrt{p}$ cubic feet per second .....1, where C = coefficient of discharge, A = orifice area sq. ft. and p = pressure differential across the opening in lb. per sq. ft. In general there will be a set of inlet openings, total area A_i sq. ft., and a set of outlet openings, total area A_o sq. ft., which may be looked upon as orifices in series. In this case the flow becomes: $V = C\ 20{\cdot}84\ \sqrt{p}\ \frac{1}{\sqrt{1/A_i^2 + 1/A_o^2}}$ cubic feet per second 2

That is, the equivalent area of a single orifice representing the effect of inlet and outlet openings in series is given by:

$A = \sqrt{1/A_i^2 + 1/A_o^2}$ sq. ft. 3

For an outside temperature of T_1 deg. F. absolute, an inside temperature of T_2 deg. F. absolute and a room height of h ft., the pressure differential may be written $p = {\cdot}08\ h\ \frac{T_2 - T_1}{T_2}$ lb. per sq. ft. 4

For small pressure differences the heat dissipated by ventilation, where S = specific heat at constant pressure BthU per deg. F. per cu. ft., is given by $H = SV\ (T_2 - T_1)$ BthU per sec. 5

Combining 1, 4 and 5, $H = 0{\cdot}114\ C\sqrt{h}A\ \frac{(T_2 - T_1)^{3/2}}{T_2^{1/2}}$ BthU per sec.

T_2 does not vary sensibly over a normal temperature range and may be taken as 554 deg. F. absolute, corresponding to 35 deg. C., the maximum average ambient air temperature for transformers (BSS 171/1936). For buildings housing up to 1,000 kW of plant including transformers C may be taken as 0·88. Using these values the heat dissipated

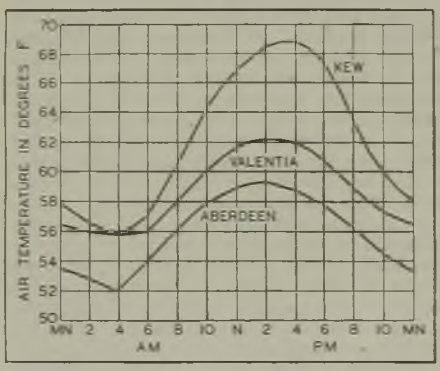


Fig. 1.—Average hourly temperature (July)

by ventilation becomes $W = 0{\cdot}00447 \sqrt{h}\, A\, T^{3/2}$ .....6 where h = room height in ft. A = equivalent area of a single orifice in sq. ft. T = temperature difference inside and outside substation in deg. F. W = energy dissipated in kW.

It is suggested that a satisfactory working value for the temperature difference may be obtained by taking the average ambient air temperature of 35 deg. C. as the inside temperature and consulting the Meteorological Office's statistics of local air temperature for the outside temperature. The graph Fig. 1 shows the average hourly air temperatures for the month of July for three stations in the British Isles. From these 68·7 deg. F. in the south and 59·3 deg. F. in the north may be considered as suitable values leading to differences of 26·3 and 35·7 deg. respectively for summer conditions.

In an actual substation the inlet and outlet areas will be made up of a number of separate openings, not all of which will be situated at the extreme ceiling or floor level as is implied by the use of a single " h " in formula 6. This is best taken into account by converting the measured area of each opening into an effective area before adding them together to obtain A_i or A_o.

Effective area = K (measured area), where $K = \sqrt{1 + x/h}$ 7

For outlet and inlet openings in the walls x is negative and is the distance in ft. below the ceiling or above the floor respectively. For outlet, roof-type ventilators x is positive and is the distance above ceiling level of the outlet from the ventilator.

The essential formulæ have been used in drawing up a set of nomograms which simplify the calculations. For example, the figures previously given relate to a transformer room (*a*), in Fig. 2, 12-ft. high having 4·5-sq. ft. louvres at the bottom of the door with centre lines 2 ft. from the floor. The inlet and outlet openings in the walls are 4·5 sq. ft. with their centre lines 1 ft. from the floor and ceiling respectively. There is one 12-in. dia. roof ventilator with its outlet 2 ft. above the ceiling. The door and wall openings are covered by a fine mesh, reducing their useful area by 25 per cent.

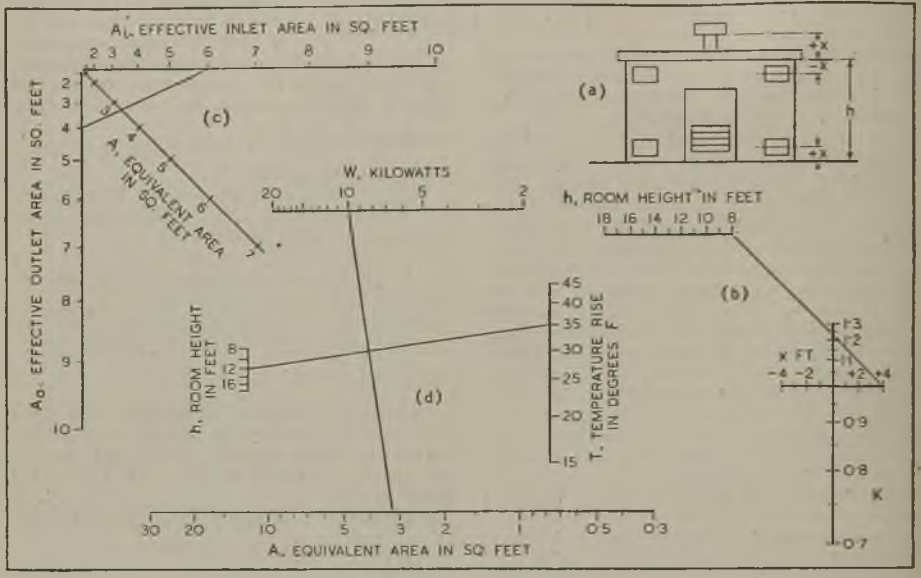


Fig. 2.—Nomograms for substation ventilation calculations

Referring to the nomogram for K, (*b*) in Fig. 2, a line from the horizontal scale of h to the horizontal scale of x cuts the vertical scale of K at the value corresponding to $\sqrt{1 + x/h}$. The following table is now drawn up:

	Measured area, sq. ft.	x ft.	K	Effective area sq. ft.
Inlet openings				
In walls ..	3·38	−1	·95	3·22
In doors ..	3·00	−2	·91	2·73
Total inlet				5·95 = A_i
Outlet openings				
In walls ..	3·38	−1	·95	3·22
In roof ..	·78	+2	1·08	·84
Total outlet				4·06 = A_o

The effective inlet and outlet areas are now converted into the equivalent area A of a

single orifice having the same resistance to air flow, by means of nomogram (*c*) in Fig. 2. Setting 5·95 on the horizontal scale of A_i and 4·06 on the vertical scale of A_o, a line joining these points intercepts the diagonal scale of A at 3·16 sq. ft., which is the equivalent area required.

Nomogram (*d*) in Fig. 2 enables the four variables of formula 6 to be handled at one operation. Draw two intersecting lines, truly at right angles, on a piece of tracing paper and place over the nomogram so that one line intersects the vertical scale of h and the vertical scale of T at the selected values. Move the sheet sideways along this line until the line at right angles intersects the horizontal equivalent area scale at the correct value. With these three values correctly intersected the latter line now cuts the horizontal scale of kW at the kilowatts dissipated by ventilation.

In the example given h = 12 ft., A = 3·16 sq. ft. and T is taken as 35 deg. F. The power dissipated by ventilation is seen to be 10 kW. Adding this to the heat dissipated by conduction through the walls and roof, the total losses dissipated with a 35 deg. F. difference are 12·4 kW. This figure may not be exceeded if the interior ambient air temperature rise is not to exceed that specified.

Organisations of the Industry—X

Accumulator Makers' Association

By F. C. Vine,
Secretary

WHILE the Accumulator Makers' Association was established in 1912, its roots go back into the nineteenth century. The stationary-battery manufacturing industry was born in 1881 when secondary batteries, invented in 1859, were first brought within the realms of practicability. The manufacturers who formed the Association had all been engaged in the industry from its infancy and were thus able to contribute to the pool of general knowledge experience gained in some thirty years of battery manufacture. The Association was started because its founders realised that the time had arrived when individualism must be replaced by intelligent and enlightened co-operation. It was to provide a means of ensuring such co-operation and a body in which to vest the requisite authority that the A.M.A., as it is now familiarly known, was brought into being.

Like most similar associations the A.M.A. devoted its earlier activities towards the establishment of a common and equitable selling policy. It stabilised discounts to electrical contractors, engine makers, manufacturers of all kinds of electrical equipment, and indeed, to all classes of buyers. Standard conditions of sale were drawn up. These and a host of similar reforms were introduced and maintained until, in course of time, they became, by long usage, the established custom of the industry.

To give full effect to the stabilised trading conditions, regulation of technical matters was equally necessary and important, as it would have been invidious to impose strict trading conditions without giving, at the same time, obvious reciprocal protection to the buyer. The A.M.A., therefore, gave close and constant attention to the policy of standardisation.

The rating of plate capacities, final voltages and voltages at intermediate and variable rates of discharge had for long been determined by the research, experiment and practical experience of individual members. These were now standardised. Stationary batteries for all purposes and their components were dealt with as occasion arose until all members, without any sacrifice of the individual characteristics of their own products, could guarantee to their customers a standard quality of performance, coupled with equal and equitable conditions of purchase. This work was an unconscious anticipation of the excellent work of the B.S.I. which has drawn freely upon A.M.A. experience in the preparation of battery specifications.

In pursuit of objects of purely domestic importance, the A.M.A. inevitably came into close contact with bodies representing other organised trades. It had always co-operated very closely with B.E.A.M.A. and had been represented on its Council for many years. During this long association, negotiations covering almost every phase of commercial activity have been successfully concluded. Both the English and Scottish Contractors' Associations have collaborated with the A.M.A. for many years and are still its loyal allies.

All such collaboration between these Associations concerned with various branches of the electrical industry, undoubtedly prepared the way for the formation of the Electrical Fair Trading Council and the

promulgation of its policy. In accepting that policy, the A.M.A. accepted the principle of autonomous sectional control under one central authority, while the Fair Trading Council endorsed the A.M.A. policy by its inclusion in their own.

Storage batteries are not only articles of general commerce, but are essential components in equipment used by many public services. During the war of 1914-1918, the Government learned the advantage of dealing with organised industry. The various buying departments were quick to perpetuate the close collaboration inaugurated and practised during the war. They have ever since drawn freely upon the manufacturing experience of A.M.A. members for data to prepare and improve their specifications so that the essential conditions of technical efficiency and economy might be met.

If the A.M.A. had done no more than regulate its home trade, it would have accomplished much, but its influence has spread abroad throughout and beyond the Empire. The A.M.A. members and overseas agents have jointly stimulated interest in battery-using equipments, resulting in a considerable increase in export business.

Although the A.M.A. is concerned, as regards standardisation, only with stationary batteries, it now concerns itself with matters of all kinds which affect the accumulator industry as a whole. When the Motor Traders' Association desired protection for the starter battery trade it was not difficult to apply A.M.A. principles through an appropriate association to that section of the industry and the British Starter Battery Association was formed in 1933 and has since acquired considerable prestige. It was quickly followed by the Portable Accumulator Makers' Association performing a similar service for the radio battery trade.

By pooling experience and co-operating in preventive and curative measures, A.M.A. members have eliminated the dread scourge of lead poisoning from their workpeople. They were not content with mere compliance with statutory requirements, but have gone further and provided ameliorative conditions of labour and facilities for the enjoyment of leisure.

The present war has made many urgent and imperative calls upon the versatility, ingenuity and adaptability of the industry. The storage battery is an integral part of many war appliances, and as these have extended in number, range and scope, the battery has had to be designed or adapted to ensure complete co-ordination of electrical and mechanical effort in infinitely variable conditions of use. The continuous research work of the industry over many years had prepared it for this severe test and enabled it to tackle and solve these technical war problems not only competently, but readily.

Uses of Porous Metal

By J. W. Lennox (*Sintered Products, Ltd.*)

POROUS metals may have applications in the electrical field which have yet to be discovered. Their increased surface area compared with that of solid material is considerable and their porous nature enables them readily to absorb other substances and liquids.

A wide variety of diffusing, distributing and filtering materials are employed in industry, but it is curious that in this country little use has hitherto been made of porous components made of metal. These new materials have a considerable diversity of applications in engineering as well as the electrical trades and they have already been employed as flame arrestors on flame-proof electrical apparatus, for air filtration, diffusing and distributing high-pressure gases, separating liquids, filtering fuel oil and distributing de-icing fluid.

The alloy used is a 90/10 bronze, but development work is being done with other metals and alloys. The bronze is at present manufactured in the form of sheets up to 8 in. × 4 in. × 5/16 in., discs up to 6 in. in diameter and ¼ in. thick and also conical capsules up to 2½ in. in diameter. Larger sizes and a wide variety of shapes can readily be produced to meet special requirements. Total porosity can be varied from 10 to approximately 60 per cent. and is uniformly distributed and interconnected. Maximum size of pores can be adjusted to suit circumstances and can vary from 0·00004 in. to about 0·02 in.

The tensile strength of a 50 per cent. porosity fine-pored bronze has been found to be 3·3 tons per sq. in. with an elongation of 3 per cent. Hardness determination is difficult owing to the tendency of the loaded indentor to close up the pores, but as determined by standard methods it is indicated as a Brinell hardness of 20 for a bronze of 50 per cent. porosity. Bend tests with ⅛ in. thick material in various grades of porosity show that the material will form over a ¼ in. radius to angles of up to 50 deg.

A measure of permeability to various liquids can be obtained from the following:—

Liquid	*Porosity, per cent.*	*Max. pore size*	*Pressure lb./sq. in.*	*Flow in pints per min./sq. ft.*
Petrol	48	0·005"	0·324	16·78
,,	38	0·0025"	0·567	9·89
Oil (Shell J. D. 2)	50	0·015"	0·88	8·6

The electrical resistance of copper with 45 per cent. porosity is about the same as that of pure nickel, namely 9 microhms per cm. cube.

Porous bearings that are impregnated with oil, or grease, which is gently released by frictional warmth in service, are already in use. Other applications, utilising the high specific surface of this type of material, may suggest themselves to readers.

Trunk-Road Lighting

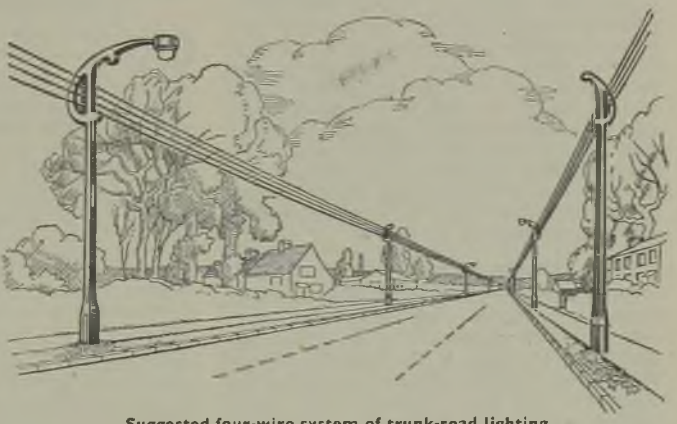
Requirements for an Economical Scheme

By F. H. Pulvermacher, A.M.I.E.E.

AMONG the schemes for the ordering of the post-war world I have not yet found one dealing with the illumination of our trunk roads in their entirety, as distinct from the portions of them that run through urban areas. The nearest approach to the subject seems to have been at the Association of Public Lighting Engineers' Conference last September, when Mr. E. C. Lennox pointed out that the present policy of competitive street lighting for the least expenditure had prejudiced the lighting of roads between towns, and suggested that the Ministry of Transport should be responsible for both the roadway and its illumination.

Of the 180,500 miles of road in Great Britain, approximately 27,550 are graded as Class 1 and 17,630 as Class 2, the residue being little or never used by through traffic. The cost of maintaining and improving this system amounted to £68,000,000 for 1936-37. County Councils are responsible for all classified roads outside the area of metropolitan and county boroughs, whilst the borough and urban authorities are responsible for those within their areas, excluding county roads. In 1937 the Ministry of Transport assumed control of 4,500 miles of Class 1 roads known as trunk roads and is responsible for their care and improvement. It is the illumination of these that is here considered—the actual mileage involved would probably be about 4,000, since a portion of them run through areas where the amount of night use is insignificant. Also, since a further 25 per cent. is probably already illuminated by the existing lighting authority, as distinct from the highway authority, the final mileage may be taken as 3,000. To prepare a competent scheme for the lighting of such an expanse of roadway would require very detailed work, consequently only tentative suggestions can be advanced.

The Report of the Ministry of Transport's Departmental Committee on Street Lighting (1937) recommended that an average spacing of 150 ft. should not be exceeded between lamps on main roads with a maximum of 180 ft., the spacing closing up on corners. On this basis a total of approximately 105,000 standards would be required for the lighting of our main roads in their passage from town to town. It will be generally agreed that the lamp itself should be of either the mercury- or sodium-vapour type, the choice probably depending to a large extent upon the personal preference of those responsible for the distinctive colouring of either of the two systems. Whichever method is adopted it should be adhered to throughout the length of the road under review, preferably for a whole region. This condition should apply also to the equipment in both type and design so that the present plethora of different patterns might be avoided.



Suggested four-wire system of trunk-road lighting

The lantern will, of course, be of the directive type, although I am of the opinion that fittings with a sharp cut-off are not so suited for open roads, since their tunnel effect suggests built-up areas, whereas the illumination of trees and the like gives a form of beacon lighting visible from a distance, which is helpful in view of the relative high speeds of vehicles using the roads. The siting of the lantern would conform with that given in the Ministry of Transport's Report, *i.e.*, a mounting height of 25 ft. and an overhang from the kerb not exceeding 6 ft., with the lamps staggered along the route except on bends and corners, where they should be placed on the outer

perimeter of the bend. Where the road has dual carriageways, each way is treated separately, but a post with two arms, one for each track, can be utilised, though where the dividing strip is narrow a single lamp for both ways will serve.

Distribution calls for special consideration, since by far the greater portion of the trunk roads will be devoid of low-voltage mains. Since the distributor would be purely for public lighting, no limits are imposed by sharing the conductors with other classes of consumers or by having an extra conductor of small dimensions, and a three-phase, four-wire system can be fully utilised. Assuming a spacing of 150 ft., 400-W mercury-vapour lamps and a 0·06 sq. in. four-wire distributor, then, since lamps on the same side of the road are spaced at 300 ft. and as only every third lamp is connected to any one conductor, the distance from the point of supply will be two miles before the volt drop exceeds 21, which can be compensated for by suitable grading of lamps along the route. As the feed at the point of supply is from both ends, such points would require spacing at distances of not less than four miles, the load at each point being 60 kW. These feeding points could probably be adjusted to coincide with existing points of 400-V supplies to villages and the like along the major portion of the road, although in some cases, such as over the Cheviots, a high-voltage feeder running parallel with the road and supplying special substations would be necessary.

Overhead Supply System

From an economic standpoint an overhead system is preferable, especially since every other point of suspension of the conductors could be embodied in the lighting column itself. This method entails correlating the design of the lamp standard and intermediate support, the means of attachment of the conductors to the lamp column being an integral part of the design and not an apparent afterthought. Such a layout is shown in the accompanying sketch. Should concrete columns be used, all metal attachments must be rustproof.

Regarding costs, the only figures extant are those of five years ago, and these certainly bear no relation to what will be the post-war price. Assuming, however, a figure of £25 for each lamp complete with auxiliaries, then, for the 105,000 envisaged, we get an expenditure of £2,500,000 in round figures. For 6,000 miles of distributor along the 3,000 miles of road the cost would be, at £500 per mile, £3,000,000, making a total capital cost of £5,500,000. Assuming 400-W lamps with dusk-dawn lighting, an annual consumption of 175,000,000 kWh is arrived at, which at a flat rate of 1d. per kWh amounts to over £700,000 per annum. Lamp renewals would come to about another £400,000, whilst labour would be some £300,000, making the total annual running cost over £1,400,000. Adding interest and sinking fund charges, possibly another £400,000, the total cost of lighting trunk roads would approach £2,000,000 each year.

This expenditure, though seemingly large, would show at least as good a return in its way, by making possible safer and faster driving, as the £68,000,000 spent on maintaining the trunk roads in 1936-37. The number of accidents at night should be materially reduced, and on a cash basis alone this saving would go far towards meeting the cost. There would also be the advantages of quicker deliveries, less fatigue of personnel and the facilitating of night travel, as one would have an ever constant indication as to whether one was on a main road or not. The carrying out of such a plan would also provide employment after the war.

Eastbourne's Plans

CONTEMPLATED post-war plans for the Eastbourne undertaking outlined in a report by Mr. N. Boydell, borough electrical engineer, include the establishment of new offices and showrooms (£87,000); extension of Cavendish Bridge depot (£17,000); removal of transformers to new site (£1,000); a second switch house (£7,000 for buildings only); ring mains between Pevensey Bay and Eastbourne and between the East Dean, Friston, Jevington areas and the Wannock, Lower Willingdon areas (£7,600); enlargement of substations (£6,150); centralised remote control of street lighting, etc. (£25,000); street lighting extensions (£7,000); and parade lighting improvements, including changing colour floodlighting. The institution of an attractive scheme is visualised for the hire-purchase of cookers, water heaters, washing machines and washboilers as an alternative to or substitute for the present simple hire system. It is estimated that £48,000 will be spent on apparatus for this purpose in the first five post-war years.

In addition, it is anticipated that £16,000 will be spent in the same period on free wiring for domestic premises and £3,400 on the assisted wiring (lighting) scheme. Replacement of old meters will cost £15,000 and new meters from £3,000 to £3,850 a year.

Replying to the Electricity Commissioners' questionnaire, Mr. Boydell puts the total revenue expenditure for the first five post-war years at £83,000 and capital expenditure at £355,700. If compulsory standardisation were introduced the cost to Eastbourne would be £150,000 for standardising voltage only or £500,000 for standardising the system including voltage. Most of the distribution system is at present single-phase, 200 V.

Blackpool Street Lighting. — Following the successful introduction of the "moonlight" street lighting system at Liverpool, the Emergency Committee has instructed the town clerk to prepare a report with costs and suggestions as to the best system to operate in Blackpool.

CORRESPONDENCE

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

Control Systems

SINCE Mr. Daines in his article in your issue of August 4th on relays *versus* time switch control, seems to feel that he has a mission to the industry, then my company in continuance of its forty-year old policy of trying to present true argument only, would like to help him, and anybody who might be interested in his story, to get the facts a little clearer.

First, there is the bogy of flexibility of control. What does it amount to and how can it be applied? Do supply authorities really set out to sell electricity to consumers on the basis that at uncertain and unspecified times it may be inconvenient to give a supply and that at such times, of which no due notice will be given, they propose to utilise a flexible relay to switch them off? On what basis would the shift engineer decide which particular range of presumably tuned relays he was going to pull off or would he just adopt the simpler expedient of cutting them all off? If it is not so much a question of remote cutting off as one of switching over to a high rate meter, I cannot conceive a contract which would fail to state the times at which this high or, conversely, low rate would apply. No, I prefer to go on believing that the supply authority does know to within reasonable commercial limits what are and what are not its normal peak periods. The time factor is fundamental and flexibility does not come into prominence at all.

Floodlighting, shop window lighting, street lighting, these also are basically linked to a previously calculable time-table and in the case of a street lighting contract, this does most often form the basis of the supply authority's quotation to the lighting authority. Where does flexibility come in here? Is it for switching off and, if so, under what conditions would this unexpectedly be required? The only answer which readily occurs to me is in the case of war, but I am not aware that any considerable relaxation of street lighting regulations is allowed in the few cases where this flexibility exists during the present war and it would be a rash man who attempted to prophesy the conditions of any future war. Is greater flexibility required than that provided by a solar dial fitted to a time switch? If so, under what conditions; a thick fog or an overcast late afternoon? What engineer faced with the incidence of industrial and domestic load overlapping on these occasions, wants another one thousand or five thousand 100-W lamps slapped on to his peak and, once again, what would be the basis of contract for such irregular lighting supply where the supply authority was not the lighting authority? Is flexibility necessary to adequate thermal storage water heating in excess of that provided by a time switch-cum-thermostat control?

Mr. Daines suggests that three switching operations a day present difficulties to a time switch. That may have been true of some once upon a time; there are at least 15,000, I believe, in New Zealand alone that have got along pretty well for many years now. He further suggests that much potential revenue might be lost in winter without this flexibility but I do not believe this is so. If an installation is properly designed for its purpose, it should not use more and could not use less, if the installation were to be efficient and it should not be installed if it were not.

Now let us examine the pros and cons which Mr. Daines puts forward. His first point is size—4¼ in. by 8½ in. by 4 11/16 in. (? weatherproof box) for a 5-A size relay. If small physical dimensions are claimed by him as an advantage, then a 10-A solar-dialled synchronous motor-driven time switch meets this point with its dimensions of 3½ in. by 4 11/16 in. by 3 7/16 in. (excluding external fixing lugs if required). His next point is price. He does not make it quite clear whether his figure of £3 15s. is a pre-war figure and gross or net. He also forgets to add in the cost of the transmitter or controlling plant at the station end. But, in any case, the time switch referred to above, either pre-war, post-war, gross or net, wins comfortably.

And does Mr. Daines seriously suggest that existing distributors—off which a very great deal of street lighting is tapped—can be disinterred, switch wires added, and re-instated at 1s. per yard; or is he only interested in confining his system to brand new self-contained non-extending networks and, therefore, inclined to leave the more difficult conditions of existing networks to time switches, since they can manage them so easily?

As for that relay he envisages with no moving parts and exclusive non-corrosive metal content, non-lubricated bearings and a complete oblivion to dirt and atmospheric conditions, well I would certainly give him best if that were the case. But one should be careful about maintenance claims; theoretical conjecture being one thing and practice another. It is a fact, of course, that very

often the major cost of cleaning and adjusting a contact is in sending out to fetch it in, which would be common to both arrangements. What else is there of a regular nature of which Mr. Daines knows? Furthermore, I should imagine that with all this flexible popping in and out which Mr. Daines enjoys so much, I should almost expect his apparatus to be a worse sufferer in that respect than a time switch.

Another point in Mr. Daines' confusion is his reference to electrically-wound time switches having a continuous rating of 2 W giving a total on a 1,000-switch installation of 17,520 kWh per annum. Actually the winding consumption occurs three times per day only, totalling approximately 6 Wh or, on a 1,000 switch installation, 2,190 kWh per annum. Quite different! Perhaps he means synchronous motor-driven switches and not electrically-wound clocks. If so, he should not be misleading. In that case, he is more nearly right in his computation but, as I have already pointed out, there are other financial advantages, particularly on capital cost, easily outweighing the cost of 15,000 or so street lighting units which, in fairness, must be conceded to the time switch credit side.

No, Mr. Daines, there may one day be something that has all-round advantages over time switches—progress is inevitable and desirable if it *is* progress—but change should be the result of something more tangible than wishful thinking.

New Malden, Surrey. LESLIE C. SHARP,
Sales Director,
Venner Time Switches, Ltd.

IN his article entitled "Control Systems" in the *Electrical Review* of August 4th Mr. S. A. Daines covered the subject of "Rythmatic" control, its cost compared with time switches and certain applications. But he omitted to point out the initial cost of the motor-generator and central control gear which, if proportioned to each individual relay, will increase the cost above £3 15s. There is also the question of the appreciable floor space occupied by the motor-generator and ancillary apparatus. The relay can be housed in the base of the lamp standard but, even with a large door opening of 20 in. by 6 in., it will be a tight squeeze when the installation is for gaseous discharge lighting.

The switching operation of a street lamp is usually simple, consisting of one "on" and one "off" in 24 hours and such simplicity might not warrant the installation of a centrally controlled system. However, such an arrangement as the "Rythmatic" permits the control of several types of load and street lighting is one of its applications.

The popularising of this method of load control will make many undertakers ambitious to use it to lower the "peak." In practice that application will not be as simple as enthusiasts imagine. The chief trouble will occur in recognising a "peak": certain loads may be switched off on a dark and cold day, or use may be made of an alarm in a maximum demand indicator, or the routine of switching off during certain hours for the winter days may be adopted. The chief care is to ensure that there shall not be any noticeable decrease in service to the consumer.

Despite the criticisms I have made of Mr. Daines' article, I am in favour of centrally controlled superimposed signalling currents, as I think there are several important directions of application within the supply industry, and, now that the main technical difficulties appear to have been overcome, there should be a ready sale for those systems that have flexibility of operation.

Newton-le-Willows, Lancs. J. C. BEARD.

An Odious Comparison?

READING through the description of the Cambridge kitchen which appeared in your issue of August 11th, I note that Poplar receives a share of publicity of a discrediting nature, and consequently am prompted to pen these few words of protest and enlightenment for your readers.

The idea of the Poplar kitchen was conceived in the dark days of the London "blitz," and has been humorously referred to as the "Blitz Baby." It appears that in an effort to break into the headlines, the Cambridge Company has "snatched" this particular baby, changed its dress, re-christened it the "Cambridge Kitchen," acclaims it to be its progeny and boosts it as its prodigy. Why was it thought good publicity to invite comparison between the "Poplar" and "Cambridge" units by erecting a "Poplar" unit as well? Why take this trouble to compare the cygnet with the swan?

I am amazed that, knowing the acute shortage of material and labour, the Cambridge Company should have asked the manufacturers of the "Poplar" unit to supply them with a hand-made and admittedly roughly finished example for exhibition purposes. Cambridge must be extremely fortunate in having the time, material and redundant labour to produce a kitchen which by strange coincidence incorporates the fundamental characteristics of design associated with the "Poplar" kitchen. Would it not have been more in keeping with the cultural finesse one associates with Cambridge if the true purpose of the exhibition had been revealed to the manufacturers, thereby permitting a "Poplar" unit to be constructed worthy of comparison with any existing prototype?

Why is it that the Cambridge Company is claiming the advantage of cheaper production

when at this stage of development all costing can only be hypothetical? What justification is there of this claim to cheapness? Let us diagnose the Cambridge combination: it is made in six parts, three of which are the products of manufacturers and available to all; these are the combined washing machine, Hotpoint sink and water-heater unit; English Electric cooker; and Prestcold refrigerator. The remaining three units are storage spaces. The hypothetical cost of these would be £35, £10, £10 and £15 respectively, a total of £70. Add to this sum the cost of fan, clock, Unity heaters, lighting fittings, erection on site, electrical installation, company charges, and the final cost is at least £100. Readers of the technical and national Press will compare this most unfavourably with the hypothetical cost of the "Poplar" unit.

However, it is not my intention to start a "slanging match" regarding the relative merits of the two conceptions of kitchen design; all domestic development should have one common purpose—the betterment of conditions for the post-war consumer, and not for the aggrandisement of any particular person, undertaking or company promoting such development. It was for the benefit of the poorer type of consumer that I first introduced the "Poplar" kitchen, with its inherent characteristics of unit construction, ventilation, table-height appliances, etc. That was as far back as May, 1943. Hence my feeling of irritation is excusable when others introduce premature comparisons, although "Imitation is the sincerest form of flattery."

*Poplar, E.*14. R. ILLINGWORTH,
Borough Electrical Engineer and General Manager.

Consumers' Service Arrangements

VARIOUS ideas are being put forward regarding installations in post-war houses. May I suggest a standard main switch which would fit the supply authority's service board neatly, and enclose all cables. It could be a compact double-pole switch with earth leakage trip, enclosing an earth terminal, common neutral terminal, and the following fuses which would serve the demands of the type of house intended:—Two 30-A (one for cooker and one for water heating); two 30-A for two heating circuits; and two 10-A for lighting and 5-A plugs, on two circuits.

It is intended the consumer's main earth terminal should be at the main switch, wired direct. Plug points could be provided with outlets for both 15-A and 5-A combined. They could be made compact and with special protected contacts not needing switches (another type would lead to complications).

Four-core cable could be used for these:—One common neutral (7/·029), one heating (7/·029), one earth wire (7/·029) and one for 5-A plug (3/·029). Lighting would be provided for as usual. There would be special junction boxes for looping.

An understood standard supply service board and consumer's main, enclosing all cables, would be neat and sufficient for cooking or water heating demands. A neat label would remind consumers that it supplied cooker and water heaters as required.

Tingley, nr. Wakefield. NORMAN GREEN.

"Universal" Farm Motors

IN the issue of the *Electrical Review* dated August 11th (page 185), I note the query appearing below one of the photographs "Has the Continental-type 'universal' motor found a counterpart in this country?" I should have thought that this question need not have been asked. My company has for years manufactured electric tools with "universal" motors up to 1 HP., and the mincing machine appearing in your illustration does in fact seem to be driven by an electric drilling machine adapted for the purpose. There are surely a number of firms in this country producing geared universal motors in a wide range of sizes.

But apart from all this, and to consider the needs of the farmer and the agricultural producer, is not the main trouble the small number of agricultural establishments that have electricity "on tap"? What is being done to ensure that about 85 per cent. of the farms in the British Isles do have electricity available? You may be sure that the British manufacturer will go all out to encourage the demand, and to meet it, once the arrangements are made to reduce the mesh of our present network of electricity supply so that all farms can be caught in the net.

There really should be no need for farmers to convert electric drills for driving their odd bits of mechanical equipment!

*London, W.*5. H. RICHARDS,
Managing Director.
S. Wolf & Co., Ltd.

[The word "universal" was used in the sense that the motor was applicable to all sorts of jobs. We think that the writer's "universal" refers to the usability of the tool motors on either AC or DC.—Editors, *Electrical Review*.]

Admission to I.E.E. Meetings

THE Council of the Institution of Electrical Engineers has decided to continue for the coming session the scheme for making the technical meetings of the Institution accessible to non-members, who on payment of a fee of 10s. will receive notices of meetings and invitation cards. The possession of invitation cards will not confer upon holders any status within the framework of the Institution, nor will they have the right to join in the discussions without special permission from the chair. Those interested should apply to the Secretary of the Institution for further details and form of application.

PERSONAL and SOCIAL

News of Men and Women of the Industry

Mr. R. J. Morris, a director of Edison Swan Cables, Ltd., has been elected a director of the Edison Swan Electric Co., Ltd., and **Mr. G. A. Cheetham,** managing director of Ferguson Pailin, Ltd., is joining the boards of the Edison Swan Electric Co., Ltd., and Edison Swan Cables, Ltd.

Mr. W. A. Roy, superintendent of one of the outlying factories of the Metropolitan-Vickers Electrical Co., Ltd., has recently been elected chairman for the 1944-5 session of the Manchester branch of the Institute of Welding. Mr. Roy has been on the committee of the branch for the last seven years and was vice-chairman last year.

Mr. W. A. Roy

Sir Oliver Simmonds, M.P., has just returned from Australia which, as head of the Simmonds group of companies, he has been visiting at the request of the Commonwealth Government.

Alderman A. Sturgess has been appointed a member of the Negotiating Committee of the National Joint Board of Employers and Members of Staff (Electricity Supply Industry) in place of the late Councillor Cassels. This committee handles all the detail work such as investigations, disputes, etc.

Mr. H. E. Cordell, chief engineer to the Manchester Corporation Transport Department, is retiring at the end of this month. He will be succeeded by **Mr. F. Y. Frazer. Mr. G. L. Atkinson** will become rolling stock superintendent, and **Mr. W. Frith** and **Mr. W. Cordingley** works superintendent and assistant works superintendent respectively.

Mr. N. J. Young has received presentations from the staffs of both the transport and electricity undertakings of the Newport Corporation on his retirement from the general managership. He served with the Corporation for thirty-two years.

For the third successive year, good weather conditions attended the "Holiday-at-Home" programme which was organised for the English Electric Company's employees at the Bradford Works, during the annual shut-down week, July 19th to August 7th. Once again the organising committee, comprising members of the works and staff, provided a varied and interesting programme which catered for all tastes ranging from boxing and wrestling contests to sheep dog trials and a baby show. Sports and many other items were arranged for the children and to give a "seaside atmosphere" to the company's Phœnix Park sports ground, a sand beach with paddling pool was constructed. In addition there were the ever popular donkey rides, roundabouts, etc.

So successful was the programme that on at least two days upwards of 5,000 people were present on the ground, and the festivities concluded with a grand gala dance in the club ballroom on Bank-Holiday Monday. The whole of the arrangements were supervised by the stewards and members of the organising executive committee, under the chairmanship of **Mr. H. L. Firth.**

Mr. E. T. Norris, chief designer to Ferranti, Ltd., is to speak on "The Moving-Coil Voltage Regulator" at the opening meeting of the session of the Women's Engineering Society. This will take place on September 5th at the Engineers' Club, Manchester (6.30 p.m.).

Stirling Town Council is advertising for an electrical engineer to succeed **Mr. W. R. Murray,** who has just retired. It was stated at a recent Council meeting that the salary would be £537 per annum on appointment, £584 in the second year of service, and £632 thereafter.

We regret to hear that on medical advice **Mr. E. F. Holland,** M.I.E.E., engineer and general manager of the Hutt Valley Power Board, New Zealand, is resigning. He will, however, continue to act as consultant to his successor, for whom the Board will shortly advertise in various parts of the world. During the last fifteen years the number of consumers served by the undertaking has risen from 8,247 to 18,137, the kWh sold annually from 10·7 to 75·6 million and the total revenue from £74,552 to £220,379. At the same time the revenue per kWh sold has declined by 57·9 per cent to 0·699d.

Mr. Felix Sharpe, chief engineer and manager in India to Merz & McLellan, tells us that he is in England "for a three weeks' hectic visit" in connection with some of the extensive work which his firm has in hand in India. He does not expect to have time to look up all of his many friends here. Mr. Sharpe has sent us an account (dealt with on another page) of an All-India Technical Conference on Post-War Electrical Development held early this year.

Mr. Denis M. Robinson, B.Sc.(Eng.), Ph.D., was recently appointed to the chair of electrical engineering at the University of Birmingham.

In recognition of her presidency of Blackburn Branch of the Electrical Association for Women since its inception nine years ago, **Mrs. R. H. Harral** was presented on August 17th with a case of silver teaspoons. The ceremony was at a party held in aid of the comforts fund. The gift was handed over by Mrs. H. Seymour.

After forty-six years' service, **Mr. Mark Ormston,** superintendent of telegraphs, Post Office, Newcastle-on-Tyne, is retiring at the end of this month. He was appointed superintendent two years ago.

Mr. James B. Hayes, general manager of the Nova Scotia Light & Power Co. since 1929, was elected president of the Canadian Electrical Association at the annual meeting held recently at Murray Bay, Quebec.

Dr. Edwin Gregory, M.Sc., has been appointed chief metallurgist to Edgar Allen & Co. Ltd., in succession to the late Mr. S. J. Hewitt.

Dr. Gregory spent twelve years with Kayser Ellison & Co., Ltd., during which he had complete charge of a battery of electric furnaces. Health compelled him to resign this appointment, but on recovery he became a member of the permanent staff of the Metallurgical Department of Sheffield University in 1921.

The Electrical Power Engineers' Association is advertising for a technical editor and director of studies (commencing salary £600) in succession to **Mr. J. W. Thomas**, who was recently appointed secretary of the British Engineers' Association.

Obituary

Mr. H. J. Duncan, chief engineer of the General Electric Co., Ltd., for Ireland, died recently at the Royal Victoria Hospital, Belfast. He went to Northern Ireland about twenty years ago.

Mr. J. H. Headley.—We regret to record the death on August 10th of Mr. J. H. Headley, who retired in 1938, after being in the service of Electromotors, Ltd., and (after the amalgamation) Laurence, Scott and Electromotors, Ltd., for thirty-five years. He had been in the electrical industry for nearly fifty years at the time of his retirement, and was well known in the London area.

Mr. Charles Henry Johnson, managing director of Dent & Co. and Johnson, Ltd., has died while on holiday in the north of Scotland. Before the last war he was with Kelvin, Bottomley and Baird, Ltd., Glasgow, and subsequently, when E. Dent & Co., Ltd. opened premises in Linwood, he became associated with that firm. He was actively engaged in research work, particularly in connection with a type of meter for assessing the horse power of turbine engines and was also associated with the earlier development of wireless equipment.

Mr. Henry W. Lee, a director of the Chloride Electrical Storage Co., Ltd., died recently at Tunbridge Wells at the age of sixty-five. He was also chairman of the Superheater Co., Ltd., and until a year or so ago managing director of J. Stone & Co., Ltd.

Mr. N. B. Dickson. — The *A.E.I. News* reports the death, on July 5th, of Mr. Norman B. Dickson, O.B.E., M.Inst.C.E., who had been a director of Associated Electrical Industries, Ltd., and its predecessors since 1910. He had had considerable railway experience and was a director of a number of other companies.

Indian Power Requirements

Proposed Technical Board

AN All-India Technical Conference on Post-War Electrical Development was held in Calcutta in January last, and brief particulars about it have been sent us by Mr. F. H. Sharpe. The conference, the first of its kind in India, reviewed India's power requirements as a co-ordinated whole. The extent of the heavy plant and equipment required by India in the period immediately after the war was exhaustively surveyed, together with a large number of potential developments many of which were considered ripe for early investigation and the preparation of definite plans. The conference demonstrated the value of drawing upon the regional knowledge of experienced engineers from different parts of India.

In addition to comprehensive details of India's heavy power plant requirements immediately after the war, the conference has presented a number of recommendations to the Government of India setting out the measures considered to be desirable in the immediate future to deal with the large amount of technical work involved in implementing power schemes. In addition to reviewing the electric power developments, both planned and potential, the conference gave consideration to the closely allied problems of siting heavy power consuming industries, rural electrification, power irrigation, synthetic fertiliser production, and the electrification of railways.

Special attention was given to the regional aspect of certain desirable power schemes where development might be affected by the existence of inter-Provincial and State boundaries. Schemes were reviewed for the provision of facilities for the specialised training of Indian power engineers overseas in order to ensure that Indians of adequate technical ability should be available to play their part in the direction of the national development of the electric power resources.

The desirability of standardising voltages, systems and power practice was considered and specific recommendations were made to deal with certain cases of projected schemes in which divergencies from desirable standards were contemplated. The conference endorsed plans now in hand for the establishment of a national high-voltage engineering laboratory and made recommendations for the inclusion of certain equipment to facilitate the design of large transmission systems. Proposals were put forward for the formation of a Technical Power Board to deal with planning and technical matters generally.

The following delegates attended the conference, which was presided over by Mr. H. M. Mathews, M.I.E.E., electrical commissioner with the Government of India: Lt.-Col. R. L. Evans, A.M.I.E.E., deputy electrical commissioner, Govt. of India; Mr. T. S. Rao, A.M.I.E.E., director of power expansion, Government of India; Mr. P. B. Advani, M.Sc., Tech., director of industries, Government of Bombay; Sir Henry Howard, M.I.E.E., M.Inst.C.E., Madras Government Electricity Department; Mr. N. N. Iengar, chief electrical engineer, Tata Hydro-Electric Agencies, Ltd.; Mr. F. N. Mowdawalla, M.A., Bombay; Mr. F. H. Sharpe, B.Sc., M.I.E.E., chief engineer and manager (India), Merz & McLellan; Flt.-Lt. Sir William Stampe, C.I.E., irrigation adviser, Government of India; and Mr. N. Thornton, M.I.E.E., deputy chief engineer, Electricity Branch, Government of Punjab P.W.D.

COMMERCE and INDUSTRY

Another Model Kitchen. Scottish All-Electric Houses.

American Water Heater Production

IT is reported by the *Electrical World* that the U. S. War Production Board recently approved the manufacture of electric water heaters for civilian use at an annual rate not to exceed 37 per cent. of the total manufactured during the year ended June 30th, 1941. Production will be confined to those plants and materials which can be diverted without prejudicing the war programme; it will be additional to manufacture for war or export purposes.

Only three sizes, and one model per size, are to be made. The W.P.B. has approved the use of metal for heater jackets rather than paper, which has been found less efficient.

West Bromwich Model Kitchen

To invite criticisms and suggestions an experimental all-electric kitchen is now being exhibited in one of the showroom windows of the West Bromwich Electricity Department. The kitchen has been arranged so that a clear view of the interior is obtained (through what would in practice be the window of the kitchen itself) from the street. It is composed of four separate units : Sink and washer; cooker and refrigerator; a drying and ironing unit; and a spare cupboard for vacuum cleaner, brooms, etc. Each unit occupies one wall. The sink unit is under the window, and the spare cupboard unit is placed on the wall between the two doors. All the units are raised on a low plinth to enable the floor to be washed easily and to prevent cleaning water entering the cupboards. Lighting is provided by a mercury discharge lamp with additional tubular lighting over the cooker hotplates and dining room hatch.

Experimental kitchen at West Bromwich

Between the two sinks provided is a motor-driven wringer which, when not in use, is pushed down out of sight by means of a small knob. Heating units at the base of the washing machine bring the water from the hot water system up to boiling point. The oven and refrigerator (4 cu. ft.) are situated on opposite sides of an alcove inside which are the hotplates, a grill boiler and an extensible table. At the back of the alcove is a hatch to the dining room. A hot water cylinder is provided in the cupboards overhead, a clock and loud-speaker being situated in the centre of the unit. The cooker oven, which has a drop-down door, is thermostatically controlled and in the final design it is hoped to incorporate a time switch.

The drying cupboard provides ample space for drying clothes indoors, heated air from a motor-driven fan being admitted; an exhaust vent is situated at the top. On the other side of this unit are the ironing board and iron plug and folding table.

Manchester Research Council

The Vice-Chancellor of the Manchester University (Sir John Stopford, M.D.), and the President of the Manchester Chamber of Commerce (Mr. A. H. S. Hinchcliffe) have announced the names of the members of the Manchester Joint Research Council which the University and the Chamber are setting up. The University representatives include the Vice - Chancellor, Sir Ernest Simon, Dr. Willis Jackson (Professor of Electrical Engineering), Professor P. M. S. Blackett (Physics), Professor D. R. Hartree (Theoretical Physics), Professor M. Polanyi (Physical Chemistry) and Professor F. C. Thompson (Metallurgy). Among the Chamber of Commerce representatives are Dr. A. P. M. Fleming (Metropolitan - Vickers) and Mr. L. E. Mather (Mather & Platt).

The first meeting is to be held at the Manchester University on Oct. 9th. Thereafter the Council will meet quarterly. At the first meeting various constitutional matters will be settled, the first chairman will be elected and other members will be co-opted. Proposals will be tabled to ensure close liaison with the British Cotton Industry Research Association and the Department of Scientific and Industrial Research. The establishment of an information bureau will also be considered.

Exhibition of Non-Ferrous Products

Richard Johnson & Nephew, Ltd., in conjunction with the Works Relations Department of the Ministry of Supply, recently staged a four-day exhibition for the interest and information of their employees, emphasising the importance of their non-ferrous products to the war effort. Many of the company's customers

co-operated, among them the Barber Switchgear Co. (knife switch); John Faulkner & Sons, Ltd. (lightning conductor); Lancashire Electric Power Co. (solid copper line wire after twenty-five years' service); Manchester Corporation Transport Department (trolley-bus junction, etc.); Mersey Cable Works, Ltd. (cables); Metropolitan-Vickers Electrical Co., Ltd. (coils); Phœnix Telephone and Electric Works, Ltd. (telephone tinsel conductor); Post Office Engineering Department (telegraph pole, together with cables); Standard Telephones and Cables, Ltd. (cables); Siemens Electric Lamps & Supplies, Ltd. (lamps); Submarine Cables, Ltd. (copper taped submarine cable); Bertram Thomas, Ltd. (motor starting switch and magnetic blow-out fuse carrier); Richard Whiffen (tray insulator for internal isolation switch).

The Ministry of Supply made available, in addition to several photographs, a variety of radio sets (field, headquarters and bomber), shells and an electrically heated flying suit. Films shown included one illustrating the conversion of blister copper to finished cable.

Lamp Specification

For some time past B.S. 161-1940, which deals with tungsten-filament lamps for general service, has been out of print. The specification has now been reprinted and copies are obtainable for 2s. post free from the British Standards Institution, 28, Victoria Street, London, S.W.1.

National Certificates in Metallurgy

It had been expected that the scheme for National Certificates in Metallurgy in which the Iron and Steel Institute, the Institution of Mining and Metallurgy and the Institute of Metals are co-operating with the Board of Education would be launched in time to allow colleges and schools to start their courses in the academic year beginning September, 1944. This has, unfortunately, proved impracticable, and the scheme is to come into operation so that courses will begin in September, 1945, and the first examinations will be held in 1946 for the Ordinary Certificate.

Scottish All-Electric Houses

Mr. Joseph Westwood, Joint Under-Secretary of State for Scotland recently opened a block of seven "Duplex" houses at Clydebank, a notable feature of which is that they are all-electric. At the opening ceremony it was mentioned that these two-storey dwellings could be erected in eight weeks at a cost of about £650 each. Each floor comprises a living room, two bedrooms and a bathroom; by removing partitions and rearranging the interior each house can be made suitable for a larger family in a few days.

The equipment includes an electric cooker, a water heater and radiators in the bedrooms and a generous supply of outlets is provided for the use of portable appliances.

In the course of a report of the function the *Clydebank Press* says:—"Several local authorities in the country are now inclined towards the view that all domestic requirements—lighting, heating and cooking—can be met as cheaply and efficiently by electricity as by any other means. The advice of the Scottish Advisory Committee on Housing is that there can be little doubt that electrical cooking has advantages from the point of view of cleanliness over any other form, and that they have found that electric stoves are very popular with working-class tenants."

It may be said that the Burgh Council has already approved three sites for 1,700 houses and a site for a further 500 is under consideration. The Burgh's total housing needs are put at 8,235. Clydebank suffered badly during the earlier air raids.

Iron and Steel Control

The Minister of Supply has made the Control of Iron and Steel (No. 35) Order, 1944 (S.R. & O. 1944, No. 909, Stationery Office, 1d.), which came into force on August 15th. This alters the existing Control of Iron and Steel Orders, the principal alterations being :— (1) the distribution scheme has been amended, (a) with regard to springs, to control only the iron and steel for their manufacture, and not the acquisition and disposal of finished springs, and (b) to free the acquisition and disposal of used wire netting from licence or authorisation; (2) the maximum prices for iron castings and for manufactured iron (wrought iron) are increased; (3) maximum prices are imposed for the first time on certain types of cold drawn tubes; and (4) the control of merchants' (including stockholding merchants') selling prices is extended to include a number of products not hitherto price controlled for sales by merchants, and by fixing margins which may be added by merchants other than stockholding merchants. A number of related price schedules are replaced by new schedules.

New Bolts and Nuts Order

The Minister of Supply has made the Control of Bolts, Nuts, Screws, Studs, Washers and Rivets (No. 5) Order, 1944 (S.R. & O. 1944 No. 910, Stationery Office, 1d.), which came into force on August 15th. This Order amends the Control of Bolts, Nuts, etc. (Nos. 1, 3 and 4) Orders, 1943. The principal alterations are :— (1) reductions in the maximum prices for certain aircraft bolts, nuts and screws; (2) increases in the maximum price of certain black steel bolts and nuts; (3) increases in the maximum prices for steel wood screws and reductions in the maximum prices for brass wood screws; (4) the introduction of maximum prices for certain bolts, studs and screws of specifications not hitherto included, and (5) the introduction of maximum prices for sales of black bolts and nuts by merchants.

The second schedule to the existing Order and the related schedules are replaced by new schedules.

Milk-Handling Equipment

The Machinery, Plant & Appliances (Control) (No. 8) Order, 1944, made by the Board of Trade (S.R. & O. 1944 No. 896) is designed to assist the Ministry of Food to implement its programme for the installation of machinery and plant used for handling, treating or distributing liquid milk or milk products. The goods controlled under the No. 3 Order (S.R. & O. 1942 No. 2487) are extended by the addition of a new class (96) covering heating equipment (including sterilising equipment, not being churn stools or sterilising

chests not exceeding 50 cu. ft. capacity), cooling equipment (not including water-operated coolers of a capacity not exceeding 125 gall. per hour), pumps, tanks, vats, vacuum pans, presses, grinders, disintegrators, etc. Class 41 is amended by the deletion of the words " not being cream separating machinery and plant."

New General Licences are incorporated with the Order which is obtainable from the Stationery Office (1d.).

" Electrical Review " Index

Copies of the index to Vol. CXXXIV (January-June, 1944) are now available to readers who require them for binding purposes. Application should be made to the Publisher, *Electrical Review*, Dorset House, Stamford Street, S.E.1.

Commodity Insurance

For the period from September 3rd to December 2nd, the rate of premium payable under the Commodity Insurance Scheme is to continue at 5s. per cent. for the three months.

Maintenance Electricians' Wages

In its Award No. 609, the National Arbitration Tribunal decides in favour of a number of maintenance electricians employed by a Bedfordshire engineering firm who claimed that they were entitled to a bonus of 12s. which was paid to maintenance millwrights by the firm.

Fatality

At a recent inquest at North Shields on Andrew Bosomworth (44) an electrician, a charred two-feet wooden rule with a metal tip was produced and it was suggested it may have caused the accident. Brian Welch, an employee of the North-Eastern Electric Supply Co., Ltd., who was in charge of work at a lead works said that Bosomworth had been cleaning the terminals of a switchboard. While he was engaged on the second panel there was an explosion which caused a fire. Three of the six contacts on the panel were " dead " and the others " alive." Another panel had already been cleaned in the same manner. Witness said he assumed that Bosomworth had inadvertently allowed the rule to slip and cause a short-circuit.

A verdict of death from burns caused by an explosion due to an accidental electric short-circuit was recorded.

Peruvian Electrical Imports

According to the *Board of Trade Journal* imports of electrical apparatus into Peru during the first quarter of this year were valued at 2,331,000 soles, as compared with 2,316,000 soles for the corresponding period of 1943.

Electric Hot-pressing

A new way of making cemented-carbide objects that are too large to be sintered in ordinary furnaces as well as specially thin-walled parts which tend to become " out-of-round " when pressed and then sintered in the usual way has been devised by the Carboloy Co. of Detroit. According to the U.S. Office of War Information the three distinct processes of hot pressing and two-stage sintering are performed in a single operation, heat being generated by electric resistance elements supplied from a 750-kVA transformer under electronic contactor control. Large components, the carbide content alone weighing up to 100 lb. in some cases, can be formed in this way by deep-drawing dies. *Machinery* states that the hydraulic press, exerting a 100-ton forming pressure, will accommodate parts up to 100 sq. in. in cross section and 8 in. high.

Trade Announcements

In connection with the establishment of post-war industries, a site on the West Chirton Trading Estate, Tynemouth, has been acquired by De La Rue Plastics, Ltd.

Pyrotenax, Ltd., has opened an office at Nelson House, 2, Moor Street, Bull Ring, Birmingham, 4 (telephone: Midland 1265), under the management of Mr. H. Glover, who, for the past five years, has been in charge of the sales department at the company's Hebburn office. Full facilities and staff for demonstration and instruction in the use of Pyrotenax products, will now be directly available for the Midland Counties.

A. E. Dees, Ltd., are moving to new premises at 24-26, Carliol Street, Newcastle-upon-Tyne, on November 1st.

Changes of Name

Lighting Trades, Ltd., has changed its name to Earlsfield Manufacturing Co., Ltd. (We recorded last week the registration of a new company, Lighting Trades & Welsbach, Ltd.).

Nelson, North, Ltd., have changed their name to Nelson (Radio Electrical), Ltd.

INFORMATION DEPARTMENT

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

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

KONTIN motors.

TRADE MARK APPLICATIONS

THE following applications have been made for trade marks. Objections may be entered within a month from August 16th.

SUNHOUSE and SUNHOUSE (design). No. 628946 and 628947 respectively, Class 7. Electric motors (not for land vehicles). Nos. 628948 and 628949 respectively, Class 9. Electrical apparatus not included in other classes. Nos. 628950 and 628951 respectively, Class 11. Electric fans, stoves, radiators, heating apparatus, lamps, immersion heaters; apparatus for domestic purposes for lighting, cooking, refrigerating, drying or ventilating, all being electrically operated.—H. Frost & Co., Ltd., Fieldgate, Walsall, Staffs.

Industrial Lighting—II

Wartime Installations

By E. D. Iliff, B.Sc.(Eng.), A.M.I.E.E.

THE considerations reviewed in last week's issue led to the sodium discharge lamp being chosen as the best medium for general lighting in a particular wartime factory where the lamps are burning continuously night and day, year in and year out, and labour for maintenance has to be kept to the minimum. A strong point in favour of sodium is its low brightness; it was adopted for all the earlier main works bays, 140-W lamps being used for high bays (over 20 ft. to roof truss) with 85 W for low bays, and tungsten lamps were added for local lighting as required. In workshops where appreciable daylight was available (so that continuous burning of lamps was not necessary) or where precision work was done, tungsten lamps were used both for general and for local lighting, and tungsten lamps in diffusing fittings were used for offices.

The sodium lamps were wired in the orthodox manner, each having its own transformer and power factor correction condenser, groups of lamps being controlled by each switch. To minimise stroboscopic effect, in the earliest schemes adjacent lamps were always fed from different phases, but this was found to be an unnecessary complication. In low bays there was not enough mixing of light to make phasing-out really effective, while in the high bays it was sufficient to connect all the lamps on each truss to one phase and supply the next truss on each side from the other two phases.

This arrangement has the advantage that in the event of failure of one or two phases the remaining lights are evenly distributed over the whole bay. The merits of this feature are exploited to the full by providing an alternative supply to the lighting distribution boards, to which both main and emergency supplies are connected through single-pole changeover switches, automatic on one phase and hand operated on the other two. Thus one-third of the lighting is automatically restored through the changeover contactor, while one or both of the other two phases can also be reconnected, if required, by operation of the manual changeover switches.

If both main and emergency supplies fail, or are switched off during an air raid, an "evacuation" lighting system comes into operation, comprising 12-V motor-car fog lamps mounted on the roof trusses and adjusted so as to provide sufficient light for personnel to find their way to the shelters. The control is entirely automatic (Fig. 2) and the lamps are fed from a trickle-charger which embodies a relay energised from the main supply to the shop lighting. Normally the primary winding of the transformer of the trickle-charger is connected to the emergency supply, and one winding of the double-wound secondary feeds the rectifier for charging the 12-V battery through a hand switch.

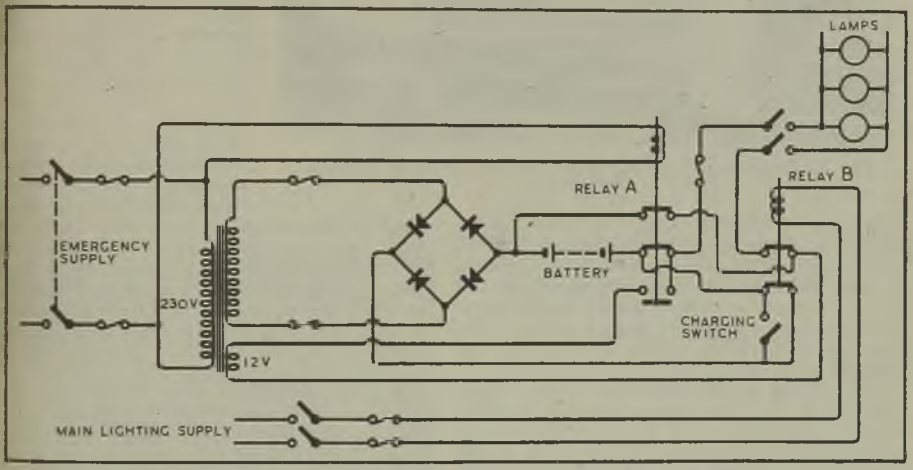


Fig. 2.—Evacuation lighting system diagram

When the main supply fails relay B drops, the battery is automatically " put on charge," and the other secondary winding is connected to the " evacuation " lights. If the emergency supply then fails a second relay A will cause the " evacuation " lamps to be disconnected from the transformer and fed from the battery only. The procedure when the signal for evacuation is given is that, first, the main supply to the shop lighting is switched off. One-third of the lights are then automatically restored and the " evacuation " lights also come on. A few minutes later the emergency supply is switched off from the shop lighting distribution boards, but not from the evacuation lighting apparatus, and the lamps continue to be fed from the transformers of the trickle-chargers. Not until the emergency supply actually fails do the evacuation lights depend on the batteries.

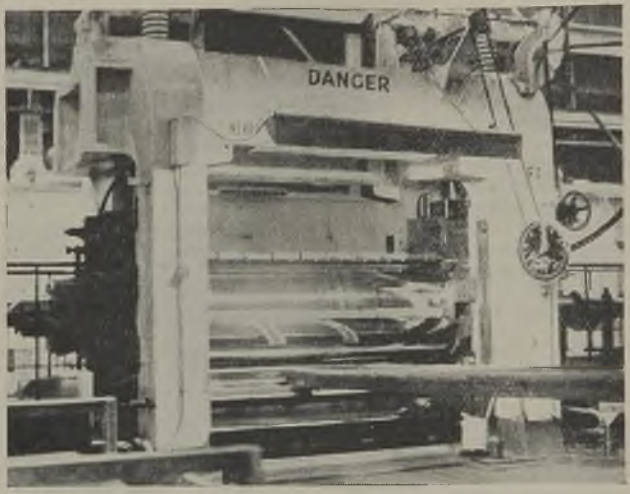


Fig. 3.—Fluorescent tube in trough reflector for local machine illumination

To return to the main lighting system; the initial level of illumination in working areas varied from 8 to 12 ft.-candles in the main bays. The walls and steelwork of the buildings had been sprayed with aluminium paint, the plant was painted cream, and the product also has high reflectivity. The general brightness of the works in course of time became somewhat dimmed and the " depreciation " was probably greater than is usually expected, the level of illumination falling to about 5 to 8 ft.-candles. The yellow light is quite suitable for general purposes and the workpeople on the whole seem to have no objection to it, though it must be admitted that at first many were prejudiced against the innovation.

The introduction of the 80-W fluorescent tube early in 1940 filled, in this factory, a long-felt want. Wherever head room is restricted and yet a high intensity of illumination is required, the fluorescent tube is a most satisfactory source of light, especially when an approximation to daylight is advantageous, as for inspection purposes. The very low surface brightness of the tubes obviates glare, and an almost shadowless light is produced. There is a slight flicker which may be objectionable, but it can to some extent be overcome where there are two lamps in one fitting (or close enough together for the light from the two lamps to mix) by supplying the lamps from different phases, or alternatively by connecting a condenser in series with the tapped choke of one of the two lamps.

These lamps have been used extensively for machine (Fig. 3), bench and instrument panel lighting in the works, for the drawing office, and in all offices where artificial light is continuously necessary; for these purposes tungsten lamps have almost entirely been replaced. The reflector represents a large item in the total cost of fluorescent tube equipment, but in offices it is often practicable to mount the lamps direct to the ceiling and dispense with a reflector altogether. A 200-W incandescent lamp is about equal in lumen output to an 80-W tube, but must generally be enclosed in a diffusing fitting for use at low mounting heights. The fluorescent tube requires no diffusing medium and is equivalent in effective output to a 300-W incandescent lamp in a diffusing globe.

Merits of Colour Mixing

Fluorescent tubes were so immediate a success that there was a strong temptation to use them extensively for general lighting, but economic considerations ruled that out. It was decided instead to supplement the existing lighting locally with mercury vapour lamps to raise the intensity to the level required and to give the illusion of an approximation to daylight. The first section in which the experiment was made is an inspection area in a main bay where there is an overhead crane and the roof truss is over 20 ft. from the floor, so that low-hung fluorescent lamps could not be used. The existing lighting comprised 140-W sodium lamps arranged alternately three and two fittings on a truss and they were supple-

mented by adding two 250-W mercury lamps to the trusses which carried three sodium lamps, and three 250-W lamps on the trusses which carried two sodium lamps. The whole scheme then comprised five lamps on each truss, alternating three sodium with two mercury and *vice versa*.

The results are most satisfactory and the blue-green light blends very well with the yellow, the effect being quite pleasing. Reference to the spectra of the two types of lamps will show that accurate colour discrimination is not possible, but there is a marked improvement in this respect over the monochromatic sodium light.

With tungsten lamps supplementing the sodium the effect is of diluting the yellow rather than of blending with it. The advantage of the mercury lamp is that it emphasises colours at the blue end of the spectrum where the light of the tungsten lamp is deficient. By using fluorescent h.p.m.v. with sodium instead of tungsten better blending was obtained and, for colour discrimination, it is superior both to tungsten and to the clear type h.p.m.v., over which, however, fluorescent lamps offer little advantage for general lighting in high bays. Both clear and fluorescent h.p.m.v. lamps have been used quite extensively to supplement the existing sodium installations, and the results have been very satisfactory.

Following these experiments, several large factory areas have been lighted with a system of mixed mercury and sodium lamps, which, so far as I am aware, has not been adopted previously in any large installation. One strong reason for adopting this system is that the workers appear to prefer it to plain sodium or mercury lighting (the latter was tried in one section and preference was expressed for the mixture) but the main practical advantage is in colour discrimination. The higher surface brightness of the mercury lamps does not commend them, but they are better in this respect than clear tungsten lamps of comparable output. Disadvantages of installation and maintenance lie in the multiplication of types of reflector, control gear and lamps.

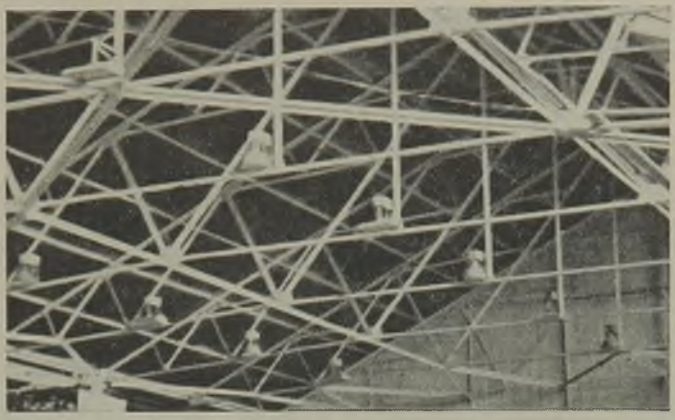


Fig. 5.—Mercury and sodium lamps mounted alternately

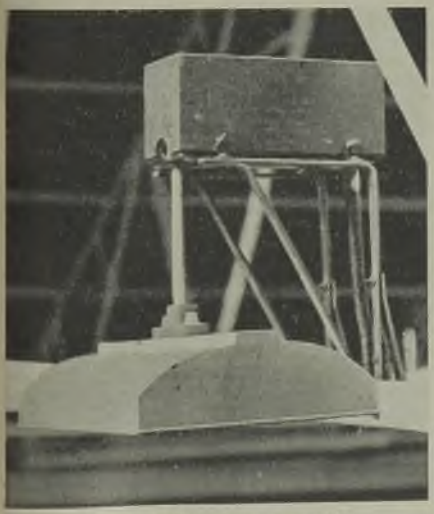


Fig. 4.—Sodium lamp assembly

Interchangeability of Gear

The essential control gear of discharge lamps comprises a tapped choke in the case of a mercury lamp, or a leak transformer in the case of a sodium lamp. The fluorescent tube has a tapped choke and a starting element and, in addition, a radio interference suppression condenser is usually connected. With all discharge lighting a power factor correction condenser is generally connected across the supply to the control unit, and it must be stressed that the purpose is to reduce the current taken by each unit and so keep cable size to the minimum. For example, a 400-W h.p.m.v. lamp takes about 3·1 A, but with a 15 μF condenser connected across the choke the input is reduced to 2·4 A. Corresponding values for a 140-W sodium lamp are 2 and 1 A respectively. These figures are typical only and will vary with different makes of lamps

and control gear. It might be more economical to correct the power factor of groups of lamps, but for simplicity and flexibility it undoubtedly pays to include a condenser in the control box of each of the large lamps at least. In the case of the smaller lamps the condenser may be omitted entirely, provided the total current of each circuit and the length of run do not cause an appreciable volt-drop at the lamp.

Standard Control-Gear Box

The practice I have adopted has been to standardise one box to hold any combination of control gear required for any type of discharge lamp. It comprises a wood base-block about ½ in. thick on a sheet steel tray over which a sheet steel cover is held in position by screws and wing nuts. The control gear is very accessible when the cover is removed and is fixed on a base-block by wood screws so that varying fixing centres will present no difficulty. One size of condenser may be used for all sodium and h.p.m.v. lamps, a different size being required for the fluorescent tube. Only two types of leak transformers are necessary for the whole range of sodium lamps, one for the 140-W size, and the other for the remainder; but each size of mercury lamp requires a different tapped choke. A sodium lamp assembly is illustrated in Fig. 4.

All sodium lamps may be mounted horizontally in a trough-type reflector, which will vary in size with the lamp, though one fitting will do for either 60- or 45-W lamps. The latter may also be fitted vertically in a reflector similar to that used for tungsten lamps. In the case of h.p.m.v. lamps only two types of reflector are required, concentrating for either 400- or 250-W sizes, while a dispersive type is used for the 250-W clear or 125-W fluorescent lamp. The latter is chosen in preference to a 125-W clear lamp because it has a g.e.s. cap like the 250- and 400-W lamps, while the clear lamp has a 3-pin cap. So far the 80-W h.p.m.v. and 125-W clear lamps have not been used, being excluded by the fluorescent tube and the 125-W fluorescent lamp respectively.

In addition to the obvious advantages, keeping the types of equipment to the minimum makes for great flexibility. In my newest installations the layout, or pattern, of the lighting points is arranged so that different combinations of units can readily be obtained without alteration in wiring, cable sizes being kept well up so as to be sufficient for the maximum anticipated requirements. In one bay for example, on each truss there are three control boxes which normally house control gear for 250-W h.p.m.v. lamps alternately with that for 140-W sodium lamps, one mercury between two sodium on one truss and one sodium between two mercury on the next (Fig. 5).

If higher intensities are required over certain areas of floor, as for inspection, then 400-W mercury lamps and chokes are substituted for the 250-W size. If improved colour discrimination were required 400-W fluorescent lamps could be used in place of the 250 W and they could also be used in place of sodium units, in which case it would, of course, be necessary to change the reflectors as well as to substitute chokes for the leak transformers. In factory sections where lower intensities are permissible 125-W fluorescent lamps may be used instead of the 250-W h.p.m.v., the chokes being changed, and smaller sodium lamps could be used if suitable leak transformers were substituted. In lower bays one type only of reflector may be used for either 250-W mercury or 125-W fluorescent lamps. By means of a g.e.s./b.c. adaptor, a 60- or 40-W sodium lamp could be used in a reflector intended for a mercury or tungsten lamp.

Another scheme suitable for mounting heights of about 15 to 20 ft. is to have alternately 125-W fluorescent and 300- to 500-W tungsten lamps, which can be used in the same type of reflector. This layout has the advantage of quite good colour definition and elimination of stroboscopic effect, but my preference is for fluorescent lamps alone. For higher bays 400-W mercury lamps may alternate with 1,000- or 1,500-W tungsten lamps if the mercury-sodium combination is not suitable.

Switching

In a blacked-out factory working continuously lamps are seldom switched off singly, or in groups, and advantage may be taken of this fact to eliminate switches from the individual circuits, which are brought straight back to the fuseboard. All the lights of each phase may then be switched together by means of one single-pole isolator controlling supply to the fuseboard busbar; if any individual circuit is to be made dead, the appropriate fuse may be drawn.

Substantial economies in installation may be effected in this way, both in saving the cost of the tumbler switches and in wiring, since the "switch-drop" is eliminated in every case. If tungsten lamps are switched out when they are not actually required, the saving of current may justify the inclusion of switches, but the same is not necessarily true of discharge lamps owing to their lower current consumption. Furthermore, frequent switching of discharge lamps is not practicable, since it takes about 12 min. for sodium lamps to attain full brightness and about 6 min. for mercury lamps; although sodium lamps will restrike immediately, mercury lamps must first cool before they will restart. Experience suggests, moreover, that frequent switching of discharge lamps tends to shorten their life.

In these days when many factories are working almost continuously there may not be opportunities for regular routine maintenance. It is generally sufficient to keep fittings clean and replace burnt-out lamps and those that are obviously dim. Although users are warned that the efficiency of all classes of lamps falls off, it is doubtful whether regular and systematic checking of the output of all lamps would be economically justified, even if it were practicable.

I have found from experience that discharge lamps usually last a great deal longer than the number of hours quoted by E.L.M.A. as "average life" and suppliers may be persuaded to agree to guarantee 2,500 hours for sodium lamps and 1,500 hours for mercury lamps. The arrangement is that all lamps which fail after burning less than the "average life" are returned and the number of hours by which they fall short is credited to the user, who receives in return a corresponding number of new lamps.

This arrangement entails the testing and marking of all new lamps and the keeping of a record card for each lamp, showing the date received, initial lumen output, current taken, date put into service, location, date returned from service and output when re-tested (if not burnt out, or broken). The service life of discharge lamps can readily be estimated, since they burn practically continuously once they have been installed, and it is well worth while to keep records, especially in view of their high cost. Detailed records of tungsten lamps are, however, not kept.

Pilot Lighting

To enable workers to find their way about the factory grounds at night "starlight" fittings (B.S./A.R.P.) will give the small amount of illumination necessary, but even this may be considered objectionable during an "alert," especially so when a raid is actually in progress on a dark night. Yet it is under those very conditions that it is most essential to prevent confusion and panic, so some pilot system which does not afford appreciable illumination is most desirable.

Accordingly, ½-W neon lamps housed in canopied miniature well-glass fittings are mounted about 8 ft. from road level on 1½ in. diameter conduit standards, the bases of which are screwed into 4 in. by 4 in. adaptable conduit boxes set in blocks of concrete. They are interconnected by lead-covered cable laid direct in the ground and jointed at each adaptable box, which is filled with compound. The leads to the lamps are of v.i.r. cable, run inside the standards. This method is inexpensive, and even for very long runs 3/·029 cable is adequate. The number of circuits is kept to the minimum practicable to simplify control and to ensure the greatest possible flexibility.

Presentation to Mr. H. C. Lamb

A PRESENTATION was made on August 15th to Mr. H. C. Lamb on his retirement from the position of chief engineer and manager of the Manchester Corporation Electricity Department. Mr. R. A. S. Thwaites, his successor, paid an eloquent tribute to the great service rendered by Mr. Lamb, an outstanding figure in the electricity supply industry. He had held many high offices, some of them the highest that the industry had to offer. Manchester was perhaps unique in having had only two chief engineers in forty years—Sir Leonard Pearce, appointed in 1904, and Mr. Lamb who succeeded him in 1925. In many respects Manchester had led the way in electrical matters, and during the forty-two years of Mr. Lamb's service enormous changes had taken place. He had always set an exceedingly high standard of efficiency.

The presentation took the form of a handsome dinner wagon with an inscription plate on the drawer, and also a wallet containing Savings Certificates which Mr. Thwaites hoped might, in due course, be devoted towards the purchase or construction of an electric lawn mower.

Mr. Lamb, in replying, referred to the days over forty years ago when life was one of more or less continuous excitement. To-day troubles, when they came, might be very serious; but they were rare and conditions were entirely different. They used to have spectacular fires in the streets with firemen standing round wondering whether they dare put water on the "bitumen gas." It was a frequent occurrence in those days for a constable to appear at Dickinson Street in a hansom cab to report that he had seen dry places on the pavement where they should have been wet! When he joined the undertaking there were fewer than 5,000 consumers; to-day there were nearly 200,000. In the early days it was by no means easy to get councillors to appreciate the potentialities of public supply, and the first chief engineer, Mr. C. H. Wordingham, a man of very high ideals and great ability, had to fight very hard indeed to prevent another Electricity Department being set up within the Corporation solely for the purpose of supplying power for street transport. It was he who chose the Stuart Street site and foresaw its development to the extent of 50,000 HP. The site could actually accommodate 250,000 HP. Mr. Wordingham was followed by Mr. G. F. Metzger, and his brief tenure of office (three years) saw the famous electricity "scandal," arising from the fact that Mr. Metzger had recommended ordering two 6,000-HP generating sets for the Stuart Street station. It was held by critics that he had completely misled the Committee because the sets would never be needed.

Mr. Metzger was followed by Mr. S. L. (now Sir Leonard) Pearce, who had put everything on a new basis, exercised a firm control, and established good relations between the committee and the staff. Mr. Lamb thanked all members of the staff for helping him to uphold the prestige of the Department.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

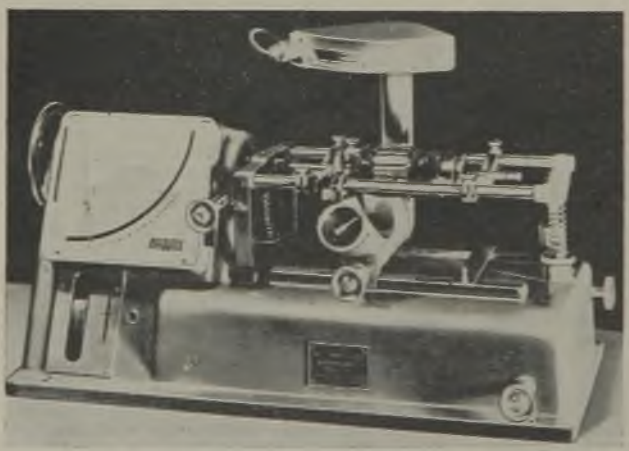
Dynamic Balancers

IN addition to the range of dynamic testing machines offered by W. T. AVERY, LTD., Soho Foundry, Birmingham (*Electrical Review*, June 25th, 1943) there are now available balancers of various sizes, some of them automatic, for such machine parts as armatures, crankshafts, pump and fan rotors. They are equipped with compensating gear in the form of a disc, mounted on a driven shaft and carrying a weight of known magnitude and position, which is driven synchronously with the test body itself; the latter is supported upon oscillating bearings. Some models will indicate automatically the amount and position of the error.

The actual balancing operation is carried out at the critical speed, when the oscillations set up by the test body's unbalance are in resonance with the oscillating system of the machine. Consequently they are magnified considerably, a fact which affords an exceedingly clear reading.

The vertical planes of the rotor (where the operator requires to carry out the compensation) can be chosen at will to suit the particular nature of the test body and the fulcrum points can be adjusted to coincide with them. This is of great advantage, because the balancing result will thus be related to the total unbalance error of the rotor, leaving no residual moments uncompensated which might have been due to leverage between fulcrum points and compensation planes.

The machines run at constant speed during the entire operation, after having been set to the critical speed; operation is fast and straightforward. There are various models for test bodies weighing from 3½ oz. to 1,100 lb. For larger rotors up to 3 tons when the time factor is not of much importance, machines are available without self-acting compensating gear, the amount and position of the error being determined by means of an optical oscillation scale and a mechanical marking indicator.



Automatic rotor balancing machine

Improved Plug

A three-pin plug produced by STANTON & CO., 60, Moor Street, Birmingham, is claimed to provide improved means of gripping the cable. In wiring this "Stanelec" plug the cable leads are first cut off to uniform length and then connected to the shielded self-aligning live terminals. Next the earth wire is doubled back under the cable and attached to the third terminal. Finally the full diameter cable with its covering is wound round the plug pillar and the lid put on, so securely holding the cable by its sheath and leaving an appreciable length inside the plug body. Should the cable be pulled out, the two live wires would be disconnected first and the earthing wire last, thus reversing the more usual sequence.

New cord-gripping plug

The new plug will accommodate fully rated c.t.s. cable; smaller sizes can be wound twice or more times round the central pillar. The terminals are of the usual "pinch" variety, the conductors being pushed through a hole and secured by a screw at right angles.

The earth wire, which is pushed axially down a hole in the third pin terminal, is visible through a cross hole from outside the plug body. The earthing pin can be made to fit plain or self-locking sockets. Similarly contrived two-pin models are produced by the firm of much the same size as ordinary plugs.

ELECTRICITY SUPPLY

Increases at Glasgow and Sheffield. Stockton Post-war Plans.

Clitheroe.—INCREASE IN LARGE POWER TARIFF.—New large consumers of industrial power will pay £4 per kW for the first 100 kW of maximum demand and £3 15s. per kW above that amount, with a unit charge of 0·35d.

Dartford.—TRANSFORMER AND SWITCHGEAR.—The Corporation Electricity Committee is to provide an additional transformer and switchgear equipment in connection with supply to Burroughes, Wellcome & Co.

Glasgow.—INCREASED CHARGES.—Following the further advance of 4s. per ton in the price of coal, estimated to cost the electricity undertaking £71,000 in the current year, the Electricity Committee is to introduce the following increased scale of charges as from the third and fourth (final) survey periods in the current financial year and until further notice, subject to the approval of the Electricity Commissioners:—Residential tariff secondary rate No. 2, from 0·25d. to 0·3d. per kWh; commercial tariff secondary rate No. 2 from 0·3d. to 0·35d. per kWh; power supply tariff, up to 40,000 kWh per year from 1d. to 1·125d. per kWh, and above that amount from ¾d. to 0·75d. per kWh.

ELECTRODE BOILERS.—A special sub-committee of the Health Committee is to consider a suggestion from the Chief Engineer, West of Scotland District, War Department, that on the grounds of economy in manpower and fuel the Corporation should proceed now with the installation of electrode boilers to provide heating and domestic hot water supply at Cowglen Hospital instead of waiting until the hospital is "de-requisitioned."

Lymm (Cheshire).—ELECTRICITY CHARGES.—The Urban District Council has asked Warrington Corporation to meet a deputation with a view to considering again the cancelling of the 10 per cent. additional charge to electricity consumers in the Lymm area.

Middlesbrough.—SALE OF HIRED APPARATUS.—The Town Council has approved proposals for the sale to consumers of apparatus let out on hire.

Newcastle-on-Tyne. — NEW SUBSTATION. — The City Council has obtained sanction to borrow £8,160 for the construction and equipment of a substation, laying of cables, etc.

Stalybridge.—RATE PRECEPTS NEARLY REPAID.—As already reported, the Stalybridge, Hyde, Mossley and Dukinfield Joint Transport and Electricity Board is this year making a grant of £4,000 from its profits to each of the constituent authorities. At a recent meeting Alderman S. Fawley (Hyde), chairman of the Finance Committee, announced that under present conditions the Board would within two or three years have repaid all the money it had had from these authorities. The net profit from the Electricity Department for the past year was £16,005 and from the Transport Department £12,233.

Sheffield.—INCREASED CHARGES.—The Electricity Committee recommends that, in view of the increased price of coal and equipment, electricity charges should be increased from 7½ to 15 per cent.

Stockton-on-Tees.—POST-WAR PLANS.—Post-war expenditure on the electricity undertaking proposed by the Town Council includes £78,000 for installations in connection with consumers; £77,000 for consumers' apparatus on hire; £85,000 for the reinforcement of mains; £104,000 for additions to transmission and distribution; £12,000 for offices, showrooms and workshops; and £80,000 for a change in the voltage.

Surrey.—HOSPITAL EQUIPMENT.—The Health Committee of the County Council is to provide seventeen electrically-heated food containers at a cost of £1,100 for St. Helier Hospital.

Overseas

New Zealand.—HUTT VALLEY PROGRESS.—Continued progress is recorded in the operation of the Hutt Valley Electric Power Board during the year ended March 31st last in the annual report sent us by Mr. E. F. Hollands, the general manager and treasurer. Sales of electricity increased from 68,325,274 to 75,621,808 kWh (or from 3,875 to 4,169 kWh per consumer), while the maximum load was 1,132 kVA higher at 18,243 kVA. The number of consumers connected at March 31st was 18,137, an increase of 505 during the year. Apparatus connected now includes 5,944 cookers, 6,736 water heaters, 3,309 motors and 123 milking motors. The total revenue from the sale of electricity was £220,379 (£193,386 in 1942-3), or 0·699d. (0·679d.) per kWh sold.

TRANSPORT

Rotherham. — OVERHEAD EQUIPMENT MODIFICATIONS.—Mr. N. Rylance, who was recently appointed transport manager, has reported to the Transport Committee that in order to comply with the requirements of the Ministry of Transport it is necessary to erect, at intervals of not more than half a mile along the trolleybus routes, pillars containing switches controlling the intermediate lengths of trolley wire. Approximately 46 pillars are required. He has suggested that while these pillars are being installed the overhead feeding arrangements shall be modified with a view to increasing the efficiency of the system. The whole work will be carried out by the Department with the assistance of the Electricity Department and the cost is estimated at £5,360. He has been authorised to proceed with the work.

RADIO & TELEPHONY

Colombo.—RADIO RELAY STATION.—A new wireless relay station has been opened at Colombo, Ceylon, to provide an alternative route for transmission of messages from London to Australia, announces Cable & Wireless, Ltd. The station has been installed for use when the direct London-Australia beam is unworkable.

United States.—NEW INDIA RADIO CIRCUIT.—A new direct radio-telegraph circuit between the United States and India has been inaugurated.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The United River Plate Telephone Co., Ltd., earned a gross revenue of £5,125,875 for 1943, as compared with £4,652,953 in the preceding year. The net earnings, after meeting expenses, depreciation and interest charges, were £1,010,076 (against £1,338,658) and to this were added £18,627 exchange adjustment, £173,089 transfer from capital surplus of realised appraised increment and £3,014,941 brought forward, making £4,216,733. After meeting other charges a final dividend of 3 per cent., again making 6 per cent. for the year is to be paid, leaving £3,603,953 to be carried forward. There was an increase of 3·5 per cent. in the number of telephones during the year, raising the total to 477,518. Pending applications for service numbered 37,658 at the end of the year (against 20,909 at December 31st, 1942).

Metal Industries, Ltd.—Speaking at the company's annual meeting on August 21st, the chairman (Sir J. Donald Pollock, Bt.) said that the holding in the British Oxygen Co., Ltd., had again provided a very satisfactory dividend. The holding in Electrical Switchgear & Associated Manufacturers, Ltd., had again been increased and the company now held all the issued ordinary shares. A dividend had been received from the profits arising mainly from its wholly-owned subsidiary, Brookhirst Switchgear, Ltd., which had operated at a high level of activity and had earned a substantial profit. The accounts also included dividends from the Igranic Electric Co., Ltd., whose issued capital was wholly owned by Metal Industries, Ltd. Further shares of the Sentinel Waggon Works (1936), Ltd., had been purchased.

Anglo-Argentine Tramways Co., Ltd.—The report for 1943 shows a loss amounting to £6,645. A long statement by the board sets out in detail the story of the company's dealings with the Argentine Government. It is stressed that the unsatisfactory position of the Buenos Aires Transport Corporation to which the company's undertaking was transferred is due entirely to the refusal of the Government to sanction increases in the fares, which were fixed some forty years ago, in spite of greatly increased costs. The company's debenture stockholders have agreed to a further postponement of their rights and the shareholders are to be asked to approve the scheme at an extraordinary meeting to follow the annual meeting on September 8th.

The Engineering & Lighting Equipment Co., Ltd., records a trading profit, after providing for depreciation, of £31,215 for the year ended March 31st last. This compares with £38,239 in the previous year. From this has to be deducted directors' fees £550 (same), war damage contribution £88 (£81), war damage insurance £225 (£338), income tax and E.P.T. £7,123 (£5,289) and reserve for E.P.T. £1,775 (£8,750), leaving a net profit of £21,454 (£23,231). The redemption fund receives £7,772 (£7,402), while dividends on preference and 4 per cent. interim on ordinary shares take £9,928 (£10,298). A final dividend of 6 per cent. again makes 10 per cent. for the year and £1,896 (£4,141) is carried forward.

Thorn Electrical Industries, Ltd., show combined trading profits for the company and its subsidiaries for the year ended March 31st amounting to £84,850, as compared with £83,831 for 1942-43. After providing for director's fee £125 (£250), additional management remuneration £2,080 (£1,905), and taxation £58,000 (£57,000), there was a net profit of £24,645 (£24,676). Preference dividends again require £1,500, and £12,000 (£13,000) is transferred to general reserve. The ordinary dividend is maintained at 20 per cent. and £10,235 (£9,091) is carried forward.

The Kalgoorlie Electric Power & Lighting Corporation, Ltd., records a profit for 1943 amounting to £31,758, as against £31,173 in the previous year. United Kingdom taxes require £6,392 (£5,025) and depreciation reserve again receives £16,000, making it £186,000. An ordinary dividend of 5 per cent., less tax at 5s. in the £, is to be paid (same), and £9,727 (£9,916) is carried forward. Due entirely to the further withdrawal of man-power from the mining industry, sales of electricity were further reduced by 7,500,000 kWh, or about 16 per cent. of the 1942 sales.

The Broadcast Relay Service, Ltd., held its annual general meeting on August 17th. Mr. Allan Miller, the chairman, reported continued expansion in all departments and new high levels of volume of business and profits earned. One of the company's manufacturing businesses in Canada had been disposed of on very satisfactory terms. The company was in a strong position financially, with ample reserves, and was giving continued consideration to post-war plans for extension and improvement of the business.

Gabriel, Wade & English, Ltd., report a net profit for the year ended May 31st last amounting to £91,309 (as compared with £86,357 for the previous year after providing £11,181 for E.P.T.). Income tax takes £19,141 (£29,172) and contribution to reserve £30,000 (bringing it up to £150,000). As reported last week, an ordinary dividend of 6 per cent. is again to be paid plus a bonus of 4 per cent. (same), and £64,236 (£71,417) is carried forward.

The Philco Radio & Television Corporation of Great Britain.—Guarantors of the recent issue of 100,000 £1 6 per cent. cumulative preference shares at 20s. 6d. each and 250,000 2s. ordinary shares at 10s. 6d. each are being called upon to subscribe for 11 per cent. of the preference and 2 per cent. of the ordinary shares.

The Kalgoorlie Electric Tramways, Ltd., record a net profit for 1943, before providing for interest on "B" debentures, amounting to £2,426 (£1,447), which is carried to reserve for redemption of "B" debentures.

Vactric, Ltd., is to pay a final dividend of 15 per cent. on its ordinary shares making

(A short series of open letters by L.S.E., commenting on some notable letters of the past.)

To Leonardo Da Vinci, who wrote to the Duke of Milan (in about 1480) offering his services as Court Engineer

Norwich, 1944

Dear Leonardo,

Even though you got the job, it seems to us that you claimed too much. You said, with no false modesty, that you could construct, among many other things, bridges, light, strong and portable, to resist fire ; armoured wagons carrying artillery (you certainly had something there !) and ships to withstand the fire of the heaviest cannon ; also conduits for water and sculpture in marble, bronze or clay. An impressive list for your noteheading, ending, we may suggest, with the magic words " Estimates Free."

You sought perfection in too many arts and died a disappointed man. Had you specialised, as we do, in mastering one art (in our case the manufacture of electric motors, which would have interested you greatly), to what even greater heights might you not have risen.

But how you would have enjoyed yourself preparing some of your novel devices for the Second Front !

Yours truly,

LAURENCE, SCOTT & ELECTROMOTORS LTD.

22½ per cent. for the year to March 31st last. The last distribution was 4 per cent. in respect of 1937–38.

The North-Eastern Electric Supply Co., Ltd., is paying an interim dividend of 2½ per cent. (same).

The County of London Electric Supply Co., Ltd., is again to pay an interim dividend of 3 per cent.

The Northampton Electric Light & Power Co., Ltd., is again paying an interim dividend of 4 per cent.

The Rushden & District Electric Supply Co., Ltd., has declared an interim dividend of 4 per cent. (same).

New Companies

Electra (Bourne End), Ltd.—Private company. Registered August 8th. Capital, £1,500. Objects: To carry on the business of electrical radio, television and mechanical engineers, etc. First directors: J. C. White, The Margarets, Bourne End, Bucks; and D. G. van Mooydonk, Woodland Thatch, Bovingdon Green, Marlow. Registered office: Marlow Road, Bourne End, Bucks.

Reda (Electrics), Ltd.—Private company. Registered August 4th. Capital, £500. Objects: To carry on the business of dealers in, and repairers of, radio, television and electrical appliances, etc. First directors: J. E. Wright, 42, Station Road, Cheadle Hulme; and E. W. Davies, 13, Park Avenue, Cheadle Hulme. Registered office: 142a, Finney Lane, Heald Green, Cheshire.

Carey Electrical, Ltd.—Private company. Registered August 9th. Capital, £100. Objects: To carry on the business of electrical engineers and contractors, repairers of, and dealers in, radio and electrical goods, etc. First directors: Sidney F. Landus Fitchie, 84, Hervey Road, Brighton, and four others. Registered office: 766, Fulham Road, S.W.6.

Jackson Automatic Electric Controls, Ltd.—Private company. Registered August 14th. Capital, £1,000 in 1,000 shares of £1 each. Objects: To carry on the business of manufacturers of, and dealers in, instruments and appliances (either static or rotary) for the measurement, operation and control of liquids, gases, solids, power, etc. Directors: S. B. Jackson, 47, Christchurch House, S.W.3 and Freda M. Haddy, 21, Queen Anne's Gate, S.W.1. Registered office: Windsor House, 46, Victoria Street, S.W.1.

H. C. Wall & Co., Ltd.—Private company. Registered August 10th. Capital, £2,500. Objects: To acquire the business of an electrician and the like carried on by Harold C. Wall at 44, Lowesmoor, Worcester. First directors are: H. C. Wall, 8, Georgina Avenue, Worcester, and two others. Registered office: 44, Lowesmoor, Worcester.

Electruks, Ltd.—Private company. Registered August 10th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, electric vehicles, motor cars, lorries, tractors, wireless equipment, batteries, etc. Subscribers: W. Reeves, 141, Hendon Way, N.W.2, and A. A. C. N. Smith, Egremont House, Sudbury, Middlesex. Secretary: S. E. Hoar. Registered office: 8, Fitzroy Road, N.W.1.

D. G. Wiggins (Engineers), Ltd.—Private company. Registered August 11th. Capital, £500. Objects: To acquire the business of an electrical and mechanical engineer carried on by David G. Wiggins at Thornaby-on-Tees; also to carry on the business of wireless service agents, etc. Directors: D. G. Wiggins and Olive Wiggins, both of 11, Lexden Avenue, Acklam, Middlesbrough. Registered office: Lanehouse Garage, Thornaby Road, Thornaby-on-Tees, Yorks.

Arthur Ellis (Electrical), Ltd.—Private company. Registered August 12th. Capital, £2,000. Objects: To acquire the business of an electrical engineer and contractor carried on by Arthur Ellis at 14, Lonsdale Road, Harborne, Birmingham. Directors: A. Ellis and Emily M. Ellis, both of 46, Harts Green Road, Harborne. Registered office: 14, Lonsdale Road, Harborne.

Companies' Returns

Increases of Capital

M.C.L. & Repetition, Ltd.—The nominal capital has been increased by the addition of £380,000 beyond the registered capital of £120,000. The additional capital is divided into 250,000 5 per cent. cumulative preference and 130,000 new ordinary shares of £1 each.

Watford Electric & Manufacturing Co., Ltd.—The nominal capital has been increased by the addition of £60,000 beyond the registered capital of £100,000. The additional capital is divided into 60,000 6 per cent. cumulative preference shares of 10s. each and 300,000 ordinary shares of 2s. each.

Controller Contacts (Cardiff), Ltd.—The nominal capital has been increased by the addition of £1,000 in £1 ordinary shares, beyond the registered capital of £1,000.

Liquidations

Reliance Lift & Engineering Co., Ltd. (in voluntary liquidation).—Particulars of claims to be sent by August 31st to one of the liquidators, Mr. J. W. Grayston, Whitaker's Buildings, New Victoria Street, Bradford.

St. James Electrical Co., Ltd.—Meetings, September 18th, at 38, Jubilee Place, King's Road, London, S.W.3, to receive an account of the winding up by the liquidator, Mr. A. G. Warne.

W. B. & H. C. Cables, Ltd.—Meeting, September 18th, at 19, Moorgate Street, Rotherham, to receive an account of the winding up by the liquidator, Mr. F. H. W. Green.

Bankruptcies

W. T. Dalton, wireless engineer, 62, East Street, Horsham.—Proofs for dividends by August 29th to the trustee, Mr. A. C. Williams, 8, Old Steine, Brighton.

T. Johnson, electrician, lately carrying on business at 25, Granville Street, Sheffield, as "Tom Johnson & Co.", mechanical and electrical engineer and contractor.—Proofs for dividend by September 2nd to the trustee, Mr. A. H. Ward, 55, Queen Street, Sheffield.

STOCKS AND SHARES

TUESDAY EVENING.

THE month of August is—by general consent founded upon past experience—always a quiet one in the Stock Exchange markets. There have been times when this tradition was broken, but it holds good in nineteen years out of twenty. The disposition is for prices to suffer some reaction owing to the usual buyers holding off. This gives the automatic selling for deceased accounts, etc., an exaggerated importance. News of the opening of a new front on the Riviera created a good impression, but had no effect upon Stock Exchange prices. Promise of an easing of street lighting restrictions during the coming winter gave a mild impetus to the buying of Home electricity supply shares. The radio group for want of public interest has leaned to the lower side.

Home Electricity

The Home electricity supply companies continue to declare dividends at the same rates as a year ago. This is taken as an indication that the final dividends will show no change from the 1943 distributions. Prices of the well-known undertakings stand at levels which may be almost regarded as equivalent to those of gilt-edged securities. County of London ordinary, for instance, are offered at 43s. 9d. to give £3 13s. per cent., assuming maintenance of the 8 per cent. dividend which has been paid annually for some years past. Edmundsons ordinary, obtainable at 32s., return £3 15s. per cent. on their 6 per cent. dividend. In the Provincial group, Yorkshire Electrics, paying the same dividend as County of London ordinary, stand at about the same price.

Four per cent. Basis

Midland Electric Power, which pays 9 per cent. dividends can be bought, as to 5,000 shares, at 44s. 3d. ; this returns the more satisfactory yield of £4 1s. 6d. per cent. From Lancashire Electric ordinary at 37s. 3d. the yield is a few pence above 4 per cent. ; there are 2,500 shares on offer at the price mentioned. Clyde Valley at 42s. 6d. give £3 15s. 3d. and Scottish Power ordinary at 42s. pay £3 16s. per cent. The dividend in each of the last two cases is 8 per cent. per annum.

Fewer Fluctuations

What has come to be for weeks past a nearly invariable series of rises in our price-lists, is interrupted this time by a slight preponderance of minus signs. Some of the improvements, however, are worthy of note ; a gain of 2s. raised Westinghouse Brakes to £4 and Johnson & Phillips have advanced to the same figure. With a gain of 1s. 6d., Telegraph Constructions are up to 56s. and Vactric at 19s. 3d. show an improvement of 2s. 9d. British Insulated rose to within a florin of £6. Chloride Electrical Storage at 4⅞ are ⅛ better and Reyrolles, with a similar advance, are up to 73s. 9d. Electric Construction at 58s. have put on 6d. The falls range from ¼ in Metal Industries " B," at 51s. 3d., to 6d. in Automatic Telephones and Enfield Cables, at the common price of 64s. 6d. Cable & Wireless preference and ordinary are both 10s. lower. Victoria Falls ordinary, upon publication of the report, rose to 83s. 9d. Tokyo sixes are another point higher at 27.

Hall Telephone

At the present price of Hall Telephone shares, 31s. 6d., the yield on the 12½ per cent. dividend now being paid is £3 19s. 4d. per cent. This seems a moderate return from an ordinary share of this nature, but is justified by reference to the manner in which the company's profits have been mounting over the past few years. The record is best illustrated by setting out the gross and net profits for the five years ended 1943. The figures are as follows :—

Year	Gross profit	Net profit
1939	£114,213	£41,606
1940	205,688	68,639
1941	399,090	152,572
1942	573,389	258,409
1943	829,086	499,626

The dividend the first two years, 1939 and 1940, was 10 per cent., after which it became 12½ per cent. ; this is the present rate of distribution. A couple of years before the outbreak of war the company issued new shares at 11s., the proceeds being used to build a factory at Dowlais.

Thorn Electrical

Thorn Electrical Industries at 26s. have recovered the dividend lately deducted. The company makes up its accounts to the end of March, and those just published show little difference from the figures of the previous corresponding period. The company made a net profit of £24,600, practically the same as that for the year ended March, 1943. The dividend is again 20 per cent. and the earnings more than twice that amount. The capital is £100,000 in ordinary shares of 5s. each and £50,000 in 6 per cent. preference shares of £1 each. The reserves are nearly £140,000. At the present price of 26s. the yield on the money comes to £3 17s. per cent., which in itself indicates the expectation that under more normal conditions the dividend will be increased.

Enfield Cables

The price of Enfield Cables at 65s. allows a return of £3 17s. per cent. on the money,

(*Continued on page* 286)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend: Previous	Dividend: Last	Middle Price Aug. 22	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	63/-	..	3 19 4
British Power and Light	7	7	33/6	..	4 3 7
City of London	7	5½	31/-	..	3 11 0
Clyde Valley	8	8	42/-	..	3 16 0
County of London	8		43/6	..	3 13 3
Edmundsons:					
7% Pref.	7	7	34/6	..	4 1 4
Ord.	6	6	31/-	..	3 17 5
Elec.Dis.Yorkshire	9	9	45/6	..	3 19 6
Elec. Fin. and Securities	12½	13½	59/-	..	4 11 4
Elec. Supply Corporation	10	10	47/6	..	4 4 2
Isle of Thanet	Nil	Nil	18/-	..	—
Lancs. Light and Power	7½	7½	37/-	..	4 1 1
Llanelly Elec.	6	6	26/6	..	4 10 7
Lond.Assoc.Electric	3	4	26/6	..	3 0 6
London Electric	6	6	31/-	..	3 17 5
LondonPowerRed. Deb.	5	5	105½	..	4 14 7
Metropolitan E.S.	8	8	42/6	+6d.	3 15 2
Midland Counties	8	8	41/6	..	3 17 0
Mid. Elec. Power	9	9	44/-	..	4 1 9
Newcastle Elec.	7	7	31/-	..	4 10 4
North Eastern Elec. Ordinary	7	7	35/-	..	4 0 0
7% Pref.	7	7	35/-	..	4 0 0
Northampton	10	10	50/6	..	3 19 6
Notting Hill 6% Pref. (£10)	6	Nil	11	..	—
Northmet Power: Ordinary	7	7	42/-xd	+1/-	3 6 8
6% Pref.	6	6	30/6	..	3 18 8
Richmond Elec.	6	6	25/6	..	4 14 1
Scottish Power	8	8	41/6	..	3 17 2
Southern Areas	5	5	23/-	..	4 7 0
South London	7	7	29/-	..	4 16 7
West Devon	5	5	23/6	..	4 5 1
West Glos.	4½	3½	24/6	..	2 17 0
Yorkshire Elec.	8	8	43/-	..	3 14 5
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	7/3	..	—
Calcutta Elec.	6*	6*	48/6	—1/6	2 9 6
Cawnpore Elec.	10	7	40/-	..	3 10 0
East African Power	7	7	34/6	..	4 1 4
Jerusalem Elec.	7	5	29/6	..	3 8 0
Kalgoorlie (10/-)	5	5	11/6	..	4 7 0
Madras Elec.	4*	Nil	32/-	—1/-	—
Montreal Power	1½	1½	25	..	—
PalestineElec."A"	4*	5*	40/6	..	2 10 0
Perak Hydro-elec.	6	7	14/-	..	—
ShawiniganPower	83cts.	90cts.	16½	..	—
Tokyo Elec. 6%	6	6	27	+1	—
VictoriaFallsPower	15	15	4⅛	+⅛	3 11 7
WhitehallInv.Pref.	—	6	24/6	..	4 18 0

Company	Dividend: Previous	Dividend: Last	Middle Price Aug. 22	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity 1955–60 (Civil Defence)	3	3	100	..	3 0 0
1955–75	5	5	115	..	4 7 0
1951–73	4½	4½	107	..	4 4 1
1963–93	3½	3½	104⅛	..	3 7 0
1974–94	3½	3½	101	..	3 4 4
London Elec. Trans. Ltd.	2½	2½	97½	..	2 11 3
London & Home Counties1955–75	4½	4½	111	..	4 1 1
Lond.Pass.Trans.: A	4½	4½	121½	..	3 14 1
B	5	5	121½	..	4 2 4
C	3	3½	71	..	4 11 7
WestMidlandsJ.E.A. 1948–68	5	5	108½	..	4 12 4
Telegraph and Telephone					
Anglo-Am. Tel.: Pref.	6	6	120	—½	5 0 0
Def.	1½	1½	30	..	5 0 0
Anglo-Portuguese	8	8	28/6	..	5 12 4
Cable & Wireless: 5½% Pref.	5½	5½	114½	—½	4 16 1
Ord.	4	4	84	—½	4 15 3
CanadianMarconi	$1	Nil	4cts.	10/-	—
Globe Tel. & Tel.: Ord.	8½*	5*	40/6	..	2 9 4
Pref.	6	6	30/6	..	3 18 8
GreatNorthernTel. (£10)	Nil	Nil	24⅛	..	—
Inter. Tel. & Tel.	Nil	Nil	23	+1	—
Marconi-Marine	7½	7½	36/-	..	4 3 4
Oriental Tel. Ord.	16	10	51/9	—9d.	—
Telephone Props.	6	Nil	18/6	..	—
Tele.Rentals(5/-)	10	10	12/-	..	4 3 4
Traction and Transport					
Anglo-Arg. Trans.: First Pref. (£5)	Nil	Nil	2/6	..	—
4% Inc.	Nil	Nil	6	..	—
Brit.Elec.Traction: Def. Ord.	45	45	1315	..	3 8 5
Pref. Ord.	8	8	180	..	4 9 0
Bristol Trams	10	10	57/-	..	3 10 2
Brazil Traction	$1	$1¾	26⅛	—⅛	6 12 1
Calcutta Trams	5½	6½	70/6	..	1 17 2
Cape Elec. Trams	5	6	25/6	..	4 14 1
Lancs. Transport	10	10	45/6	..	4 8 0
Mexican Light: 1st Bonds	5	5	107½	..	4 13 0
Rio 5% Bonds	5	5	105½	..	4 14 9
Southern Rly.: 5% Prefd.	5	5	76	..	6 11 7
5% Pref.	5	5	116½	..	4 5 9
T. Tilling	10	10	60/-xd	+6d.	3 6 8
West Riding	10	10	46/-	..	4 7 0

(Continued on next page)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Aug. 22	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron.Elec.Ord. ..	10	15	61/–	..	4 18 4
Assoc. Elec. :					
Ord.	10	10	53/6	−2/–	3 14 9
Pref.	8	8	40/–	..	4 0 0
AutomaticTel.&Tel.	12½	12½	64/6	−6d.	3 17 8
Babcock & Wilcox	11	11	52/–	−1/6	4 4 7
British Aluminium	10	10	51/6	..	3 17 8
British Insul. Ord.	20	20	118	+6d.	3 10 3
British Thermostat (5/–)	18½	18½	20/9	..	4 9 0
British Vac. Cleaner (5/–)	15	30	30/–	..	5 0 0
Brush Ord. (5/–)	8	9	10/9	..	4 3 9
Burco (5/–) ..	15	17½	17/–	..	5 3 0
Callender's ..	15	20	5⅞	−1/16	3 12 2
ChlorideElec.Storage	15	15	88/9	+1/16	3 6 7
Cole, E. K. (5/–)	10	15	32/6	−1/6	2 6 2
ConsolidatedSignal	24	27½	6¾	..	4 1 6
Cossor, A. C. (5/–)	7½*	10*	25/6	−6d.	1 19 6
Crabtree (10/–) ..	17½	17½	42/6	..	4 2 6
Crompton Parkinson Ord. (5/–) ..	20	22½	33/6	..	3 7 3
E.M.I. (10/–) ..	6	8	34/–	−2/3	2 7 1
Elec. Construction	10	12½	58/–	+6d.	4 6 2
Enfield Cable Ord.	12½	12½	64/6	−6d.	3 17 8
English Electric	10	10	53/3	..	3 15 2
Ensign Lamps (5/–)	25	15	21/3	..	3 10 8
Ericsson Tel. (5/–)	22*	20*	56/3	..	1 15 7
Ever Ready (5/–)	40	40	44/6	..	4 10 0
Falk Stadelmann	7½	7½	35/–xd	+9d.	4 5 9
Ferranti Pref. ..	7	7	31/3	..	4 9 7
G.E.C. :					
Pref.	6½	6½	34/–	..	3 16 6
Ord.	17½	17½	96/6	−1/6	3 12 2
General Cable (5/–)	15	15	15/–	..	5 0 0
Greenwood&Batley	15	15	46/–	..	6 10 4
HallTelephone(10/–)	12½	12½	31/6	−1/6	3 19 4
Henley's (5/–) ..	20	20	27/–	−⅛	3 14 0
4½% Pref. ..	4½	4½	24/–xd	+3d.	3 15 6
Hopkinsons ..	15	17½	71/3	..	4 18 4
India Rubber Pref.	5½	5½	23/6	..	4 13 9
Intl. Combustion	30	30	6¾	..	4 10 8
Johnson & Phillips	15	15	80/–	+1/–	3 15 0
LancashireDynamo	22½	22½	98/9	..	4 11 2
Laurence,Scott(5/–)	12½	12½	15/6	..	4 12 7
London Elec. Wire	7½	7½	39/–	..	3 17 3
Mather & Platt..	10	10	55/9	..	3 14 3
Metal Industries(B)	8	8½	51/3	−⅛	3 6 3
Met. Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	5½	−⅛	3 18 3
Pye Deferred (5/–)	25	25	35/–	−⅛	3 11 5
Revo (10/–) ..	17½	17½	43/–	..	4 1 6
Reyrolle ..	12½	12½	73/9	+⅛	3 8 3
Siemens Ord. ..	7½	7½	35/6	..	4 4 6
Strand Elec. (5/–)	7½	10	8/3	+3d.	6 1 3
Switchgear & Cowans (5/–) ..	20	20	19/–	..	5 5 1
T.C.C. (10/–) ..	5	7½	22/6	..	3 6 8
T.C. & M. ..	10	10	56/–	+1/6	3 11 6
TelephoneMfg.(5/–)	9	9	12/9	..	3 10 7
Thorn Elec. (5/–)	20	20	26/–xd	+6d.	3 17 0
Tube Investments	20	20	98/–	−2/–	4 1 8
Vactric (5/–) ..	Nil	22½	19/3	+2/9	5 16 10
Veritys (5/–) ..	7½	7½	8/3	..	4 11 0
WalsallConduits(4/–)	55	55	51/–	..	4 6 3
Ward & Goldstone (5/–)	20	20	28/9	..	3 13 6
WestinghouseBrake	12½	14	80/–	+2/–	3 10 0
West, Allen (5/–)	7½	7½	8/9	..	4 5 9

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 284)

which is higher than the yield available from British Insulated Cables, Callender's and Henley's. The Enfield Cable Company's 12½ per cent. dividend has been repeated for the past four years, before which the dividend was at the rate of 16¼ per cent. in 1938 and 1939, and 25 per cent. per annum in the four previous years.

The last new issue which the company made was in February, 1938, when 300,000 new ordinary shares were offered to the proprietors in the proportion of three new for every five old, free of charge.

Miscellaneous Matters

The effect of the lessened interest in semi-speculative issues can be seen by reference to Electric & Musical Industries, where the price, at 34s. is down by 2s. 3d. Pye deferred have gone back to 35s., E. K. Cole to 32s. 6d. and Cossor to 25s. 6d. Philco at 13s. 9d. are 6d. lower.

Lively dealings continue in Calcutta Trams, where the price gave way abruptly to 68s., to rally almost as sharply to 70s. 6d. Conflicting estimates continue to be made of the price which the Corporation of Calcutta may be expected to pay for the undertaking. Of the other Indian industrials, Calcutta Electric Supply at 48s. 6d. and Madras Electric at 32s. are sympathetically influenced by the dullness prevailing elsewhere. De la Rue at 9¼ are easier. Ultra Electrics have been changing hands at 9s.

High Prices Imply Confidence

So far from prices of shares in the industrial group giving way, as they have done in New York, the opposite is the case in the London market. The significance of the meagre yields that industrial shares afford lies in the measure that they demonstrate of the confidence felt with regard to the post-war outlook.

The leading industrial shares quoted in our price lists furnish ample illustration of this confidence. Prices of ordinary shares in the front-rank companies, as our tables show, stand at levels which give little more than a gilt-edged yield, on the basis of dividends now being paid. Were there to be any doubt felt as to the result of post-war conditions, our price-lists would present a very different appearance from that which they exhibit to-day.

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.

AUTOMATIC Telephone & Electric Co., Ltd., P. N. Roseby and J. F. Mackenzie.—"Electric signalling systems." 1067. January 21st, 1943. (563218.)

British Thomson-Houston Co., Ltd.—"Protective systems for electric traction motors." 14028/42. October 8th, 1941. (563177.) "Current-limiting means for electric discharge devices." 484/43. January 16th, 1942. (563188.)

British Thomson-Houston Co., Ltd., and J. R. Mortlock.—"Earth-leakage AC electric protective arrangements." 1363. January 27th, 1943. (563194.)

Brush Electrical Engineering Co., Ltd., A. E. Harrison and A. Forsyth.—"Reversing gear of internal-combustion engines." 1627. February 1st, 1943. (563250.)

A. L. Cianchi. — "Magnetically-operated switches for controlling a sequence of operations." 15130. October 28th, 1942. (563129.)

Davey, Paxman & Co., Ltd., and E. P. Paxman.—"Fuel injector devices for internal combustion engines." 6488. April 22nd, 1943. (563163.)

W. H. Devine.—"Overhead conductors of electric transport systems." 6353. April 21st, 1943. (563154.)

Electro Metallurgical Co. — "Chromium steels." 1515/43. February 4th, 1942. (563249.)

English Electric Co., Ltd., and E. A. Binney.—"Resilient torque-transmission couplings." 1362. January 27th, 1943. (563140.)

English Electric Co., Ltd., and E. H. H. Hassler.—"Shaft bearings." 4815. March 24th, 1943. (563153.)

E. G. Greville and H. W. Grover.—"Apparatus for enabling high-tension unidirectional current to be obtained from a low-tension direct-current supply." 6327. April 20th, 1943. (563256.)

Hazeltine Corporation. — "High-frequency signal-translating system." 1416/43. March 3rd, 1942. (563146.)

P. Holmes and Metropolitan-Vickers Electrical Co., Ltd.—"Removal of enamel coverings from metallic members." 1771. February 3rd, 1943. (563253.)

Holophane, Ltd. (D. H. Tuck).—"Lighting systems and lighting units for use therein." 5475. April 22nd, 1943. (Convention date not granted.) (563162.)

C. G. Lemon and Tenaplas, Ltd.—"High-frequency cables." (Cognate applications 5645/43 and 5245/43.) February 1st, 1943. (563251.)

Limit Engineering Co., Ltd., and A. L. Collins.—"Commutators for electric motors and the like." 2315. February 11th, 1943. (563228.)

M. & C. Switchgear, Ltd., and R. Morrison.—"Glands for electric cables." 16751. November 25th, 1942. (563132.)

Marconi's Wireless Telegraph Co., Ltd.—"Piezo-electric crystals and supports therefor." 1347/43. July 5th, 1941. (563139.) "Frequency modulator." 6571/43. April 27th, 1942. (563205.) "Monitoring and measuring apparatus for frequency modulation signals." 3364/43. February 27th, 1942. (563237.)

Ozonair, Ltd., and E. F. W. Cowell.—"Electrical dust-precipitation apparatus." 2471. February 15th, 1943. (563230.)

P. Peillon, N. Sarruf and L. Castro.—"Electric arc welding." 18626. December 31st, 1942. (563216.)

Proctor & Schwartz, Inc.—"Electrically-heated cooking apparatus." 3485/43. March 11th, 1942. (563238.)

Revo Electric Co., Ltd., and F. H. Reeves.—"Universal fixture mounting for trough lighting fittings." 1763. February 3rd, 1943. (563224.) "Electric lamp reflector fittings." 2853. February 20th, 1943. (563231.)

Sangamo Weston, Ltd.—"Electrical resistance elements." 6525-6/43. July 1st, 1942. (563203/4.)

W. Sharp.—"Snap-action electric switches." 3263. February 27th, 1943. (563235.)

Siemens Electric Lamps & Supplies, Ltd., and H. Austin.—"Manufacture of luminescent materials." 18404. December 28th, 1942. (563185.)

Siemens-Schuckert (Great Britain), Ltd., and A. B. White.—"Automatic temperature control of electrically-heated apparatus." 13884. October 2nd, 1942. (563176.)

Simms Motor Units, Ltd., and W. Bryan.—"Supercharging the high-tension electrical ignition system of an internal-combustion engine." 16201. November 16th, 1942. (563131.)

Standard Telephones & Cables, Ltd.—"Grid electrode constructions." 3163/43. April 7th, 1942. (563234.)

Standard Telephones & Cables, Ltd., and M. M. Levy.—"Thermionic valve circuits." 1532. January 29th, 1943. (563220.) "Thermionic valve circuits." 1538. January 29th, 1943. (563222.)

Standard Telephones & Cables, Ltd., and G. Newton.—"Chassis construction for mounting radio and like component parts." 1457. January 28th, 1943. (563197.)

Western Electric Co., Inc.—"Housings for apparatus employed particularly in submarine cable systems." 6388/43. April 21st, 1942. (563158.)

Westinghouse Brake & Signal Co., Ltd.—"Electrical relays." 1377/43. August 21st, 1942. (563141.)

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.

Morpeth.—Tubular heaters, electric water boiler, refrigerator, etc., for conversion of Thomas Taylor Homes to hospital; county architect, County Hall, Newcastle-on-Tyne.

Newcastle-on-Tyne. — Corporation Health Committee. Refrigerating plant at the Newcastle General Hospital. Specification and form of tender from the City Architect, 8, Cloth Market.

Wolverton.—September 4th. Urban District Council. Electric pumping machinery. Plans, etc., from W. H. Radford & Son, Albion Chambers, King Street, Nottingham.

Orders Placed

Berwick.—Electric lighting extensions in connection with the adaptation of Castle Hills as a maternity hospital.—I. & E. Morton.

Glasgow.—Corporation Health Committee. Accepted. Bacteriological Laboratory:—Refrigerating plant (£145).—L. Sterne & Co.; centrifuge machine, electric incubators, water baths (£441).—Thomson, Skinner & Hamilton. Food mixing machine, complete with motor, etc., for Gartloch Hospital (£183).—Hobart Mfg. Co.

Municipal Transport Committee. Accepted. Carbon brushes.—Morgan Crucible Co. Asbestos covered wire.—B.I.C. Gear cases (£2,512).—General Electric Co.

Oldham.—Town Council. Accepted. Strengthening and modification of "Ripplay" control system.—Metro-Vick. Wiring and switchgear for lighting and power installations for Central kitchen, Hollinwood.—S. Charlesworth & Co.

Contracts in Prospect

Aspatria (Cumberland).—Factory; Cumberland Development Council, Whitehaven.

Barrow-in-Furness.—Temporary houses, for T.C.; borough surveyor.

Billingham-on-Tees.—Church, north of Billingham Station; Rev. F. C. Tymm.

Bucks.—Additional accommodation(£32,887). Peppard Sanatorium; county architect.

Campbeltown.—Temporary houses (78); burgh surveyor, County Buildings.

Chester.—Extensions, City Grammar School, for E.C.; city engineer.

Dunfermline.—Dormitory block at Combination Home and Hospital (£4,000); County Clerk, Cupar, Fife.

Glasgow.—School, Crompton Avenue, for Corporation; city architect.

Hindley.—Central kitchen, Hindley Green, for E.C.; surveyor, Council Offices.

Horsham.—Infants' school, Victory Road (£14,559), for West Sussex E.C.; county architect, Chichester.

Inverness.—Houses (20), Kessock Road, for Corporation.—J. S. Chisholm & Co., surveyors, 11, High Street.

Leeds.—Church; W. A. Freeborn, Christ Church, Manston Gardens.

Leicester.—Buildings (£14,421), for patients and nursing staff, at the City General Hospital, North Evington; city surveyor.

Macclesfield.—Wing, Macclesfield Infirmary; H. S. Fairhurst & Son, architects, 55, Brown Street, Manchester, 2.

Manchester.—New kitchens in infants' and junior mixed departments of New Moston Municipal School, Moston Lane; G. Noel Hill, city architect, Town Hall.

Houses (88), Winchester Furness, Kirkstall, Royston and Sherbourne Roads, Davyhulme; A. Locke, Ltd., builders, 130, Lostock Road, Davyhulme.

Matlock.—Twelve houses for pensioners, Cromford bus station; surveyor, Town Hall.

Newcastle-on-Tyne.—Repairs to electric lighting installations in Council houses; city architect, 18, Cloth Market.

Newcastle (Staffs).—Maternity home, Far Croft, Chesterton (£10,000); borough surveyor.

Newton-le-Willows.—Infants' and junior schools, Crow Lane East, for Lancashire E.C.; county architect, Fishergate Hill, Preston.

Rochdale.—Community centre, Kirk Holt Estate; borough surveyor.

Processing plant and dairy; United Co-operative Dairies, Ltd., Moss Lane.

Rotherham.—Central kitchen (2,000 daily meals); borough engineer, Town Hall.

Salford.—Offices, stores and workshop; H. Davies & Sons, Ltd., engineers, Worsley Street.

Salop.—Adult college and community house; county architect, 5, Belmont, Shrewsbury.

Sheffield.—Sleeping accommodation for nursing staff at City General Hospital (£3,000); city architect.

Stafford.—Houses (12), Dale Lane, Haughton, for R.D.C.; E. M. Coombs, architect, County Buildings.

Stockton-on-Tees.—Extensions, Robson Maternity Home, for T.C. (£3,000); R. W. Bell & Co., Ltd., builders.

Tyneside.—Demobilisation centre for Ministry of Works (£400,000).

Warrington.—Extensions, Y.W.C.A. Club, Legh Street; Y.W.C.A., Great Russell Street, W.C.1.

West Riding.—Infants' school, Denison Road; Selby; county architect, County Hall, Wakefield.

West Sussex.—Junior technical school, Worthing, and school canteens, Pulborough and Camelside (£1,455); county architect.

Wigan.—Church, Beech Hill Estate; Rev. J. A. Lawton, St. Anne's Vicarage, Beech Hill, Wigan.

Worksop.—Additions, maternity wing, County General Hospital; county architect, Shire Hall, Nottingham.

BRISTOL AND EKCO

"Ship-shape and BRISTOL fashion." No wonder the city soon took to the brightness of EKCO Lamps. Dealers knew the name stood for reliability, stocked them and now consistently sell them. Posters prominently sited in Bristol and other great cities, together with consistent newspaper advertising, are creating profitable business for stockists.

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They shall not pass! . . . . . that is the motto of Denso, where damp and all types of chemical action are active.

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Terminal House, Grosvenor Gardens, LONDON, S.W.1.
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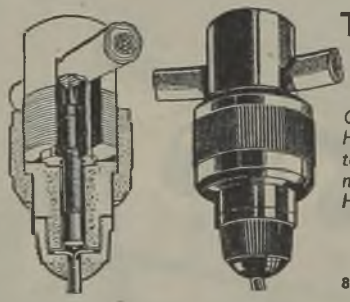

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The LAST WORD in Cable Connecting.
Attached to Live Lines WITHOUT DANGER.

Connection made in a few minutes. No damage to Cables. High rupturing capacity fuse at tapping point. No joints to be soldered. Re-fused in one minute. Made to accommodate six sizes of cable. Fitted with 5, 10 or 15 amps. H.R. Fuse. 30-amp. size also made.

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"Triumph" Fuses are in stock, for Switchboard and Busbar Mounting, in all ratings from 5 amps. 250 volts to 850 amps. 500 volts.
Prompt deliveries of all types of Distribution Boards, including H.R.C.

The only Rewirable H.O. Fuse incorporating both pressure self-aligning contacts and vented explosion chamber in base.

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INDUSTRIAL LOCAL LIGHTING UNITS
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CLASSIFIED ADVERTISEMENTS

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

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

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

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

Original testimonials should not be sent with applications for employment.

SITUATIONS VACANT

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

BOROUGH OF GRAVESEND

Appointment of Borough Electrical Engineer and Manager

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

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

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

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

Canvassing either directly or indirectly will disqualify.

H. H. BROWN,
Town Clerk.

4, Woodville Terrace,
Gravesend, Kent.
3rd August, 1944. 492

ELECTRICAL POWER ENGINEERS' ASSOCIATION

Appointment of Technical Editor and Director of Studies

THE National Executive Council invite applications for the combined appointment of Technical Editor of "THE ELECTRICAL POWER ENGINEER" and Director of Studies of the Correspondence Tuition Scheme of the Association.

Applicants should be Corporate Members of the Institution of Electrical Engineers or possess equivalent technical qualifications, should have had experience of the technical side of the Electricity Supply Industry and, in addition, experience of technical journalism. Industrial and teaching experience desirable, together with a background knowledge of trade unionism and industrial relationships.

Salary to commence £600 per annum.

The successful applicant will be required to pass a medical examination and to contribute to the Association Pension Scheme.

Forms of Application to be obtained from the —

General Secretary,
Electrical Power Engineers' Association,
102, St. George's Square,
London, S.W.1.

should be returned, endorsed "Technical Editor," not later than Friday, September 15th, 1944 539

ROYAL BURGH OF STIRLING

Appointment of Electrical Engineer and Manager

APPLICATIONS are invited from qualified electrical engineers, experienced in the management and administration of a small electricity undertaking.

Applicants must not be more than 45 years of age, unless the applicant has a transfer value under the Local Government Superannuation (Scotland) Act, 1937.

Applicants must be Corporate Members of the Institution of Electrical Engineers, with experience in all branches of the Electric Supply Industry, including the distribution of electricity, both on direct current and alternating current systems.

Conditions of Appointment may be had from the undersigned.

Applications, stating age, qualifications, training and experience, with twelve copies of not more than three recent testimonials, must be lodged with the undersigned on or before Saturday, 2nd September, 1944.

JOHN CLINK,
Town Clerk.

Stirling.
19th August, 1944. 544

LONDON COUNTY COUNCIL

APPLICATIONS are invited for the undermentioned Principalships:—

1. Hackney Technical Institute, Dalston Lane, E.8.—Day and evening technical classes, with higher national certificate courses, and a junior technical day school for boys. Present salary scale £820-£50-£960 a year basic, plus war bonus.

2. South-East London Technical Institute, Lewisham Way, S.E.4.—Day and evening technical classes for men and women, including higher national certificate courses, and junior technical day schools for boys and girls. Present salary scale £960-£50-£1,200 a year, plus war bonus.

Apply to Education Officer (T.1), County Hall, Westminster Bridge, S.E.1, for particulars and application form(s), enclosing stamped addressed foolscap envelope. Canvassing disqualifies. Last day for the receipt of applications, 30th September. 533

GREAT NORTHERN RAILWAY COMPANY (IRELAND)

APPLICATIONS are invited for the appointment of an Electrical Engineer, with practical and theoretical experience, as Assistant to the Company's Mechanical Engineer at Dundalk.

The commencing salary will be £500 per annum, and the position will be pensionable.

Applications, stating age, qualifications and full details of experience, accompanied by copies of testimonials, should be sent to the undersigned so as to be received not later than Wednesday, 30th August, 1944.

F. C. WALLACE,
Secretary.

Great Victoria Street Station,
Belfast.
12th August, 1944. 535

ASSISTANT Storekeeper (exempt or discharged), with knowledge electrical/radio equipment, required for American Company's King's Cross premises. Salary £4-£4 10s. per week according experience. Apply, giving full details age, etc., to—Box 545, c/o The Electrical Review.

ELECTRICAL Wholesalers require a Clerical Assistant, conversant with trade and materials as handled.—London Electrical Co. (Blackfriars) Ltd., Blackfriars Road, S.E.1. 24

ENSIGN Lamps Limited require Representative to take over and further develop sales connections throughout Sussex. The appointment is permanent and carries salary, commission and car expense payments. Applications in writing to—The Manager, Ensign Lamps Limited, 10, Kingston Hill, Surrey. 527

MANAGER to take complete control of electrical contracting section of large engineering business. Essentials—first-class technical qualifications, wide knowledge of installation design, estimating and general business experience (preferably in contracting field). Salary up to £1,500, according to qualifications. Good prospects. Applications held confidential. State age, education and detailed employment record.—Box 482, c/o The Electrical Review.

MOTOR Control Gear Designer, experienced in small and medium size apparatus, required in Birmingham. State age, experience and salary required. Apply—Box 6153, c/o The Electrical Review.

OVERSEAS Employment. Sudan Railways require the services of an Electrical Foreman. Candidates should have served a full apprenticeship with a reputable firm and should have had a good general experience in the maintenance of both A.C. and D.C. distribution and of motors and equipment. Diesel Power Station experience an advantage. Selected candidate will be appointed for two years on Short Term Contract. Salary £E.400-500 per annum according to age, qualifications and experience. (£E.1 = £1 0s. 6d.). There is no income tax in the Sudan. Full particulars will be supplied to candidates considered suitable for interview. Written applications (no interviews), giving the following essential details:—(1) Full name, (2) Date of birth, (3) National Service Registration number, (4) Local Office shown on address side of Registration card N.S.2, (5) Medical grade if known, (6) If discharged from the Forces, particulars of Service number, rank, unit, and reasons for discharge, (7) Industrial training and experience, (8) Name and address of present employers, (9) Details of present work, should be sent to The Secretary, Overseas Man Power Committee (Ref. 374/2), Ministry of Labour and National Service, Alexandra House, Kingsway, London, W.C.2. Applications will not be acknowledged. 538

PERSONNEL Manager. Established firm, 1,800 employees, require experienced man capable of handling engagement of labour, labour returns, deferment cases, applications for release and appeal cases, apprenticeship scheme, etc. Knowledge of the Essential Works Order, Factory Acts, working conditions and rates of wages under Engineering Federation agreements essential. Applications treated in confidence. Apply—Box 526, c/o The Electrical Review.

REQUIRED, Estimator for electrical contractors, Oxford. Must have knowledge of consultants' and Government department specifications, plans, etc., and be capable of preparing complete electrical installation schemes. State age and experience and reply to—Box 541, c/o The Electrical Review.

REQUIRED immediately for Municipal Power Station in S.W. England, the following Shift Operation Staff: Turbine Drivers, 25.87d. per hour; Assistant Turbine drivers, 24.34d. per hour; Boiler Firemen, 25.24d. per hour; Assistant Boiler Firemen, 24.01d. per hour; Ash Conveyor Attendants, 23.98d. per hour. The positions are permanent and pensionable for suitable men, and a medical examination is necessary. Previous similar experience is required in all cases. Applicants must ascertain their position regarding release from present employment. In view of the acute housing shortage in the area, successful applicants who, as a result of taking up one of these appointments, have to maintain two homes, will, during the period of hostilities, and whilst awaiting a house, be paid lodging allowances on the Ministry of Labour scale.—Box 498, c/o The Electrical Review.

SALES Representative, permanent progressive position for man with personality and good experience of electrical contracting industry, London and South. Full particulars experience, salary, etc.—Box 6131, c/o The Electrical Review.

TECHNICAL Manager required for design section of firm manufacturing F.H. and H.F. Motors, good theoretical electrical qualifications necessary and practical experience of F.H. motors very desirable, good prospects for right man. Applications in confidence. State age, education, experience and salary required.—Box 532, c/o The Electrical Review.

WORKS Manager wanted for Electrical Instrument Works, fully experienced in modern production methods and labour control. Essential work with excellent post-war prospects. Write—Box 505, c/o The Electrical Review.

APPOINTMENTS FILLED

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

SITUATIONS WANTED

A Constructional Engineer (37), with 19 years' experience with supply companies and contractors engaged on overhead and underground electrification, erection of substation equipment, cable jointing, surveying, office routine, control of labour, etc., seeks progressive position. Free now.—Box 6160, c/o The Electrical Review.

AIRCRAFT Development Engineer, highest technical and administrative qualifications, 8 years' practical and administrative experience, design, testing and installation of aircraft electrical and mechanical apparatus, desires contact substantial concern, interested progressive ideas. Write—Box 6174, c/o The Electrical Review.

EDITORIAL Dept.: Electrical Engineer, recently invalided from Services, desires settlement in permanency, S. Midlands, Central or N. London. House journal and/or articles for technical press, advertising. Age 40, over 20 years' experience of wide variety of electrical works. Trained supply co. and manufacturer. £500-£600 per annum.—Box 6150, c/o The Electrical Review.

ELECTRIC Lamps, associated products and components. Production specialist with wide experience seeks post in executive capacity.—Box 6152, c/o The Electrical Review.

ELECTRICAL Engineer (A.M.I.E.E.), 18 years' managerial experience, seeks responsible post on Technical Sales Staff in Manchester district. Would consider representation on agency basis. Replies treated confidentially.—Box 6132, c/o The Electrical Review.

ELECTRICAL Engineer, age 52, seeks supervising position or charge of factory plant, long experience with D.C. and A.C. layouts for power and lighting, highest testimonials.—Box 6161, c/o The Electrical Review.

ELECTRICAL Engineer, M.I.E.E. (exempt), transmission, distribution, L.T.—132 kV, construction, administration, executive and consulting experience, requires position offering post-war prospects. Available month's notice.—Box 6130, c/o The Electrical Review.

ELECTRICAL Engineer (31), industrial power installations and maintenance O.H. lines and substation erection (ten years), area management for rural undertaking (five years), executive position in Ministry (three years), desires appointment to permanent progressive position.—Box 6151, c/o The Electrical Review.

ENGINEER, age 39, general distribution experience, knowledge of generation, specialised experience of measurements, testing and protected gear, A.M.I.E.E., seeks change.—Box 6127, c/o The Electrical Review.

F.H.P. Motor and Ancillary Equipment Specialist (40), 21 years' comprehensive experience, energetic and enthusiastic, desires responsible managerial post, either sales or works.—Box 6108, c/o The Electrical Review.

LONDON B.Sc., age 37, seeks a managerial position, experienced generation and distribution, industrial research, mass production of radio components and general management.—Box 6149, c/o The Electrical Review.

LONDON Electrical and Mechanical Engineer desires change to country or provincial town, 25 years' practical experience, used to controlling labour, good organizer, married, 44 years of age, good accommodation required.—Box 6159, c/o The Electrical Review.

YOUNG Engineer, 27, exempt military service, requires responsible position with London firm. Technical qualifications including Higher National Certificate and 8 years' experience.—Box 6162, c/o The Electrical Review.

FOR SALE

Traders buying and selling hereunder must observe the Restriction of Resale Order, S. R. & O. 1942 *No.* 958.

GEORGE COHEN, SONS & CO. LTD.

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GUARANTEED ELECTRICAL

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Telephone: Shepherds Bush 2070
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Established 1834.

27

REBUILT MOTORS AND GENERATORS

LONG deliveries can often be avoided by purchasing rebuilt secondhand plant. We can redesign or replace surplus plant of any size.

SEND US YOUR ENQUIRIES.

OVER 1,000 RATINGS ACTUALLY IN STOCK HERE.

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WATER TUBE BOILERS IN STOCK

Two 12,000 lbs. evaporation, 200 lbs. W.P.
One 12,000 ,, ,, 160 ,, ,,

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Telephone, Middlesbrough 2622.

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BURDETTE & CO. LTD.

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Reconditioned A.C. and D.C. Motors and Starters Equal to New.

STONHOUSE STREET, CLAPHAM, S.W.4.

Day and night service. MACaulay 4555.

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ECONOMISERS IN STOCK

TWO Green's Economisers, 208 tubes, 250 lbs. W.P.
ONE Green's Economiser, 128 tubes, 185 lbs. W.P.
All guaranteed re-insurable and first-class condition only, low prices. Quotations per return. Installations delivered and erected complete.

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7, Commercial Street, Middlesbrough. Telephone 2622.

65

LICENCES IN PRACTICE

(No. 1) Order, 1943, Ministry of Supply
Control of Industrial Elec. Equipm.

Our daily experience when selling

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TRANSFORMERS * GENERAT.-SETS
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Grams, Powaguide (Phone), London.

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73, CHANCERY LANE, LONDON, W.C.2.
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ELECTRIC MOTORS AND DYNAMOS

WE hold one of the largest stocks of New and Second-hand Motors. Secondhand machines are thoroughly overhauled. Inspection and tests can be made at our Works.

For Sale or Hire. Send your enquiries to:—

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Printed in Great Britain at THE CHAPEL RIVER PRESS, Andover, Hants, and published by ELECTRICAL REVIEW, LIMITED, at Dorset House, Stamford Street, London, S.E.1.