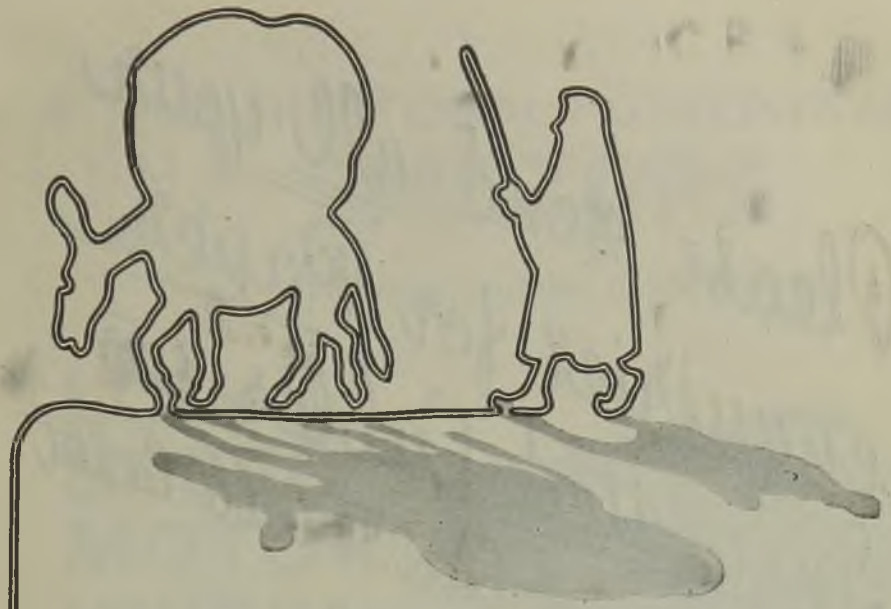
ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXIV. No. 3474 JUNE 23, 1944 9d. WEEKLY



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and Osram Infra-Red Industrial Lamps

G.E.C. Infra-Red Lamp Heating may be employed for paint drying, coil drying, foundry mould drying, setting synthetic glues and softening plastics, etc. Operating times are drastically reduced and close control is obtained over quality. By incorporating the plant in the production line much handling is avoided, or it may be used in small units adjacent to individual machines.

G.E.C. Infra-Red Lamp Heating specialists are available for giving advice, and preparing schemes, for special requirements.

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Infra-Red Lamp Heating Plant is compact and occupies little floor space.

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Consistent results obtained with unskilled labour.

SAVES HANDLING

G.E.C. Infra-Red Lamp Heating Plant may be inserted in the production line in large or small units.

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Of special robust construction.

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The day will dawn when the distant hum of engines will no longer bring thoughts of Death and Destruction ; when the pilot and his crew can fly the skies untroubled by the anxieties of enemy approach.

Yet the attack will continue.

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There is no known method of entirely eliminating this ruthless enemy.

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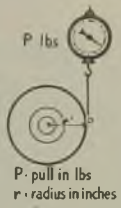
Motor Maintenance Points & Problems

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

MINIMUM TORQUE REQUIRED

to start any machine can be obtained by tying a cord, as shown, round the pulley on the driving shaft and measuring the pull required to turn it.

$$\text{Minimum Torque (Tm)} = \frac{P \times r}{12} \text{ lb.-ft.}$$



If horse-power and speed of usual motor size is known.

$$\text{Full Load Motor Torque (Tf)} = \frac{hp \times 5250 \text{ lb.-ft.}}{\text{Speed}}$$

Now if

Tm = Tf Direct Starting or Slip Ring motor must be used

Tm = Tf/2 Use High Torque "Star-Delta" starting.

Tm = Tf/3 "Star-Delta" starting will be satisfactory.

SPEED OF AN A.C. MOTOR

The synchronous or no load speed of an alternating current motor of any type in

$$\text{r.p.m.} = \frac{\text{Frequency} \times 60 \times 2}{\text{Number of Poles}}$$

Frequency is now standardised at 50 cycles per second.

SLIP OF INDUCTION MOTORS

The slip, and hence the full load speed of any induction motor, can be obtained without any counting mechanism.

A voltage is induced in the shaft itself and, if the instrument leads of a millivoltmeter are connected to metal spears and the two ends touch the shaft, the "beat" or slip frequency can easily be counted over one minute.

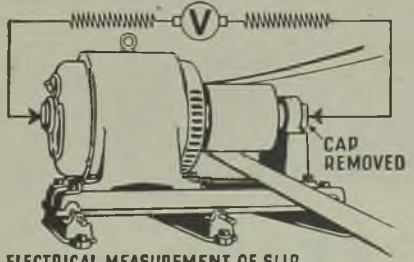
$$\text{Slip per cent.} = \frac{\text{Beats per minute}}{60 \times 50} \times 100$$

Thus, on a 1500 r.p.m. synchronous motor, a reading of 120 "beats" in a minute means a slip of 4 per cent.

This means that the slip is $1500 \times 4 = 60$ r.p.m.

LOAD SPEED 1440 r.p.m.

The spear connections should be made with one spear on each shaft centre. This method can be used for cage motors. On slip ring rotors, connect between two slip rings, but only when starter is in full-on position.



ELECTRICAL MEASUREMENT OF SLIP

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What a fitting comparison with BIRCH RESISTANCES, *Arms of the Ohm's Law.*

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GOOD VOLTAGE BALANCE *with load variations from zero to full load.*

SIMPLE TO OPERATE — *no complicated control gear.*

EASILY ADDED TO *as the plant extends*

MOST ECONOMICAL *and cheap to install.*

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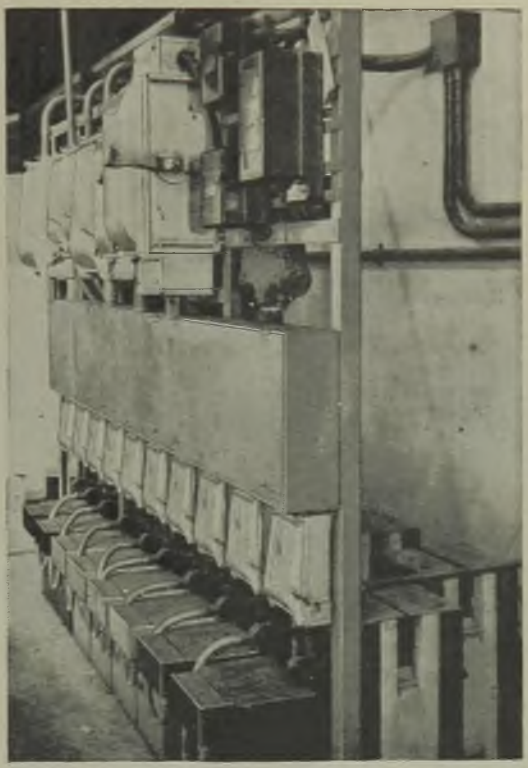

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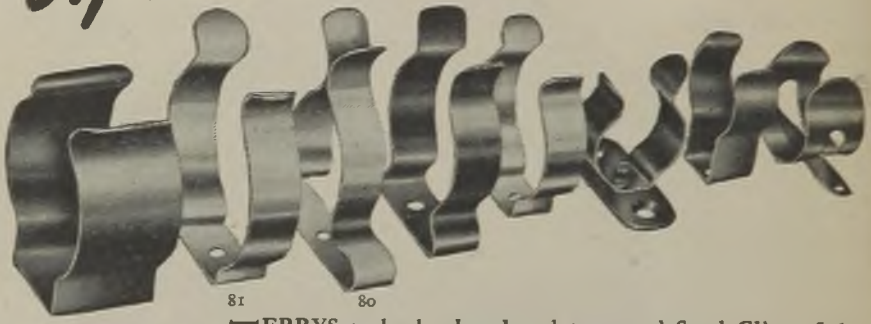

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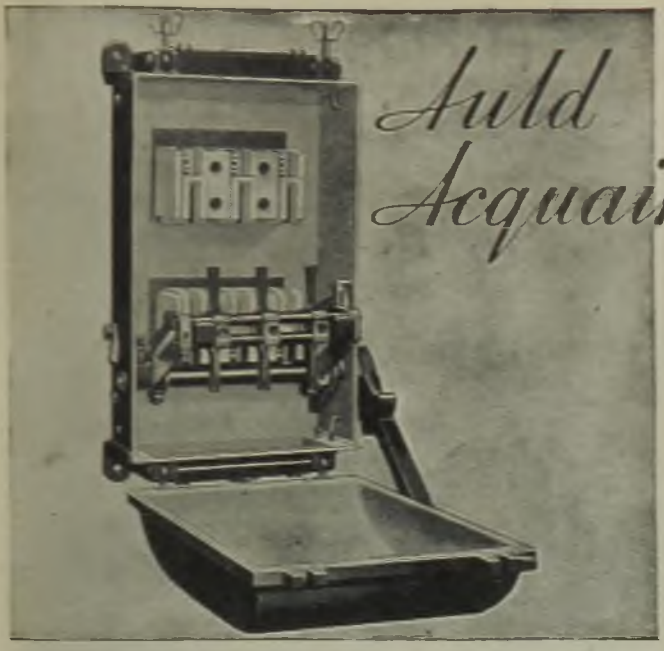

Auld Acquaintance

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M·E·M

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AND LOCALISED LIGHTING EQUIPMENT

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ENFIELD AND THE SPIRIT OF THE MOMENT . . .

Should a Company provide leisure and recreational facilities for its employees? There are many views, for and against. At Enfield we provide certain facilities but we do not subsidise their use nor does the Company take a hand in social club organization. The club members, therefore, are encouraged to show their mettle and to run their own show. We believe that relationships between employer and employee, no less than those between manufacturer and consumer, must be based on mutual confidence.

THE ENFIELD CABLE WORKS LTD.

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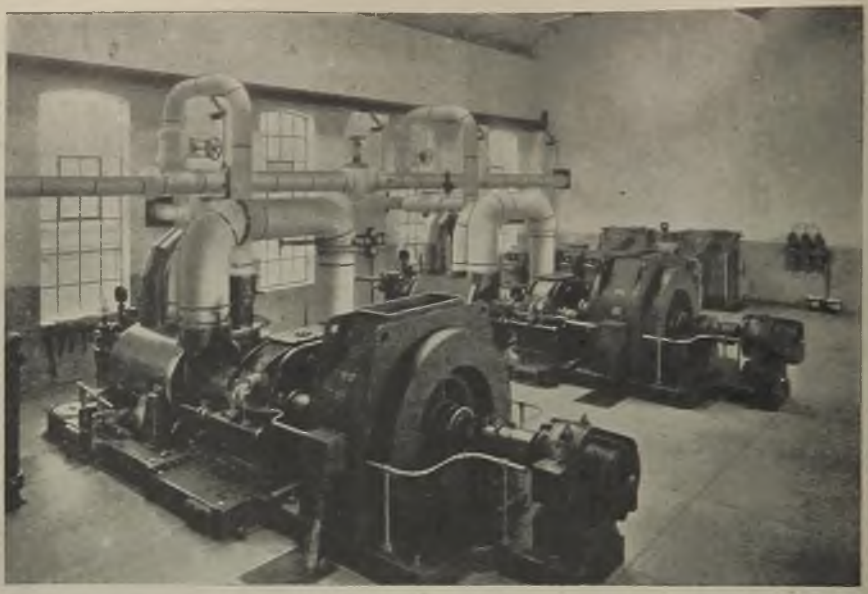

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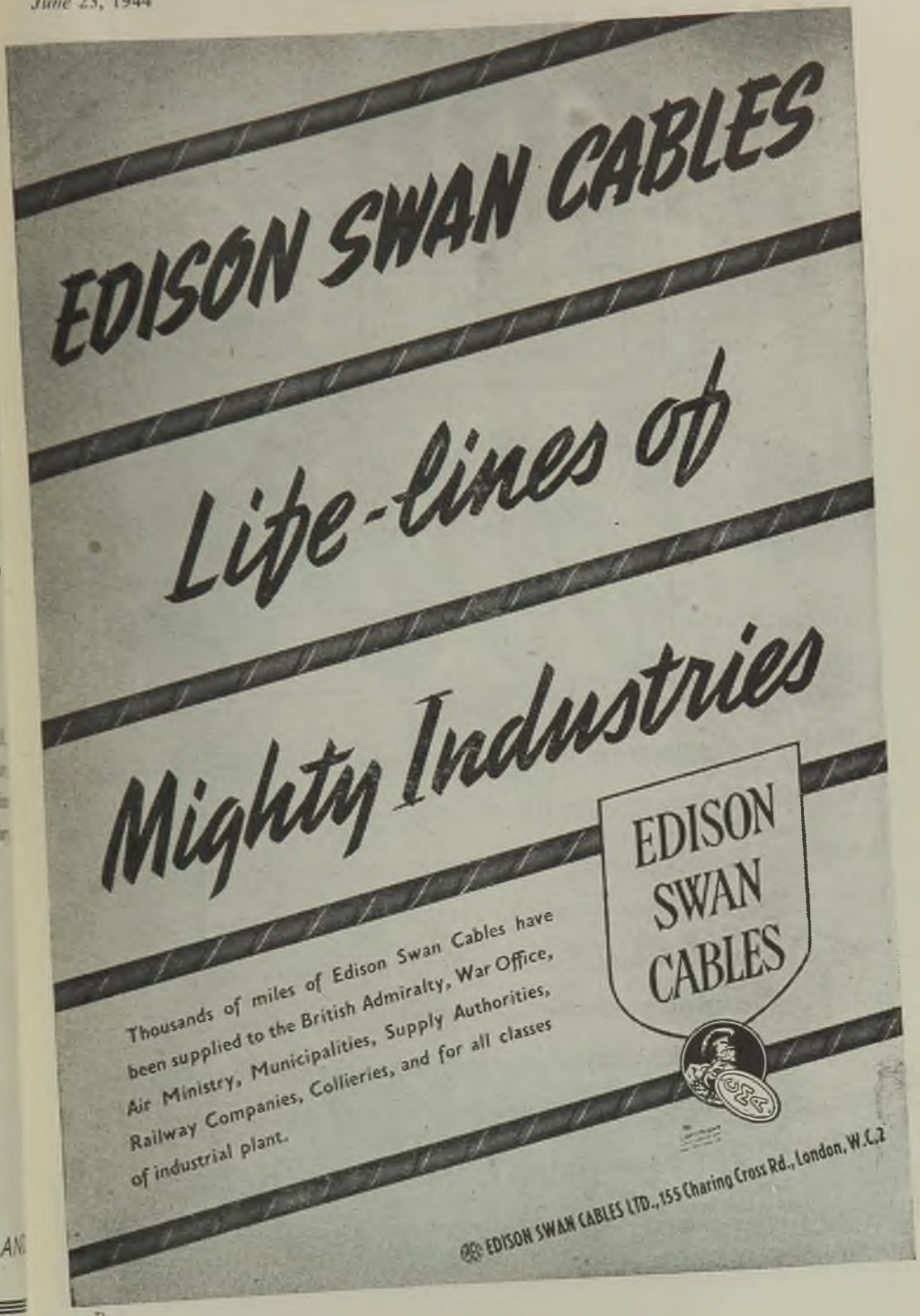
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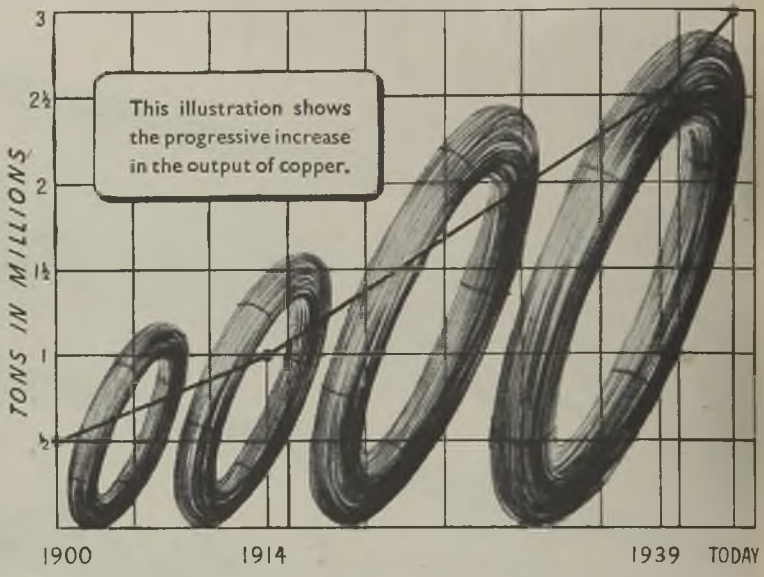

Post-war development of electrical services of every description will doubtless call for a greater use of copper than ever before. Although it may take a little time after the war to re-stock the world with all the many types of copper products required, the supply of copper will certainly be adequate, and electrical engineers may safely plan to make use of it to the fullest extent.

If technical advice or assistance is required the services of the Copper Development Association are available, free of charge.

ELECTRICAL REVIEW

June 23, 1944

Managing Editor : Hugh S. Pocock, M.I.E.E.

Technical Editor : C. O. Brettelle, M.I.E.E.

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXIV. No. 3474. JUNE 23, 1944 9d. WEEKLY

The Gas Turbine

Application to Electricity Generation

As a result of the putting into commercial service of a number of gas turbines during recent years hopes have not unnaturally been aroused that prime movers of this type may figure prominently in plans for generating electricity after the war. The gas cycle is inherently capable of giving higher thermodynamic efficiencies than the steam cycle and affords the further advantages of eliminating boilers and condensing plant. Prospects of exploiting these advantages are, however, subject to definite limitations. The lapse of about 150 years since Barber, in England, took out the first patent for a gas-operated turbine is significant in its indication that effective developments in one branch of science very often depend upon concurrent progress in other branches.

High-Temperature Alloys

In earlier experimental machines the net power made available was apt to be somewhere near zero, since the gross output was absorbed in compressing the gas. Since then the metallurgist has come to the rescue by producing alloys that could stand up to the high temperatures requisite to secure reasonably good turbine performance. At the same time, largely due to aerodynamic research, advances in compression technique have enabled rotary compressors to cope efficiently with large volumes of gas. As a consequence nearly one-fifth of the gross turbine output has been made available at the alternator terminals of the only unit so far constructed for public electricity supply. This set, of 4,150 kW, which (like all gas turbines in successful commercial use) is of the open-cycle combustion type with axial-flow compressor, was installed in Switzerland for emergency service shortly before the war. No doubt units having appreciably higher efficiencies could be built now as a result of later metallurgical developments and of technical improvements analogous to those of steam practice.

Size of Generating Units

Such improvements would do little towards removing a second obstacle to the wider use of gas turbines. On account of the physical size of the plant necessary to deal with the gas-air mixture circulated at low pressure, the output of individual generating units would be too small for modern needs. Investigations are being made, on lines indicated elsewhere in this issue, into the possibilities of approaching steam-turbine capacities by means of closed-cycle systems, which may also enable coal or furnace oil to be employed instead of the high-grade oil requisite for the open cycle.

The foregoing commentary relates to the production of electricity in the near future. Satisfactory results have apparently been achieved with open-cycle gas turbines for other applications in which the power required falls within a definite range and in which the requirements of low weight and small dimensions and non-dependence on water are paramount. Locomotive and ship propulsion, in which reversible motion can be obtained through an electric drive and aeroplanes (*e.g.*, jet

propulsion) provide examples. Nevertheless, the position is likely to be very different when an economic life of many years for heavy continuous duties is in question. Expectations based upon the ability of some alloys to withstand short war-emergency periods may therefore be disappointed. Present indications are that much patient development work will be necessary before the manufacture of gas turbines comparable with steam turbines in efficiency and output will become practicable.

Electrical Organisations

JUST before the war we published a series of articles giving brief histories and surveys of the activities of organisations of the electrical industry by the principal officers of these bodies. At the time these were so well received that the issues in which they appeared were quickly sold out. Since then, and particularly recently, we have had many inquiries for copies and we therefore think that the re-publication of the articles in a revised form will be opportune. As before, we begin the series with the Electrical Development Association. In this instance the article is a completely new one, by Mr. V. W. Dale, and in some other cases the matter has also been entirely rewritten. For the rest only revisions necessitated by the march of time have been made.

Central Board Appointments

GENERAL regret will be felt in the electricity supply industry at the approaching departure of Sir Archibald Page from the Central Electricity Board which he has served and controlled with distinction since its establishment. It is to be hoped that relief from his great responsibilities will restore him to health and enable him to enjoy many years of happy retirement. Sir Archibald's successor as chairman, Mr. Harold Hobson, is well equipped for his new position having been in charge of the business side of the grid for sixteen years. He is an outstanding example of that combination of engineering and commercial ability which we said a week or two ago was the ideal for the management of an electricity supply undertaking. Sir Johnstone Wright's transfer from the engineering to the managerial side will prove that he is also of this school. Mr. J. Hacking, deputy chief engineer to the Board since 1934 is Sir Johnstone's natural successor; his grid experience dates back before the time of his joining the Board.

Flat Rate

REPORTS from local committeesof the Farmers' Union continue to testify to the keen interest taken in electrification. An opinion that finds expression from time to time is that there should be one "flat rate" for farms throughout the country. The term seems not to have the restricted meaning attached to it by electrical engineers, but rather to refer to a wish for an easily understandable and generally applicable uniform charge. Although inevitable variations in local conditions may make this economically impracticable and the inclusion of the two-part principle is essential to development, a reasonably near approach to satisfying such a wish could be obtained by way of a two-rate variable-block tariff, adjusted to suit the circumstances.

Service Entries

As post-war housing is now under discussion, attention may be drawn to a suggestion made by Mr. A. S. Hiscock, chairman of the I.E.E. Hampshire Sub-Centre, with a view to saving labour in running in services. His idea is that the builder should lay a three-way conduit from the public thoroughfare to a point inside each house, one branch being allocated to each of the electric, gas and water services. Even if one of the conduits remained unused (as would no doubt be the case more and more frequently as time went on) the cost of the superfluous way would not be so heavy as that of three separate excavations and reinstatements of the ground.

Development Plans

IN response to an inquiry by the Electricity Commissioners authorised undertakings throughout the country are preparing estimates of their proposed expenditure in the five years following the end of the war. Details so far published show that supply authorities are preparing to embark upon extensive development schemes and to meet the inevitable big demand for consumers' apparatus. Thus at Southend, where the programme envisages an expenditure of £437,000, no less than £250,000 of this is estimated to be required for apparatus and wiring. Grimsby is planning to extend its

electricity services wherever economically possible. Bradford has a programme calling for an expenditure of a million pounds. Other projects which have been announced include Colchester (£600,000); Hove (£247,825); Maidstone (£245,000); Lichfield (£134,417); Stockton (£100,000); Whitehaven (£59,900); and Tonbridge (£58,800).

Electrical Economy

A SENSE of proportion is necessary in considering ways of saving electricity, as Mr. Verdon O. Cutts pointed out in his lecture last week, which is reported on a later page. Economy should be regarded from the angle of more efficient use rather than of mere restriction of consumption. This attitude is not only of immediate importance in view of the coal situation. As a permanent factor in load development, encouragement of greater efficiency in the use of electricity is the surest means of securing an ultimate growth of consumption that is essentially useful.

Rates

WHILE they welcome the benefits of hydro-electric development local authorities in the Highlands are loath to sacrifice any rates for this purpose. The Committee which has been inquiring into the matter, after attempting to visualise the alternatives from the point of view of these authorities, is, however, satisfied that their interest lies in making some concession. It points out that on the one hand there is the attractive possibility of a large increase in rate income, accompanied by the dangers of imperfect development—none at all in difficult areas—failure to attract industries and a restricted and expensive domestic supply. On the other lies the opportunity of gaining many advantages at the cost of a reduced return from the potential rateable values of hydro-electric schemes. The choice should be obvious.

Grampian Qualification

CONCEDING the principle that concessions are desirable and that, in equity, the same relief should be granted to existing concerns, the Committee nevertheless seeks to make a condition in the case of the Grampian Company. An assurance was given by the company's representative during the deliberations that any relief from rates "would unquestionably be utilised for the benefit of the consumers in one way or another." The Committee, however, wishes to go further than this and make the relief conditional upon the extension of the company's distribution system "to the maximum economic limits, so that current is carried into 'fringe' areas and provided to householders and others who are at present without a supply." When this has been fulfilled it is suggested that there should be a condition that the produce of the concession should be applied to the reduction of tariffs. The use of the rating and valuation system as a "big stick" in this way is surely unprecedented.

South Africa's Achievement

THE dependence of modern industrial production upon electric power is illustrated most emphatically in a brochure showing how South Africa, starting almost with a blank canvas, has built up wartime industries capable of providing for all the needs of her armed forces. The Union luckily already had her "Iscor" undertaking for producing iron and steel, a good example of electrical operation, and the capacity of the works has been practically doubled during the war. With this important exception, the Union was not equipped for large-scale war production but rapidly she erected works after works until she achieved independence of the imports upon which she relied before the fall of France. In all this electric power has been an indispensable adjunct and it is appropriate that the man most responsible for what has been accomplished, the Director-General of Supplies, Dr. H. J. van der Bijl, is also head of the South African Electricity Supply Commission.

Contractors as Retailers

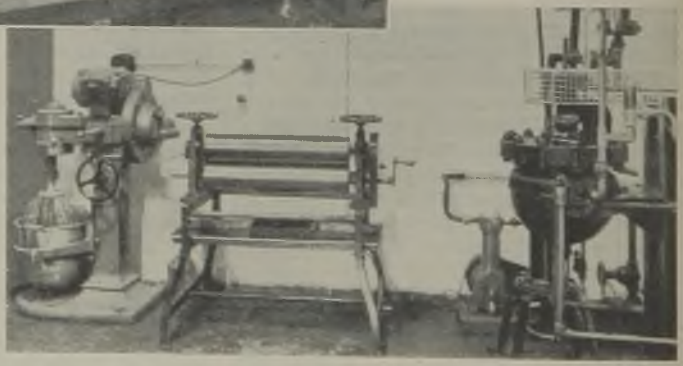
ALL electrical contractors are not retailers in the generally-accepted sense. Yet under the Location of Retail Businesses Order, 1942, they may be considered to be carrying on a retail business. The Director of the Electrical Contractors' Association (Mr. L. C. Penwill) has informed one of the branches of the Association that the Board of Trade had ruled that electrical installation work came within the scope of the Order. The reason given was that the electrical contractor was, in fact, selling the articles which composed an electrical installation. If, however, a contractor did no more than maintain existing installations he would be acting within the General Licence given in respect of service.

Testing Plastics

Electrical, Physical and Chemical Laboratories

IN the *Electrical Review* of November 26th, 1943, we gave a detailed account of the processes in the works of Birkbys, Ltd., and in the following pages the important work that goes on in the company's testing laboratories is described as a logical continuation of our earlier article.

During the production of the moulding, powder samples are brought into the laboratories from time to time to keep a check on the flow characteristics of the powder in production. This is to ensure that in the final blending of the material there is a greater degree of uniformity, thus eliminating the risk of blending moulding powders of widely differing flows. The term "flow" indicates the degree of plasticity of the moulding material under moulding conditions, *i.e.*, while it is in the press.



Above: One production unit comprises two 5-in. and one 3-in. simple presses and one 3-in. semi-automatic press

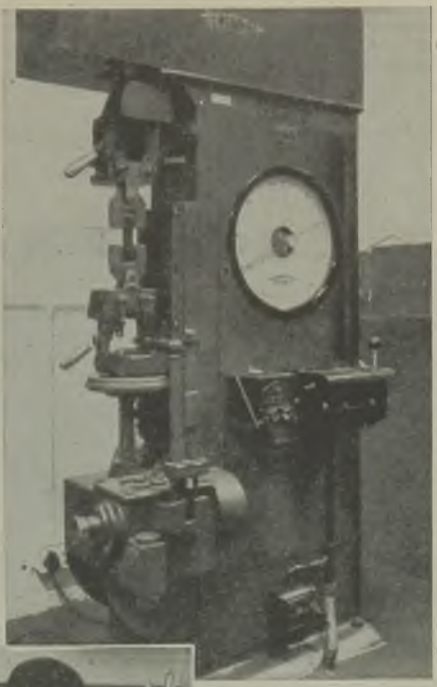
Right: For development and research work the laboratories are equipped with an experimental still (right); note also vacuum pump, coating rolls and mixing machine

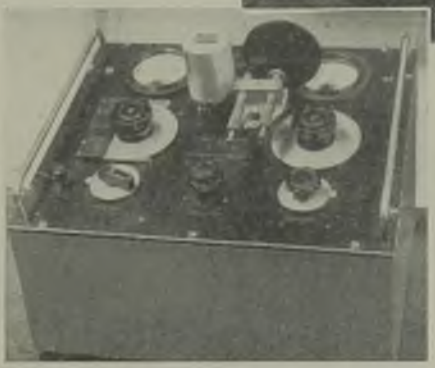
Materials are required in varying degrees of plasticity, depending on the nature of the mould in which the moulding operation is performed. For example, where considerable flow is required, or where the mould contains delicate pins, it is necessary for the moulding material to have freely flowing characteristics, so that, in the first case, all parts of the mould become filled in the pressing operation, and in the second case, so as to avoid shearing of the pins during mould closure. A typical example of this is the radio switch frame, in that it contains numerous pins and is also intricate in construction. On the other hand, in the production of a moulding like the G.P.O. telephone bell case which contains no delicate pins and is not intricate in construction, a moulding powder of less plasticity is more advantageously employed.

A sample of each blend of moulding powder, representing as a rule 800 to 1,000 lb. of material in the production shop, is brought to the laboratories for final testing for flow, tensile strength, impact strength, power factor, surface and volume resistivity and electrical breakdown. Specimen mouldings on which all these laboratory tests are carried out are actually produced in the laboratories by means of a special production installation which is completely independent of the factory moulding shops. The results obtained have to conform either with B.S.S. 771 or, in certain cases, with special specifications. On receipt of approval of the blendings from the laboratories the blendings are discharged into drums which are labelled to certify that the materials are approved for use. The laboratory production installation consists of six

hydraulic moulding presses arranged as two units. One unit comprises two 5-in. simple presses, one 3-in. simple press and one 3-in. semi-automatic press, while the other unit has a 5-in. semi-automatic press and a 3-in. semi-automatic press. These presses are all equipped with steam-heated platens and the hydraulic pressure is provided by means of two electrically driven Fraser mono-radial hydraulic pumps. These pumps have an advantage over the works constant-pressure accumulator system in that the line pressure may be varied between 400 and 4,000 lb. per sq. in. The variations are afforded by means of pressure relief valves on the pumps.

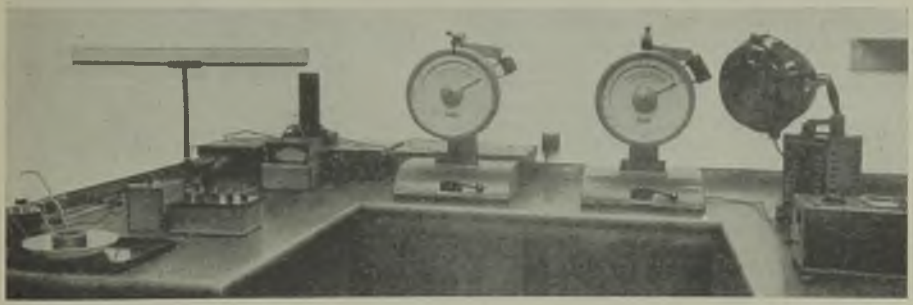
Production of the specimen mouldings in the laboratories results in the greater supervision of production and precise control of pressure and temperature which are necessary to ensure perfect specimens. The tensile test is carried out on a waisted specimen (rather like a dumb-bell in longitudinal section with a cross-sectional area at the centre of about $\frac{1}{4}$ sq. in.), using a 5,000-lb. Denison self-indicating testing machine. The load is mechanically applied at four different speeds by the use of an incorporated two-speed motor and a two-speed gear box. The machine is scaled with four different ranges, namely, up to 500 lb. with each division representing 1 lb.; up to 1,000 lb., with each division representing 2 lb.; up to 2,500 lb., with each division representing 5 lb.; and up to 5,000 lb., with each division representing 10 lb. The scale ranges are changed by the alteration of the gearing. The specimen is placed in suitable grips on the machine into which the broad ends of the specimen fit, and the specimen is pulled to breaking point.





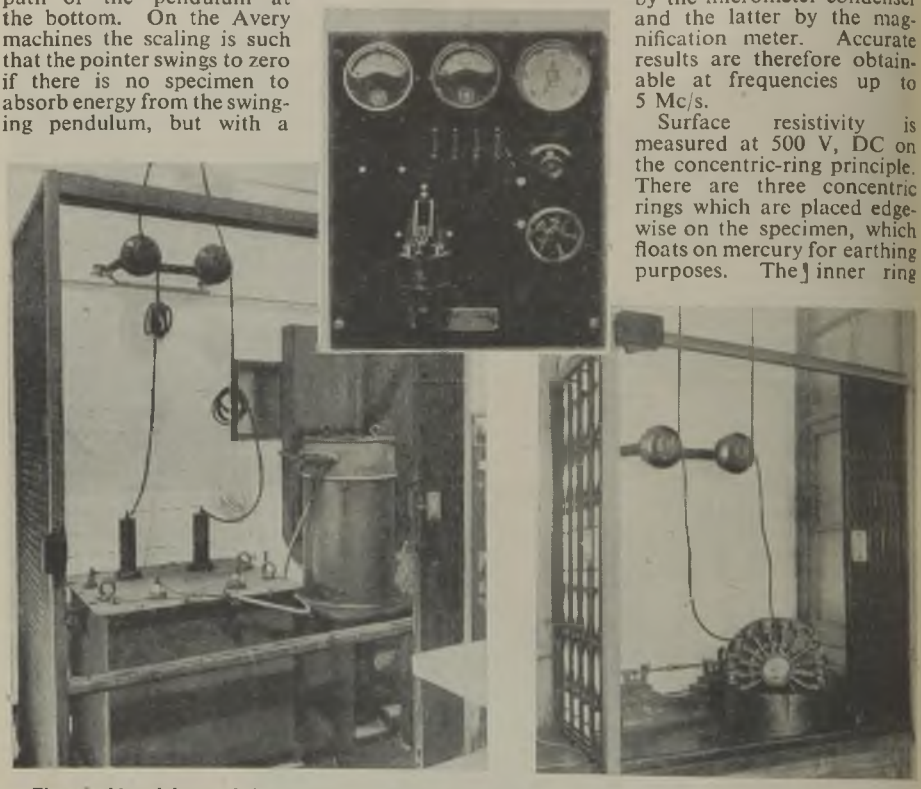
Right: Tensile tests are carried out on a 5,000-lb. self-indicating machine Below: P.f. tests are made on a circuit magnification meter in conjunction with a dielectric loss test jig

Routine impact strength tests are carried out on two



Resistivity tests are carried out on the concentric-ring and mirror-galvanometer principle (left); impact strength machines and fluorescent analytical lamp are also shown

Avery impact machines, one of which has an impact capacity of one ft.-lb. and the other of three ft.-lb. For experimental work, however, an E.R.A. impact machine is employed. The impact test specimen is a ½-in. sq. piece about 2 in. long with a notch at the centre on one side. On each machine a pendulum is released to swing "through" the specimen, which is suitably clamped in the path of the pendulum at the bottom. On the Avery machines the scaling is such that the pointer swings to zero if there is no specimen to absorb energy from the swinging pendulum, but with a



Electrical breakdown of the specimen in the specified time results in the rejection of the batch of general purpose material; left, isolated high-voltage transformers; centre, control board; right, moulding and electrodes in breakdown chamber

specimen aboard the swing is to a point short of zero by the amount of energy absorbed.

The load on the E.R.A. machine pendulum can be varied from ¼ ft.-lb. up to 13 ft.-lb., and the speed of the swing can also be varied. The scale is marked in degrees which can be interpreted into ft.-lb. values from the load, weight and speed values.

Power-factor testing is effected on a Marconi-Ekco circuit magnification meter in conjunction with a dielectric loss test jig. The jig comprises a holder with accurately ground plates for the test specimen and an incremental condenser. Both components are controlled by micrometer heads and are mounted on a low-loss ceramic base. The method of measurement is an elaboration of the means of measuring the magnification of a circuit in terms of the fractional mis-tuning required to produce a definite fractional change in the voltage developed. An important advantage of the method is that the result depends only on an incremental capacitance measurement and the voltage ratio. The former is provided with high accuracy by the micrometer condenser and the latter by the magnification meter. Accurate results are therefore obtainable at frequencies up to 5 Mc/s.

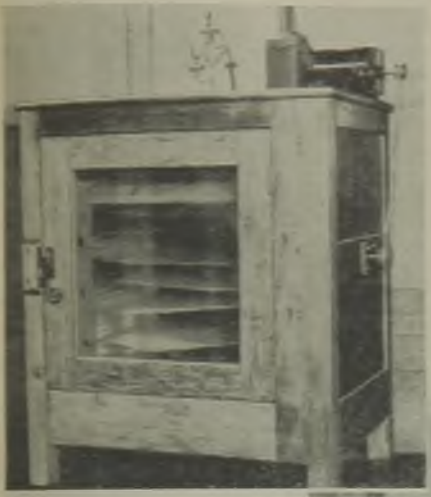
Surface resistivity is measured at 500 V, DC on the concentric-ring principle. There are three concentric rings which are placed edgewise on the specimen, which floats on mercury for earthing purposes. The inner ring contains mercury and there is also mercury between the outer and middle rings, thus leaving the surface of the specimen between the inner and middle rings uncovered. Electrical connections are made with the mercury in the centre ring and that between the outer and middle rings, so that by means of a sensitive mirror galvanometer the resistance of the surface in the annular space between the inner and middle rings is measured. A DC supply for this test is afforded by a nickel-iron battery.

Volume resistivity is measured with the same apparatus by taking the resistance through the specimen from the mercury under the specimen to the mercury over the speci-

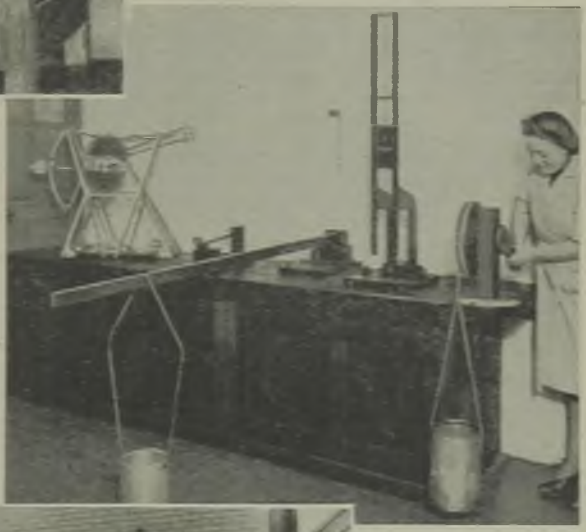
men within the inner ring. The specimens for the power-factor and resistivity tests are 4-in. diameter discs.

Regarding electrical breakdown testing, the standard specification calls for the application for one minute of 200 V per mil thickness of the material, and breakdown of the specimen under this time results in the rejection of the batch of general-purpose material. The specimen is generally placed between suitable semi-spherical electrodes in air for routine work, but for tests at high temperature flat electrodes are employed in oil. The supply for the breakdown tests is obtained from two transformers in permanent cascade connection. The first transformer has three tapped ranges of up to 800, 1,600 and 3,200 V, and the second fixed ratio (16 to 1) transformer therefore renders available maximum voltages of 12,800, 25,600 and 51,200, according to the selected ranges on the first transformer. On either range the voltage is applied gradually by means of a quadrant stud regulator on the control board in the actual electrical laboratory. This regulator operates on low voltage and actuates contactors in the transformer chamber by which the transformer tappings are operated. The readings on the control board voltmeter, however, indicate the total voltage on the fixed-ratio transformer. Operation of the range selector switch automatically alters the scale of the voltmeter. The electrode equipment is screened by a sliding gate which is interlocked so that the apparatus cannot be alive if the gate is open.

Where the specification calls for the con-



Impregnated paper for testing the electrical breakdown properties of thermo-setting resins is dried in an electrically heated thermostatically controlled oven



Above: The load on the E.R.A. impact machine (left-hand of picture) can be varied from ½ ft.-lb. up to 13 ft.-lb.; mechanical testing includes torque tests (right-hand) and blow and transverse testing for telephone cradles and handles

Left: A feature of the chemical laboratory is the absence of bench sinks, water being available at any point, and waste removed by continuous water channels

ditioning of samples at fixed humidities, the specimens are treated in an electrically heated cabinet which is both humidistatically and thermostatically controlled. Moulded products are also subjected to tests according to customers' requirements. The electrical tests include one for breakdown, such as that on transformer tapping-switch plates, in which the breakdown value is determined between adjacent terminals in hot oil. Resistivity tests may be carried out on samples as received or after immersion in water. For the latter tests on such products as condenser terminals and junction boxes, either the "Megger" or the mirror galvanometer is used. Mechanical testing on mouldings includes torque tests which are applied to the release knobs for oxygen control apparatus, and impact tests which are applied to telephone cradles to ensure non-breakage except in cases of extreme mis-use. The oxygen control release knob has a central metal insert with a square hole which fits on to the spindle of a wheel from the periphery of which hangs a weight which is lifted by turning the specimen ; 180 in.-lb. is the test aim.

In the case of the telephone cradle a blow of 2½ ft.-lb. is applied at a point 9 mm. from the base of the horn. An example of transverse testing is that carried out on the telephone handle by the application of a load of 1,000 lb. to the middle of the handle by means of a weighted lever when the ends of the handle are supported. A typical example of the tensile tests which are applied to moulded products is that relating to link aerial terminals, the test being conducted on the Denison machine. It is, of course, impossible to submit all mouldings to the physical test, so representative samples are taken from the production shops four times a day and passed through the inspection department.

Resinous Products

Other activities of the laboratories include the testing of materials for resinous products, which may consist of solid resins for use in moulding powders, resins for varnishes for the production of laminated sheet, impregnated paper and armature impregnation, and the testing of solid and liquid resins for the production of grinding wheels, brake linings and cements. These tests involve the observation of hardening characteristics at various temperatures, and the control of the viscosity of solid and liquid resins at high and low temperatures. For the production of grinding wheels the degree of fineness of the ground resin is carefully controlled by screening the material through sieves of 200 mesh to ensure that no coarse particles are present which might assist in the production of a flaw in the resulting grinding wheel.

For development and research work the laboratories are equipped with an experimental still for the production of small batches of resin and varnish, a small set of experimental rolls for the production of moulding powders, and various mixing machinery for varnishes, cements and the like. The development of new products and of new uses for existing products in industry always has a prominent place in the laboratories' activities, and the staff are always ready to co-operate with customers and prospective customers in finding possible uses of phenol formaldehyde products in their own production.

Much attention is being given at present to the possible improvement in the electrical breakdown properties of thermo-setting resins for use in the manufacture of laminated sheet. The aim in this connection is to produce a resin which, when formed into laminated sheet on a paper base $\frac{1}{16}$ in. thick, will be capable of withstanding a voltage of 50,000 AC at 90 deg. C. This work is still in the experimental stage, but the advance already made may be indicated by the fact that during our recent visit we saw a specimen of the material under test which broke down at 50,000 V after a few seconds, the voltage having been gradually applied from zero. The paper sheet is first impregnated on coating rolls and the impregnated paper is then dried in an electrically heated thermostatically controlled oven and then pressed hydraulically. The laminated material so produced is tested for electrical breakdown in the same way as in the tests on mouldings and specimens, between flat electrodes under oil.

As an aid in the identification and testing of various raw materials a fluorescent analytical lamp is employed, and the usefulness of this lies in the fact that certain materials are shown up by peculiar colourings.

We are grateful to Mr. A. T. Birkby and Mr. F. E. Birkby for permission to visit the laboratories and publish this description, and to Mr. A. J. Buck, A.R.C.S., chief chemist and research manager, for his help in collecting the information.

The Scope of Prefabrication

ESSENTIAL conditions for the development of prefabrication are laid down in the first progress report of the Standards Committee set up by the Ministry of Works ("The Use of Standards in Buildings," Stationery Office, 6d.).

There would be no justification, the report states, for any new substitutes or alternative method or material unless they reduce cost, reduce time, draw on additional labour and material resources to supplement the normal, or improve standards without adding to the cost. There must be an acceptance of the principle of maximum standardisation of components, dimensions and methods of assembly, and it would be necessary to obtain an assurance that prefabricated structural units complying with standard requirements would be accepted throughout the country and not be dependent on interpretations of building regulations.

Associations of the Industry—I

British Electrical Development Association

Twenty-five Years' Progress

By Victor W. Dale,
Asst. Director and Secretary

THE leaves of a drastically abridged history of E.D.A. are picked up almost indiscriminately in a necessarily hurried return to *Memory Lane*—familiar scenes in a fairly eventful past, a halt at a somewhat perplexing present, and an attempt to get a glimpse of a future in which, I am quite confident, developments in every branch of electrical utilisation will transcend the industry's earlier achievements.

I must avoid personalities as far as possible: an inevitable exception must be my old chief—J. W. Beauchamp: twenty-five years ago he laid the foundations of a great deal of the E.D.A. we know to-day—and how well and truly he laid them! E.D.A. 1944 has much in common with E.D.A. 1919 and certainly the pattern and structure of the post-war edifice which many of us begin to visualise finds its source and continuous inspiration in the examples seen and the precepts learned day in and day out during those happy and busy early years.

On a glorious May morning in the year 1919 the door was opened to an unpretentious (and smoky) four-roomed suite in the most diminutive building in Kingsway; shortly afterwards two of the rooms were sublet to Mr. E. B. Wedmore of the Electrical Research Association—probably to help to pay the rent. A few days earlier sundry excursions had been made to furniture repositories south and north of the river for second-hand bargains. For E.D.A. started with immense confidence in its mission—which time has confirmed—with less than a dozen disciples known as "Founder Members" drawn from all sections of the industry, plus an "annual revenue" equal to the Association's present normal expenditure for a period of only twenty days.

Lord Brabazon of Tara, President

Mr. Clarence Parker, Chairman of Council

Mr. V. W. Dale, Chief Executive Officer

It was well that the executive staff in those seemingly not very distant days had faith—in the months that succeeded they certainly needed it. Soon it became very apparent that we had not been installed at the seat of custom, but that before us were two strenuous jobs—one to *sell electricity* and the other to *sell E.D.A.*—the latter by far the more formidable task. It must be remembered that, until E.D.A. broke the ice, two or three guineas a year to their respective trade associations was the only impost made upon the revenues of electricity supply for national and co-operative activities.

I think E.D.A. was due at least five years earlier. The 1914-18 war intervened: otherwise the electrical industry, already at least four years behind its gas contemporary, would probably have established a central educational publicity organisation in 1915, although I have little doubt that it would have experienced still the same early struggles. While carbon lamps were giving a flicker of light in half a million homes supply people were boasting that the ball was at their feet, but generally there appeared to be no particular urgency about kicking it. If I permit myself to reminisce to the extent of translating the aphorism there is little wonder that a great London shopkeeper once ventured the opinion that we had the finest commodity in the world to sell and we were selling it in the worst possible way.

Earlier the London Electricity Publicity Committee, with a small office in Fleet Street, was producing posters, etc., which were purchased by a few publicity-minded undertakings—both municipal and company. The I.M.E.A. in 1913-14, through its Development Committee, had its eyes directed towards the same object. But it was in the autumn of 1918—with victory already on the horizon—that the I.E.E. Heating and Cooking Section revived the idea of a

development organisation. The British Electrical and Allied Manufacturers' Association and other wealthy relatives gave generous support measured against a very different background from the one we have to-day, and the first honorary secretary was the late and greatly respected Frank Broadbent. Just six months later brings me to the point at which I started.

Twenty-five Years Ago and Now

Here, I suggest, we shall do well to reflect on some of the salient events which have left their mark on the industry. At the start we had less—considerably less, than a million consumers compared with nearly eleven millions to-day: then capital expenditure little more than £100,000,000—now nearly £700,000,000: an annual revenue of some £14,000,000, to-day the figure is stated to be in the region of £125,000,000: then less than a half a dozen electricity supply showrooms, to-day more than a thousand. At that time electricity was available over 14 per cent. of the country's area, the corresponding figure is now said to be 90 per cent. The largest turbo-alternator was rated at 3,000 kW. Coal per unit generated was of the order of 5½ lb. against a possible 0·9 lb. to-day. Neon, gasfilled and coiled coil lamps were virtually unknown: the dimensions of the radio and television load were undreamed of: cooking and water heating interested a few pioneers. And so by many examples one could continue to reveal chapters of development in this now great industry. What part did E.D.A. play? In a more critical analysis perhaps a much greater share of credit would go to E.D.A. than many imagine: such an investigation has no place in this brief article although in more peaceful times a challenge will not be unwelcome.

The Association's Early Activities

It took a long time to establish the Association on a reasonably satisfactory financial basis, yet less than a year had passed, with a staff of no more than five, and E.D.A. had commenced advertising in the national Press. Some thirty "publications" had been written and released and were spreading the electrical gospel. Editorial publicity was already flourishing: for twenty-five years electricity has been *news* and never more so than at the present time. Only a little later and there had been established special Committees on Rural Electrification, Industrial Heating, Tariffs, Assisted Wiring, etc. All these things were not prototypes—they were the beginning of a new phase in electrical history.

Above all, I think, in that first year the E.D.A. Salesmanship Conferences were inaugurated: looking back, I am sure those early conferences—the nucleus of still greater promise—were one of the Association's most inspired and inspiring achievements: the invisible influence of those regular fortnightly meetings at the Patent Agents' Library in Chancery Lane, at St. Bride's Institute, Caxton Hall, and elsewhere, and the devotion of the whole of the technical Press to that branch of the Association's work definitely did more than any other single activity to introduce sprightliness into all sections of the industry, particularly amongst the then rising generation.

If J.W.B. was the central figure of the hierarchy in those days, there was one who established himself as a leader in the "laity"—I refer to Mr. H. T. Young. Never a conference without his cheery presence: never a conference when he was not impatient to give the utmost encouragement and extend his undoubted vision to his contemporaries. It was my privilege in later years to hear Mr. Young, as President of the Institution of Electrical Engineers, pay tribute to the inspiration he gained from those early E.D.A. meetings: I sometimes wonder if it ever occurred to him to assess the value of the inspiration he gave to many of *us*.

Subscription Increased

It was a landmark in E.D.A.'s history in 1925 when, with not a little courage, it quadrupled its subscription basis. It was an earlier landmark in 1924 when, in one effort, the Association gathered a voluntary contribution vastly greater than any ever paid to any organisation in our industry, and thus electricity supply established for itself a not inconspicuous place on the map at the British Empire Exhibition at Wembley. From then on, it can be said that the Association nailed its flag to the top of the mast and has led the supply industry at all national exhibitions; in popularising assisted wiring schemes; in developing the heating, cooking and water-heating loads; in promoting the hire and hire-purchase of electrical appliances; in raising standards of lighting in home, shop, hotel and factory; in extending the use of electric heat for industrial processes. Those who have subscribed to E.D.A. have invested well and the *whole* industry has received handsome dividends. By means of films, lectures, and nation-wide campaigns, immense acceleration was given to development.

In the "Wiring the Homes of Britain" (W.O.B.) campaign, demonstration electric houses were introduced to this country. For the mere printing cost of a booklet nearly one hundred such exhibitions were organised and more than 2,000,000 people visited them. Then followed campaigns which can merely be catalogued: cooking, water-heating, refrigeration, late shop lighting, hotel lighting and heating, industrial heating,

etc. For the W.O.B. campaign, Area committees and offices were set up and subsequently they became and remain a permanent and valuable part of the organisation.

In 1935 E.D.A. parted company, but not a family relationship, with the manufacturers, wholesalers and contractors. I am glad that at least some form of co-operation has remained and more than grateful to know that it is the policy of the Council at the present time to encourage still closer and more active co-operation with all sections of the industry.

The extent to which E.D.A. assisted local development work is often ungrudgingly acknowledged by scores of engineers in whose areas exhibitions and other local publicity activities were organised or assisted: the Association had a big hand also in the modernisation and efficient planning of supply showrooms.

The Faraday Centenary Celebrations and the Albert Hall Exhibition provided yet another landmark as did also the Association's contributions to the North-East Coast Exhibition at Newcastle, and the Empire Exhibition in Glasgow in 1938. For many years E.D.A. was much in evidence at the British Industries Fair; the Royal, the Bath and West, the Highland and other Agricultural Shows; the Royal Sanitary Congress; the I.M.E.A. Convention and numerous other national events in which electricity would have been inadequately represented, if at all, but for the effort made by the national Association. During these years other activities included lecture services, salesmanship training courses, public speaking competitions and other general and individual services "too numerous to mention."

Wartime Problems

And thus—with all this solid and spectacular development; with at least eight million additional consumers to our credit; with nearly two million housewives cooking by electricity and the curve of demand rising almost vertically—came September 1939!

After only the slightest hesitation the E.D.A. Council decided that the service should be maintained: almost daily for a few weeks bulletins were issued dealing with wartime problems and E.D.A. became as it were at that stage a buffer between harassed undertakings and a puzzled public. Do you remember an E.D.A. appeal to keep showrooms open during an alert: window protective devices, wartime demonstrations, etc.? These are the sort of incidents that are apt to get lost in the mists of time. Assisting the Government by adapting showrooms to new and national tasks: food, rationing, information, fuel economy—how well the industry responded! Stocks diminished, raw materials were diverted, staffs depleted, restrictions imposed, but the Association held firmly and maintained the industry's goodwill—never hindering, always helping, broad national interests. Meanwhile the Association became involved also in a variety of other problems: A.R.P., mutual aid, entertaining the troops on many a cinema screen and advising on the lighting, heating and ventilation of shelters. It was E.D.A. that initiated and organised the first national black-out exhibition in London opened by Sir John Anderson, then Minister of Home Security. Lost in the mists of time. And so, through nearly five fateful years, E.D.A. has kept intact, but inevitably very depleted, an organisation that is ready *now* to respond, and is indeed already responding, with vigour.

The stage is set for *liberation* in the social and economic spheres in which electrical utilisation has a vastly important part to play. When, if at any time, the whole story of the Association's recent activities can be revealed it will be seen that vigilance and aggressiveness have marked the Association's policy and action at a critical juncture when experience was at a premium and that so far as E.D.A. is concerned, electricity's place in the sun in the new world was certainly not left to the caprices of either accident or fortune.

Preparing for Peace

How firmly the Association is now established in the confidence of the industry was demonstrated by the fact that with absolute unanimity members agreed, before the end of the war, to revert to full scale subscriptions, and by what is accepted as the best attended and most enthusiastic annual meeting and luncheon of its history held in London on March 17th last. Bearing in mind the President's historic speech and subsequent events it is only slightly cryptic to say that in some respects the E.D.A. annual meeting in 1944 probably marks the occasion of a turning point in the fortunes of electricity supply!

But organisations cannot survive on their past record. The day may come—but it is, I think, distant—when the industry may decide that E.D.A. has accomplished its mission. Before that day, indeed in the very near future, we have tasks transcending anything that have gone before. In spite of any real or imaginary obstacles, electricity supply is farther away from saturation than it was twenty-five years ago when fewer than a million domestic consumers were using the service, almost exclusively for lighting. It is in E.D.A.'s province to see that progress is not retarded—it cannot in any case be stopped.

Space is limited and extreme brevity is necessary to complete a pocket history.

In these twenty-five years E.D.A. has enjoyed the counsel of a great many of the pioneers and leaders of the industry whose contributions are remembered with great gratitude. The first Director was succeeded by Colonel W. A. Vignoles; he, in turn, was succeeded by Mr. A. C. Cramb who retired early in 1943. For a short time the late Sir William Ray functioned as Executive Chairman. During the period under revew the staff has multiplied itself by ten; many of the senior and area officers are now serving in the Forces and there remain at present only the Chief Technical Officer, Mr. J. I. Bernard, Mr. Philip Honey and four Area Officers. Publicity and Exhibition staff and services have been maintained throughout. The Association's revenue has increased sixteen times.

Area Committees continue to operate successfully in South-East, South-West and Central England, North-West England and North Wales, Mid-East England, Northern Counties, Scotland and Northern Ireland. A characteristic example of the value of the work of these committees was experienced recently when, in connection with a most urgent problem, special meetings of all of them were convened in eight working days and, in that brief period, made their recommendations to the Council. Special committees have been revived in connection with publicity, cooking and street lighting: others will be re-established at the earliest possible moment. Advisory panels are being formed in connection with allied professions. Public relations work is being considerably expanded; exhibitions, including the Building Centre, are flourishing; cinema films are again in production; post-war kitchen planning is well to the fore; and other schemes are envisaged with a view to rendering a more comprehensive electrical advisory service to all sections of the public and all classes of electrical user.

The end of the road along which we have travelled for nearly five unhappy years is not yet quite in sight, but I venture to entertain and support an earnest hope that when the goal *is* reached, the industry will find E.D.A. firmly established and ready to meet all demands. The end of the road along which many of us have travelled for twenty-five years is certainly not in sight. Section 30 of the 1919 Electricity (Supply) Act legalised contributions to the Association because of the immense service which the wider use of electricity could render to the community and because educational publicity had become to supply undertakings much more than a merely desirable enterprise. What better inspiration do we need in 1944?

These views, it is my privilege to know, are overwhelmingly shared by many who have the Association's welfare truly and impersonally at heart, and who are neither bound by tradition nor party to retrogression. Admittedly, the industry has its problems and difficulties, but so far as utilisation is concerned fears and frustrations are not even respectable fantasies to those who are able to look into the future with faith and vision.

Supervising Engineers

Annual Meeting and Prizewinning Papers

AT the annual general meeting of the Association of Supervising Electrical Engineers a resolution was passed directing official attention to "the absence of effective control of electrical installation work" (permitting the activities of unskilled persons to the detriment of the public, loss of materials and labour) and thus "bringing into disrepute the otherwise greatest and safest medium for light, heat and power." The view was expressed that only a statutory scheme of registration of employers and operatives would solve the problem. Emphasis was laid on the importance of "extending to all, under efficient and safe conditions, the benefit of this great national asset." By a separate resolution, the Association is to seek support for prohibiting the use of materials which do not conform to British Standard Specifications, where applicable.

The meeting was well attended by branch delegates and members from most districts, and among other decisions was a departure from previous practice to hold the 1945 annual general meeting in Manchester instead of London.

Members elected to fill six vacancies on the Executive Council were: Messrs. D. Barke, E. E. Gammon, W. S. Gearing, J. H. K. Pendry, A. E. Poole, and E. J. Sutton, A.M.I.E.E. At the first meeting of the newly-appointed Council the following principal officers were elected for 1944–5: Chairman, Mr. J. Flood; vice-chairman, Mr. J. W. Noble; and hon. treasurer, Mr. J. J. Smith, M.I.E.E. (re-elected).

Branch Papers Competition

Mr. H. W. Swann, M.I.E.E., president of the Association, occupied the chair at the concluding meeting of the 1943-44 session at the Lighting Service Bureau, London, on June 13th, when the three winning papers in the Branch Papers Competition were read by the authors. First prize went to Mr. S. H. Harding (North-West London Branch) for his paper on "A Comparison of Starting Methods for 3-phase Squirrel-cage Motors"; second prize to Mr. J. S. Smith (Sheffield) for a paper on "An Introduction to the High-frequency Furnace"; and third prize to Mr. W. T. Partington (Liverpool) for a paper on "Static Electricity." Congratulating the authors, Mr. Swann referred to the difficulty experienced by the examiners in reaching their decision in view of the generally high standard of entries received, and stressed the high educational value of the scheme.

The papers were reviewed in our last issue.

Central Board Changes

Mr. H. Hobson to Succeed Sir Archibald Page

THE Minister of Fuel and Power has appointed **Mr. Harold Hobson**, B.Sc., M.Inst.C.E., M.I.E.E., now general manager of the Central Electricity Board, to be chairman of the Board in the place of **Sir Archibald Page**, M.Inst.C.E., Hon.M.I.E.E., who is resigning for health reasons on July 31st. **Sir Johnstone Wright**, chief

Sir Archibald Page

Mr. Harold Hobson

engineer, succeeds Mr. Hobson as general manager, and **Mr. J. Hacking**, deputy chief engineer, has been promoted to be chief engineer.

Sir Archibald Page has been chairman of the C.E.B. since January, 1935. He was previously the Board's first general manager, having been appointed to that post when the Board was set up in 1927, and has thus occupied a unique position in connection with the construction and development of the grid system. He was also one of the first members appointed to the Electricity Commission when that body was constituted in 1920, and served as a Commissioner for nearly five years. Among other appointments which he has filled are those of director and general manager of the County of London Electric Supply Co., Ltd., general manager of the Clyde Valley Electric Power Co. and deputy city electrical engineer, Glasgow. Sir Archibald, a native of Alloa, where he was born in 1875, received his knighthood in 1930. He is a past president and honorary member of the Institution of Electrical Engineers and last year he was honoured by the Council with the twenty-first award of the Faraday Medal in recognition of his outstanding services in the sphere of electricity supply.

Mr. Harold Hobson, who is fifty-three, enjoys wide and intimate contacts with the electricity supply industry and an expert knowledge of the Board's work and ramifications through many years' practical experience in the highest executive posts. He joined the staff just over sixteen years ago as commercial manager and has been general manager for the past nine years. In the former capacity he was responsible for the preparation of the tariff upon which the Board's vast trading operations are based and for carrying through the many intricate and difficult negotiations which have led to the smooth working agreements with the selected station owners and other authorised electricity undertakers. Before joining the C.E.B., Mr. Hobson, who is the son of the late Mr. J. A. Hobson, the well-known economist, was for three years joint manager of the County of London Electric Supply Co., Ltd., having earlier had considerable experience of the engineering and commercial aspects of electricity supply with Merz & McLellan. He is a member of the Institutions of Civil and Electrical Engineers and is a past president of the Association of Supervising Electrical Engineers.

Sir Johnstone Wright, who was born at Dunning, Perthshire, in 1883, joined the C.E.B. as deputy chief engineer soon after it was established and has been chief engineer since January, 1933. He was previously chief engineer and general manager of the Belfast Corporation Electricity Department, in which capacity he carried through a complete reorganisation of the undertaking, including the construction of the Harbour power station and the laying of a high-voltage network throughout the city. Sir Johnstone was also responsible for the preparation of a comprehensive scheme for electricity throughout Northern Ireland and in this way laid the foundations on which supply is now given by the Northern Ireland Electricity Board. A wide and varied experience of the municipal and company sides of the electricity supply industry also included earlier important appointments held successively with the Cleveland and Durham Electric Power Co. and the

Sir Johnstone Wright

Mr. J. Hacking

Bradford Corporation. He is a past-president of the I.E.E. and received his knighthood in the 1943 New Year Honours.

Mr. J. Hacking, who was born at Burnley, Lancs, in 1888, has been deputy chief engineer for the past ten years. After a period of service with the North Eastern Electric Supply Co., he oined the staff of Merz & McLellan, for whom he undertook important work abroad, mainly in connection with railway electrification schemes. Besides visiting the United States, he supervised construction works in Argentina, South Africa and India, the contracts involving in some instances not only the electrification of main and suburban lines but also the provision of the associated power supplies. Although his direct association with the C.E.B. did not begin until 1934, Mr. Hacking supervised the construction of the grid in the Mid-East England and North East England Areas, for which Merz & McLellan were the consulting engineers.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AS announced last week, in consequence of the forthcoming retirement of Mr. E. B. Wedmore, director and secretary of the British Electrical and Allied Industries Research Association, **Dr. S. Whitehead,** an assistant director of the laboratories, is to take up the duties on January 1st of acting director of the Association *pro tem*, while **Mr. R. A. McMahon,** who has latterly acted as assistant secretary,

Dr. S. Whitehead

Mr. R. A. McMahon

will become secretary as from July 1st and will be in general charge of the business side of the organisation under the director.

Dr. Whitehead, who is forty-one, obtained his M.A. degree at Jesus College, Oxford, and Ph.D. degree in electrical engineering at London University. After a year's research under Prof. Lindemann at Clarendon Laboratory, Oxford, he joined the E.R.A. before its laboratories were established as a development of a testing station. A member of the Institute of Electrical Engineers and a fellow of both the Institute of Physics and the Physical Society, Dr. Whitehead is chairman of the London Branch and member of the board of the Institute of Physics, member (I.E.E.) of the Management Committee of *Science Abstracts*, and member of the Joint Committee of the Institute of Physics and the Mathematical Association. Apart from membership of several B.S.I. and I.E.E. committees, he is chairman of the I.E.C. Sub-committee on High-voltage Measurement and as I.E.C. representative helped to draft one volume of the C.G.I. Guiding Principles for International Telephonic Communications. Subjects which he has covered in thirty publications include dielectrics and insulation, transmission and distribution, and radio interference.

Mr. R. A. McMahon, who is fifty, was educated at the City of London School, Clongowes Wood College, Co. Kildare, and Finsbury Technical College, serving his apprenticeship with the City & South London Railway, Sir Benjamin Baker Mott & Hay and the French Thomson-Houston Co., Ltd., Paris. He spent four years in the French & British Westinghouse switchgear and installations departments, mainly in designing the layout of large installations in France. For six years he acted as liaison officer between the English Electric Co., Ltd., Constructions Electriques de France and Constructions Electriques de Belgique. The work consisted mainly in following the design and manufacture in England of prototype plant for the electrification of the Midi Railway of France, the Paris-Orleans Railway, the Northern Railways of Spain and the Moroccan Railways (300V DC) and subsequently supervising the setting up and manufacture and testing of similar plant in France and Belgium. Before joining E.R.A. ten years ago, Mr. McMahon spent five years in electrical and mechanical engineering business on his own account and was one of the pioneers of AC arc welding in this country. He is a member of the I.E.E. and two E.R.A. reports for which he was responsible, "A Statistical Survey of the Performance of Discriminative Protective Gear" and "Fire Fighting in Electrical Installations," have been presented to the Institution in the form of papers.

Dr. J. R. I. Hepburn has been elected president of the Electrodepositors' Technical Society for 1944-45, with **Dr. G. E. Gardam** and **Dr. S. Wernick** as vice-presidents.

Mr. C. C. Barnes is to be chairman and **Mr. H. Shorland** vice-chairman of the I.E.E. London Students' Section for next session.

Mr. C. W. Salt, M.I.E.E., city electrical engineer and manager, Carlisle since 1919, is to retire. Mr. Salt, who was born in 1878, received his technical training at Birmingham Technical Institute, the Northampton Institute and King's College. He joined the Croydon Electricity Department in 1900, leaving in 1905 to become chief assistant to the Bradford Electricity Department. From 1909 until going to Carlisle he was chief engineer at Torquay. He served with the B.E.F. in the last war. Mr. Salt has been a member of the I.M.E.A. Council for the past eight years, is past chairman of the North-Eastern Centre of the I.E.E., and a past-president of the Associated Municipal Electrical Engineers.

Mr. C. W. Salt

Mr. H. Riggall, director of Ruston & Hornsby, Ltd., has been appointed assistant managing director. He joined the associated company, Ransomes, Sims & Jefferies Ltd., in 1920 and transferred to Ruston & Hornsby in 1921. He is vice-president of the British Engineers' Association, a member of the Grand Council of the Federation of British Industries, a member of the Executive Council of the Association of British Chambers of Commerce and of the Executive Committee of the Internal Combustion Engine Manufacturers' Association. **Mr. Walter Haynes,** director and secretary of the same company, is retiring from his executive secretarial duties at the end of this month but will remain on the board. He has filled the

position of secretary for the past forty years and has completed fifty-two years' service. Succeeding him, **Mr. Geoffrey Pawlyn**, has been made a director and appointed secretary as from July 1st. He joined the company in 1936 as chief accountant, which position he will continue to hold.

Mr. D. C. Brook has been appointed a director of the Perak River Hydro-Electric Power Co., Ltd.

Mr. A. B. Cape

The list of those awarded the M.B.E. in the King's Birthday Honours included the name of **Mr. A. B. Cape**, engineering test superintendent with the General Electric Co., Ltd., whose portrait we now reproduce. Among those who were awarded the British Empire Medal was **Mr. S. A. Franklin**, works superintendent of the rubber cable factory of Johnson & Phillips, Ltd.

The *Passenger Transport Journal* reports that the South African Minister of Transport has appointed **Mr. J. A. Bromley**, A.M.I.E.E., to be a member of the National Road Transportation Council. Mr. Bromley is general manager and engineer of the Durban municipal transport undertaking.

Mr. L. F. Jeffrey, chief engineer to the West Midlands Joint Electricity Authority, has been elected chairman of the committee of the Midland Section of the Institute of Fuel.

The post of superintendent of lighting for the First District of Renfrewshire, which has been vacant for over a year, has been filled by the appointment of **Mr. W. J. R. MacKenzie**, Clarkston.

Mr. T. H. Heritage, engineer and manager of the Urban Electric Supply Co.'s Hawick undertaking, has been elected president of the Hawick Rotary Club.

Miss D. Smith, A.M.I.E.E., designer of motors at the Metropolitan-Vickers works, Manchester, has been re-elected chairman of the Manchester Branch of the Women's Engineering Society. **Miss Barbara Wright**, mechanical engineer (Metropolitan-Vickers), has been appointed hon. secretary.

Mr. David M. Watson, B.Sc., M.Inst.C.E., of the Westminster firm of Messrs. J. D. & D. M. Watson, has been elected chairman of the Association of Consulting Engineers for the year 1944-45. This is the second occasion in the history of the Association on which the son of a former chairman has occupied the chair. The retiring chairman is **Mr. S. B. Donkin** (Messrs. Kennedy & Donkin), who completes his second period of office.

Signalman Desmond S. Ashmore, Student I.E.E., Royal Corps of Signals, eldest son of Mr. J. Ashmore, M.I.E.E., Birmingham district manager, British Electrical Repairs, Ltd., and Mrs. Ashmore, was married on June 17th, to Miss Joan Wilbraham of Erdington, at St. Michael's Church, Boldmere, Sutton Coldfield. The young couple received presents from the workpeople and staff at both British Electrical Repairs, Ltd., and Foundry Services, Ltd.

Mr. A. G. Grundy, who has just retired from the position of transport manager to the Stalybridge, Hyde, Mossley and Dukinfield Joint Transport and Electricity Board, had been connected with transport undertakings for fifty-two years.

Mr. A. H. Ginman, general manager of Cable & Wireless, Ltd., in Canada, and president of the Canadian Marconi Co., has been elected a director of Cable & Wireless (Holding), Ltd., with the title of director resident in Canada.

Mr. Arthur E. Skan has joined the board of directors of George Ellison, Ltd., and of Tufnol, Ltd.

At the annual meeting of Ayrshire Electricity Board held at Kilmarnock, **Provost T. Murray**, Ayr, was unanimously reappointed chairman.

Mr. J. G. Holmes, B.Sc., has been elected chairman of the Birmingham Centre of the Illuminating Engineering Society for the next session with **Mr. C. F. Partridge**, B.Sc., M.I.E.E., as vice-chairman.

On Monday last week Tommy Handley and the "Itma" cast performed the show "Tom Marches Back" before 2,000 of the employees of the General Electric Co., Ltd. It was broadcast in the B.B.C. Home Service at 9.35 p.m.

The Tommy Handley show "Tom Marches Back" being performed at the G.E.C. works

Obituary

Mr. P. Fink, commercial assistant with the Walthamstow Electricity Department, died on June 8th at Harrogate after a short illness. He had been with the Walthamstow Corporation for the past 25 years, before which he was with the Southwark electricity undertaking.

C. J. Neale.—We regret to record the death on June 13th, at the age of sixty, of Mr. C. J. Neale, manager of the Cardiff branch of Siemens Electric Lamps & Supplies, Ltd. Mr. Neale joined the company in 1912 as accountant at Cardiff and was appointed branch manager in 1920.

Mr. W. A. Moore.—Many people in the electrical industry will be sorry to hear of the death of Mr. William Alfred ("Bill") Moore on June 15th, at Westerham, Kent. Mr. Moore retired from the service of W. T. Henley's Telegraph Works Co., Ltd., in 1940, having been with the company for forty years, for seventeen of them as advertising manager. He was responsible for the inauguration of the "Henley Telegraph," an outstanding example of the better type of "house" journal and edited it for many years. It was in the "Telegraph" that he published the story of the life of W. T. Henley, a long and fascinating account of a struggle against many adversities of the founder of one of the greatest British electrical concerns.

The late Mr. W. A. Moore

Mr. Moore was born in Manchester sixty-nine years ago and joined Henley's after being with Henry Tate & Sons, during which time he studied at the Woolwich Polytechnic and the East London (now Queen Mary's) College.

Mr. P. S. Turner.—With great regret we have to record the death, on June 16th, of Mr. P. S. Turner, of Associated Electrical Industries, Ltd. He had been ill for some time and had to undergo a major operation. His illness prevented him from presiding at the April annual meeting of B.E.A.M.A. of which he was chairman for 1943-44.

The late Mr. P. S. Turner

Mr. Turner was probably best known for his work in connection with railway electrification, particularly the conversion of the Hungarian State Railways. He had been a director of A.E.I. since 1939 and became a vice-chairman in March last, when he was also appointed chairman of the Edison Swan Electric Co., Ltd., Edison Swan Cables, Ltd., and Ferguson, Pailin, Ltd. He was also on the board of the Metropolitan-Vickers Electrical Co., Ltd.

Mr. J. J. Middleton, representative of the Rickmansworth Urban District Council on the London and Home Counties Joint Electricity Authority and chairman of the local advisory committee of electricity undertakings, died recently at the age of seventy-two.

Mr. W. H. Stoker.—We regret to report the death on June 16th of Mr. William Henry Stoker, K.C., who for many years was known as a leading arbitrator in industrial disputes. He had also served in many other judicial capacities; among other things he was on the panel of arbitrators set up under the 1926 Electricity (Supply) Act. At one time Mr. Stoker was a frequent contributor to the *Electrical Review* on legal matters.

Lord Herbert Scott.—We report with regret that Lord Herbert Scott, chairman of the Westinghouse Brake & Signal Co., Ltd., died on Saturday at Winchester at the age of seventy-one. From 1928 to 1931 he was president of the London Chamber of Commerce and in 1934-35 president of the Federation of British Industries.

I.E.E. Luncheon

THERE was an attendance of 262 members and guests at the informal luncheon of the Measurements Section of the Institution of Electrical Engineers last week at the Connaught Rooms. MR. E. W. MOSS, chairman of the Section, presided and remarked upon the pleasure his year of office had given him. Standardisation was fashionable just now, but his opinion (in which he probably stood alone) was that it should not be followed too eagerly, for it suggested avoidance of change and, consequently, lack of progress.

COL. SIR A. STANLEY ANGWIN, president, spoke of specialised sectionalisation, which was also causing some concern in the United States just now. There was a feeling once there that sectionalisation might lead to isolation and lack of interest in the present body as a whole. But it was right and proper to cater for sectional interests, for it was better to try and accommodate all under one umbrella than to risk break-away into numerous separate organisations. There was no sign of isolation about the Measurements Section, which was a very active component of the I.E.E. in that measurement was essential to engineering in general and to the electrical profession in particular.

MR. T. R. SCOTT, chairman of the Transmission Section, returned thanks on behalf of sectional chairmen and guests.

Trade Associations

A "broadsheet" (No. 221, 24 pp.) published by P.E.P. (Political and Economic Planning) deals with the subject of trade associations without discussing their merits or demerits. After some notes on the internal structure of such associations, in the course of which it is suggested that B.E.A.M.A. has one of the largest staffs (100), results of a "sample inquiry" are set out. The method consisted of an examination of the first 100, alphabetically, of a list of 840 bodies of various kinds on the B.S.I. list.

Next the functions and methods of operation of trade associations are surveyed; this section is divided into the following heads :—Standardisation; pooling and interchange of patents; joint research; external relations; exhibitions and publicity; control of prices; control of channels of distribution; regulation of output and market sharing; centralisation of selling activities; and labour.

The last section of the report deals with recent trends including growth in numbers.

CORRESPONDENCE

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

Electrical Terminology

WITH reference to Mr. Banner's interesting article in your issue of June 2nd and Dr. E. Hughes's comments in your issue of June 9th, I would remind your readers that any publications issued by this Institution may be obtained at a discount of 50 per cent. if they are ordered through a technical college or other educational authority. Many of the British Standards are of considerable educational value, and we are glad to co-operate with schools and colleges in making these publications available to students at as low a price as possible.

The following short selected list of British Standards refers to some of the publications which are of particular educational value and interest to students of electrical engineering and allied subjects:—

Glossary of Electrical Terms (B.S. 205).
Glossary of Telecommunications Terms (B.S. 204).
Glossary of Acoustical Terms (B.S. 661).
Graphical Symbols for General Electrical Engineering (B.S. 108).
Graphical Symbols for Telecommunications (B.S. 530).
Engineering Symbols and Abbreviations (B.S. 560).
Drawing Office Practice (B.S. 308).
Workshop Practice (B.S. Handbook No. 2).
Temperature Measurement (B.S. 1041).
Flow Measurement (B.S. 1042).
Machine-cut Gears (B.S. 545 and 721).
Sampling and Analysis of Coal and Coke (B.S. 735).
Limits and Fits for Engineering (B.S. 164).
Quality Control Charts (B.S. 600R).

*London, S.W.*1. P. GOOD,
Director,
British Standards Institution.

Power-Factor Slide Rule

IN your issue of June 9th there appeared a description of a special slide rule for deriving power factor directly from kW and kVAr. It certainly gives a very open scale and is probably worth constructing if extreme accuracy is important.

I do not agree, however, with the statement in Mr. W. M. Gore's first paragraph that the ordinary slide rule makes heavy weather of power factor. There is no need to use trigonometrical ratios, neither is a cursor required. The calculation can be done in only two moves thus:—Calling scales A B C D top to bottom, the first move is (1) to set kVAr on scale D opposite kW on scale C, and to (2) observe the value on scale A appearing over 100 of B; to this add one. The second move is to (3) shift slide so that "1 + A" appears over 1 of scale B, and to (4) read power factor on scale C over 10 on D.

Care is necessary with decimals, but the 3.4.5. example will always help. Obviously the answer is 0·8. This example gives (item 2) 0·56 which becomes 1·56 in item (3). Put this value on A over "1" on B and 0·8 appears on C over "10" on D. Certain better-class slide rules give still shorter cuts. The computation is based on the formula, power factor $= \frac{1}{\sqrt{1 + \left(\frac{kVAr}{kW}\right)^2}}$, which in trigonometry is expressed as $\cos A. = \frac{1}{\sqrt{1 + \tan^2 A}}$

Bristol. G. W. MAXFIELD.

WHILE giving Mr. W. M. Gore full credit for his ingenuity in producing the slide rule described in your issue of June 9th, it is only fair to point out that a rule already exists which enables power factor and associated calculations to be quickly and accurately carried out.

I refer, of course, to the well-known "AC Electrical" rule devised by Dr. A. E. Clayton and manufactured by Messrs. Thornton. It carries scales of cos ϕ, sin ϕ and tan ϕ on the stock, all of which are under the cursor line at the same time, with evident advantage.

*London, E.*15. G. F. FREEMAN,
West Ham Municipal College.

Engineers and Managers

I AM interested in the Stoke-on-Trent item in the Personal column of the June 2nd issue, and your subsequent leader on the subject ("Engineers and Managers") in the issue of June 9th. The item is of particular interest as this undertaking is somewhat similar in constitution. Lines three and four in column one on page 796 concisely summarise the real need. To be really successful the commercial executive must have had *actual experience* in and possess proper knowledge of all branches of a supply undertaking.

Following a reorganisation of this undertaking on lines recommended by Messrs. Price Waterhouse (recalled in your early 1939 issues) two executives were appointed (*a*) Commercial and (*b*) Distribution. The former is responsible for general administration and all contacts with consumers, together with direct control of all departments (including Installations, Meters and Maintenance, etc.) with the sole exception of the construction, operation and maintenance of

the distribution system, which is the responsibility of the latter executive.

Unfortunately, the distribution executive is designated by the general broad expression of electrical engineer, and the term is somewhat misleading. This is borne out by the advertisement for the commercial appointment, which caused me some misgiving until the conditions of the position, as given above, revealed an equal need for an "electrical engineer."

This misgiving was not by any means confined to myself but concerned (and still does) many "managing engineers" who felt that encroachment by the uninitiated was being made on essential technical aspects of the supply industry.

H. E. TAUNT,
Chichester. *Commercial Manager.*

Tariffs for Welding

AS a result of the publication of Paisley Town Council's recent decision that small consumers (using less than 50,000 units per annum) taking a supply of electricity for welding equipment shall be charged on a kVA basis, I have received several inquiries with regard to the type of tariff it was proposed to adopt. As this subject is of extreme importance at the moment and may be of interest to other supply undertakings, I give below the tariffs which have been introduced:

(*a*) *Standard Welding Tariff for Small Power Consumers*—

The charge to consumers taking a supply for welding purposes shall be, a fixed charge of £1 per annum per kVA of the maximum continuous rating of the welding plant, plus a running charge for kWh used at Schedule "A" power rates. (First 4,000 kWh per annum at 2d. per kWh, and the next 46,000 kWh per annum at 1½d.; subject to coal clause adjustment in each case).

Where more than one welding machine is installed, the following discounts will be applicable to the fixed charge: Two machines 20 per cent. discount; three to six machines, 40 per cent.; seven or more machines, 50 per cent.

(*b*) *Alternative Off-peak Tariff*—

Consumers have the option of adopting the following off-peak tariff, which has been primarily designed for the infrequent user of welding equipment: All kWh used for welding purposes will be charged at Schedule "A" power rates, but the consumer undertakes not to use welding apparatus during the peak load periods of the undertaking in the months of November, December, January and February; these periods being determined by the undertaking. At present the periods are 11.30 a.m. to 12.30 p.m. and 4.30 to 5.30 p.m.

In the standard welding tariff the figure of £1 per kVA per annum represents 50 per cent. of our estimated distribution costs of £2 per kVA per annum. The percentage was evolved from actual tests on welding equipment and represents the maximum load reading in kVA registered on a temporarily installed "Trivector" meter (30 minute m.d. period) expressed as a percentage of the welding rating of the equipment as shown on the nameplate.

I should welcome any comments on these tariffs.

DANIEL ROSS,
Paisley. *Engineer and Manager.*

Plugs and Sockets

IN your issue of June 16th, Mr. A. Milne objects to a domestic standard plug of one size only. Presumably he wants to retain the three B.S.S. sizes 2-, 5-, 15-A, but has he considered which of these to use in a post-war house having a dozen plug points, so that a 2 to 3-kW fire can be used in any room? Unless the large and costly 15-A size is used throughout, a new standard is essential because the 2- and 5-A are obviously too small. If he is referring to our domestic 3-kW, 230-V standard fused plug and socket, whose overall size is less than the present 5-A, he may rest assured that the use of bits of 18 or 20 SWG wire in place of the fuse is out of the question.

If all outlets were to be individually connected to the distribution board and interlocked switches provided at each point, the cost of wiring, switches and dis-board would be prohibitive with ten or twelve outlets. Hence the ring main or room circuit with local fuses at the plug points.

Mr. Palmer also appears to be under a misapprehension as to the type of fuse in question. It is of the h.r.c. type and blows without flash or report on a prospective short-circuit of over 30,000 A at 250 V DC or 18,000 A at 400 V AC in 0·006 sec.

For DORMAN & SMITH, LTD.,
R. AMBERTON,
London, E.C.4. *Director.*

Compulsory Registration

I AM unconvinced by "Consumer's" answer in your issue of June 16th, to the first question that I previously raised. Even if he did not say that the I.E.E. was unconcerned, he was obviously in agreement with the finding of the I.E.E. Sub-committee. I wonder whether if any of his friends or relatives were electrocuted in their homes by faulty installations he would adopt the same attitude. His joke about people falling out of bed, is in this instance, in bad taste and I can only repeat what I have often stated—namely, "If only one person is killed per annum by faulty installations, that is one too many and something should be done."

Handymen and amateur electricians have been the cause of many nasty domestic accidents and it is with a view to stopping such people that compulsory registration or licensing is suggested. Irrespective of "Consumer" and others of like mind, compulsory registration is coming.

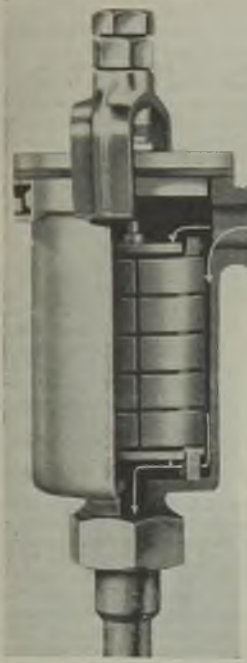
Glasgow. ALEX MILNE.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Magnetic Filtration

THE latest addition to the range of magnetic oil filters (*Electrical Review*, October 30th, 1942, p. 564) made by Philips Lamps, Ltd., Century House, Shaftesbury Avenue, London, W.C.2, has been specially contrived to remove



Magnetic filter for lubricants

fine swarf from machine-tool cutting and cooling fluids. The latter usually reach the cutting edge under pressure through fine apertures, being therefore capable of causing expensive spoilage if contaminated with ferrous particles not removable by ordinary means.

The centre core of the filter is a cylindrical permanent magnet surrounded by iron rings that are connected by brass strips, but separated from each other so that contaminating particles are collected in the gaps between the rings. Longitudinal division permits the two half-circles of rings to be pulled away from the magnetic core for cleaning.

These magnetic devices are intended for extracting any fine particles that may remain in suspension after normal filtration.

Fire-Hose Vulcaniser

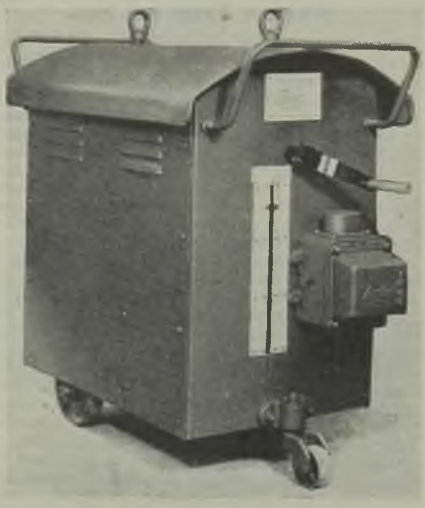
A variant of the " Ultric " vulcaniser for the inner tubes of vehicle tyres (*Electrical Review*, October 22nd, 1943, p. 554) has been devised by KAUTEX (PLASTICS), LTD., Elstree, Herts., for the repair of water hose piping.

In this the thermostatically controlled platen measures 11·25 by 6 inches, its area of 67 sq. in. enabling a 10-in. long patch to be dealt with by the central pressure arm, or two 5·5-in. long repairs to be executed together with two side-arm pressure brackets. The loading of the Bray resistor helix is 500 W at 230 V and a three-pin Reyrolle connector is provided.

Single-Operator Welder

A transportable single-operator AC welding set manufactured by JOHNSON & PHILLIPS, LTD., Victoria Way, Charlton, London, S.E.7, weighs 530 lb. and is 39 by 22 by 37 inches high. Perambulator handles, two roller wheels and one castor enable it to be pushed about quite easily, and the sheet metal housing has louvred side-plates for ventilation. Hand links are furnished for the selection of mains input tappings while the output is smoothly variable from 30 to 250 A by simply turning a handle, two clearly marked wander plugs being provided for the high and low ranges. An ironclad double-pole switch of 60 A capacity is included for isolating the transformer in compliance with B.S. 638 and Home Office regulations. Brass packing glands accommodate the input leads and two cable sockets are solidly attached to the sheet metal housing, one of them for earthing the machine and the other for the " work."

The air-cooled transformer employed is of the moving coil regulating type for connection across two lines of a three-phase circuit, its ratings being 22·5 kVA (welding) and 15·75 kVA (continuous B.S.) based on 70 per cent. diversity factor. An auxiliary choke coil connected in series provides the lower range (30 to 60 A), rotation of the operating handle causing the primary winding to move toward or away from the secondary winding so that the inherent reactance of the transformer is correspondingly changed over a wide range. A weatherproof condenser for power factor correction can be attached to one end of the set.



Single-operator J. & P. welder

COMMERCE and INDUSTRY

New Radio Receivers. Engineering Workers' Pay.

Power for Industrial Development

IN the House of Commons last week Mr. Griffiths asked the Minister of Fuel and Power what steps his Department was taking to ensure that an adequate supply of electric power at low cost for the development of new industrial processes was available.

Major Lloyd George said that the provision of electric power at low cost for new industrial processes could not be considered apart from the general problem of the reorganisation of the electricity supply industry which was at present before the Government.

Proposed Research Fund

It is reported in *The Times* that scientists and M.P.s on the Parliamentary and Scientific Committee have drawn up a scheme for a £10,000,000 National Research Fund which would be devoted to developing industries in Britain. The scheme is now being examined by the Committee under the chairmanship of Mr. E. W. Salt, and if it is adopted it will be submitted to the Government.

Gas Turbines and Jet Propulsion

The third edition of "Gas Turbines and Jet Propulsion for Aircraft," by Geoffrey Smith, M.B.E., is now available from the Flight Publishing Co. Ltd., Dorset House, Stamford Street, London, S.E.1., price 6s. (post free 6s. 4d.). New chapters are devoted to the working cycle of a turbo-compressor unit (with original diagrams) and to the problems of small-sized plants, fuel consumption factors and heat exchangers. There are also notes on new gas turbine projects and closed cycle systems with gaseous and liquid working media.

Wireless Receiving Sets

The first releases of the new wartime radio receivers for civilian use are likely to be made shortly, states the Radio Manufacturers' Association. During the next twelve months 175,000 AC mains and 75,000 battery models are to be retailed at £12 3s. 4d. and £10 9s. respectively. They cover only the medium wave bands, from 200 to 560 metres, and a very simple type of tuning scale is used on which the Home and Forces programmes are shown by name. The performance compares with typical pre-war popular-priced superhets.

The manufacture, and supply by the manufacturers, of valve-operated wireless receiving sets designed for the reception of broadcast programmes are brought under control for the first time by the Musical Instruments and Wireless Receivers Order, 1944 (S.R. & O. 1944, No. 658), which supersedes the Musical Instruments (Control of Manufacture and Supply) Order, 1942, the No. 2 Order, and the General Licence dated October 22nd, 1942, and comes into force on July 1st. Manufacturers will be required to obtain licences permitting them to continue the manufacture and supply of such wireless sets after July 1st, and should write to the Assistant Secretary, Industrial Supplies Department, Board of Trade, Millbank, S.W.1, for an application form if they have not already received one.

Manufacturers may now supply without restriction controlled goods of their own manufacture which have been returned to them for repair. To assist persons carrying on businesses which comprise both manufacturing, and wholesale or retail branches (whether in separate premises and under different names or not), the Order provides that they may, if the Board agrees, treat their manufacturing branches as wholly separate businesses, and goods may be considered to be supplied when they are transferred from the manufacturing to the wholesale or retail branches. Manufacturers will be required to apply the expression "Wartime Civilian Receiver" by means of a transfer to wireless sets made in accordance with certain specifications drawn up by the Radio Manufacturers' Association and approved by the Board of Trade.

Simms Magnetos

In the obituary notice of Mr. Frederick R. Simms (*Electrical Review*, April 28th) we mentioned the taking over by the British Thomson-Houston Co., Ltd., of the Bosch-Simms business. Simms Motor Units, Ltd., wishes to make it clear that this does not indicate that it is controlled by the B.T.H. Co.; in fact there is no connection, financial or otherwise, between the two concerns. Simms Motor Units make magnetos for vehicles and aircraft in addition to other equipment.

Contract Price Adjustment Formulæ

The British Electrical & Allied Manufacturers' Association informs us that the following are the latest figures for its contract price adjustment formulæ:—(*a*) Rates of Pay.—The rate of pay for adult male labour at June 17th shall be deemed to be 90s. 6d. (no change). (*b*) Costs of Material.—The index figure for intermediate products last published by the Board of Trade, on June 17th, is 176·2 (against 174·7) and is the figure for May.

A.E.U. Resolutions

The National Committee of the Amalgamated Engineering Union, meeting in Edinburgh last week, passed by 41 votes to eight a resolution dealing with the wages of women in the engineering industry. It instructed the executive, in conjunction with other unions concerned, to review the existing women's schedule with a view to a substantial advance to all ages, and also to secure a fluctuation in women's pay to correspond with any movement in men's pay.

On the question of dilution, a resolution was moved that the executive should open negotiations with the Engineering Employers' Federation for preventing any further entry of dilutees under the relaxation agreement, in view of the present state of the industry. To this there was an amendment by a delegate who considered that it would be undesirable to put an absolute ban on the intake as more dilutees might be required for repair work. The wording of his amendment, which was carried

by 34 votes to 16, was that "the time has arrived for the executive to give serious consideration to the menace of the continued extension of dilution of labour in the industry."

On Monday it was decided by 43 votes to six to ask the Executive Council to seek the approval of the National Joint Engineering Trades Movement to a claim for an immediate advance of 10s. a week on the basic rate to adult male workers. This was carried as an amendment to a proposal to press for a national minimum wage of £6 for a 47-hour week for all skilled workers. The National Committee expressed the view that the time had arrived for serious and urgent consideration of the whole wages position in the engineering industry. A fresh approach, it considered, must be made with a view to building up a new wages structure embracing all grades and which would relate the basic rates of the lowest grade of worker to human needs. The Executive Council was asked to formulate proposals for such a new structure. The president said that this could not be done in less than six months.

Canadian Plant for Russia

According to a report in *Electrical News and Engineering* (Toronto), proposals are now in preparation by several Canadian manufacturers, on the basis of specifications submitted by Russian representatives, for the supply of equipment to replace wrecked hydro-electric generating stations. One of the manufacturers concerned described as a considerable understatement the newspaper estimate of $25 million as the value of the equipment and said that the orders would be for turbines, generators, switchgear and allied equipment for the reconstruction and extension of eight or nine large hydro-electric developments. These are known to the Canadian companies only by letter symbols, but it is stated that, contrary to newspaper reports, they do not include plant for the Dnieper Dam. When the Dam was recaptured by the Russians it was found that the Germans had made unsuccessful efforts to destroy the massive concrete structures, and steps were then taken to re-install two generating sets which had been dismantled before the 1941 retreat. Orders for twelve new turbines and generators to replace those which had been destroyed were subsequently placed with the American General Electric Company and at Newport News, where the original units were manufactured.

South Africa's War Record

When France collapsed in 1940 South Africa, which had relied on importing most of her war needs, found herself thrust back on her own resources. Apart from a recently established but rapidly growing steel and iron industry, these resources and the necessary experience for their development were very small. But by a tremendous drive these deficiencies were overcome in a remarkably short time and the Union is now able to equip her troops with practically all their needs.

How this was accomplished is described in "South Africa on Service," a profusely illustrated brochure on the various phases of the activities. It contains a foreword by the Prime Minister, Field Marshal Smuts and a message from Dr. H. J. van der Bijl, Director-General of Supplies, to whose energy much of the accomplishment is to be credited. The provision of guns, shells, bombs, instruments and all kinds of equipment, as well as agricultural products, is dealt with in several sections and the brochure concludes with a brief reference to the production of electric power without which most of the achievements would have been impossible.

Emergency Services Organisation

The attention of all firms engaged in war production for the Admiralty, Ministry of Supply or Ministry of Aircraft Production is drawn to the necessity of the immediate reporting of damage arising from enemy action, civil fire, explosion or accident, to the Local Reconstruction Panel of the Emergency Services Organisation. Panels, which exist in every individual area in Great Britain and Northern Ireland, are able to render great assistance in facilitating the restoration of production. They are also the official channels for immediate report of damage to the appropriate Production Departments, to whom the earliest possible notification is imperative. Firms not acquainted with the address of their appropriate panel should apply to the Emergency Services Organisation, Ministry of Aircraft Production, Millbank, London, S.W.1.

Radio After the War

Following upon proposals to establish a Radio Research Institute, a post-war development report (part one) has been published by the British Institution of Radio Engineers. It is intended to be a practical interpretation of future desiderata, as they appear to the compilers of the report, dealing quite briefly and in very general terms with sound broadcasting (both wireless and wired), television, home gramophone recording, film recording, radio-telephone communication, and more fully with industrial applications of electronics, Government control and the extent to which standardisation is desirable being also considered. A chart is included to illustrate present utilisation of the frequency spectrum; its comparison with another published by the *Wireless Engineer* in June, 1925, will indicate the development of wireless science.

Science and Industry

Last March and April the Manchester Chamber of Commerce, in collaboration with the Department of Scientific and Industrial Research, held a series of meetings at which views were expressed on how best scientific knowledge and the results of research could be applied to aid British industry and commerce. The principal speakers were Lord Riverdale of Sheffield, Dr. A. P. M. Fleming, Dr. Andrew McCance and Sir Edward V. Appleton. The addresses have now been published in full in booklet form, with a foreword by Mr. A. H. S. Hinchliffe, president of the Manchester Chamber of Commerce. Copies (price 1s. 6d. post free) may be obtained from the offices of the Chamber at Ship Canal House, King Street, Manchester.

Lister Savings Campaign

Employees of R. A. Lister & Co., with a target of £10,000, contributed £13,426 in Dursley's "Salute the Soldier" week. Twenty-nine part-

time women workers headed the list with an average saving for one week of £19 14s. per head. The Lister campaign was run as an inter-department competition worked out on a "points" basis.

Rural Electrification in Eire

Presenting the estimate for his Department in the Dail, Mr. Lemass, Minister for Industry and Commerce, Eire, gave more details of the plan to make electricity available to every farm in the country. He said it was intended that to the maximum degree possible the construction of machinery and apparatus for use in that scheme would be carried out in Eire. It was proposed to extend the powers of the Electricity Supply Board to enable it to initiate industry for this purpose.

The aim of the Government was to bring the national electricity supply to every farmhouse on a basis which would enable energy to be sold at a cost attractive to the farmer and rural workers. The E.S.B. had prepared a report as to the financial and other arrangements involved and the Government had approved it. It was being printed and would be published shortly, and the legislation necessary to implement it was being drafted.

Exhibition of Welding

The growing interest in welding and the important position it now holds in industry were demonstrated by the remarkable attendance at a three-day exhibition organised last week at the Dorland Hall, London, by Thos. P. Headland, Ltd. Continuous practical demonstrations were given of electric arc, spot, seam, projection and light alloy welding, flash jointing and soldering, and there was a programme of technical films, together with a "Brains Trust" of experts to answer any problems relating to welding and allied processes.

Association of Ex-Siemens Men

A reunion supper of the Association of Ex-Siemens Men is to be held at the Prince of Wales Hotel, 154, Drury Lane, W.C.2. on June 30th. Guests will be welcome. Mr. P. C. Pope, 29, Bramham Gardens, S.W.5., the treasurer, or Mr. R. R. Griffin, c/o the Union Cable Co. Ltd., of Dagenham Dock, Essex, the secretary, will be pleased to forward particulars of the Association to any who are qualified for membership, or tickets to members for the supper.

Dimensions of Public Service Vehicles

For some time discussions have been going on with a view to securing alterations in the regulations governing the dimensions of public service vehicles. Last November the Associated Road Operators, Commercial Motor Users' Association, Municipal Passenger Transport Association, Public Transport Association and and the Society of Motor Manufacturers and Traders sent a memorandum to the Ministry of War Transport on the subject. It was suggested that the corresponding changes in the Ministry's "Memorandum on the Form, Construction, Dimensions and Weight of Trolley Vehicles and their Electrical Equipment" which would be required could best be dealt with by a separate approach. In a reply received by the Associations last February it was announced that the Minister had decided to undertake a review of existing regulations which would be restricted to major questions of design. Details of suggestions for amendments of the regulations relating to trolley vehicles were asked for. According to the *Transport World*, a second memorandum has now been sent to the Minister and the section dealing with trolley vehicles proposes the following revised "box" dimensions:—Maximum permissible overall length for single and double deck vehicles with two or more axles, 30 ft. ; maximum overall width, 8 ft.; height, 15 ft. 10 in. over the trolley base; laden weight, 14½ tons, with no restrictions on maximum axle weight.

Aluminium Development Association

The Aluminium Development Association, Ltd., was registered on May 22nd, as a company limited by guarantee, without share capital. Its objects are to promote the use of aluminium; to provide facilities for research work and the discussion of problems (other than questions of wages and prices); and to organise and finance scholarships and exhibitions. The property and income of the Association are to be applied solely towards promoting its objects. The first members of the Executive Council are Sir W. Murray Morrison and Messrs. G. Cunliffe, W. Emery, H. A. Woodroffe, J. R. Wilson, G. Boex and W. B. Penycoste.

The Stoke-on-Trent Appointment

In commenting on the recent debate on the appointment of Capt. T. Lockett as general manager of the Stoke-on-Trent Electricity Department (*Electrical Review*, June 9th) we attributed views upon the relative importance of the engineering and commercial sides to Alderman H. Leese. Actually these views were put forward by another member of the Council, Alderman J. A. Dale, who moved an unsuccessful amendment that Capt. Lockett's appointment should be for the duration of the war. Alderman Leese supported the Electricity Committee's recommendation.

Municipal Transport Meeting Postponed

The annual general meeting of the Municipal Passenger Transport Association, provisionally fixed for July 12th and 13th in London, has been postponed.

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:—

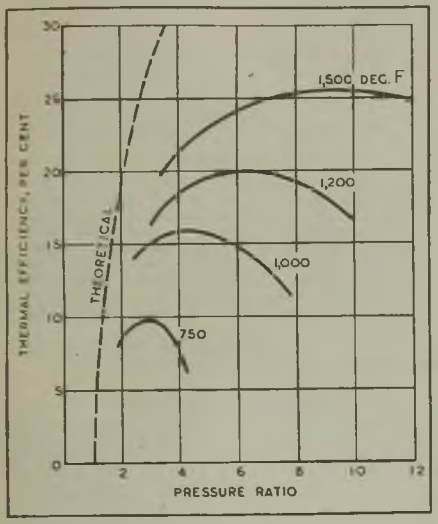
HARVEST pump.

Silent Electric Clock Company (present address).

Combustion Gas Turbines

Potentialities of Open and Closed Gas Cycles

THE open-cycle gas turbine of the combustion type, as now being developed, consists of a unit comprising an axial-flow compressor, a relatively small combustion element and a turbine resembling a plain reactive non-condensing steam turbine. Products of combustion are expanded in the turbine and exhausted to atmosphere. The chemical energy of the fuel is converted into heat energy by being burned with sufficient excess air (*e.g.*, 600 per cent. when the turbine-inlet temperature is 1,200 deg. F.) to obtain the desired temperature, instead of being converted as in the steam cycle, into another medium at a lower temperature before expansion. Higher thermo-dynamic efficiencies are therefore theoretically possible than with steam. Constructional advantages associated with the gas turbine are the elimination of boiler and condenser.



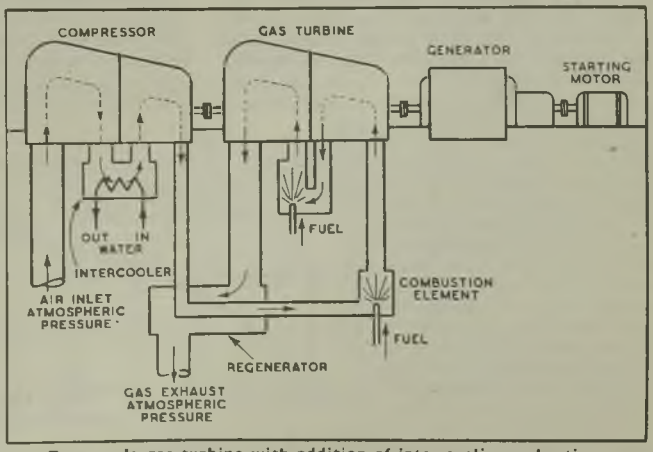
Effect of pressure ratio at various turbine inlet temperatures on thermal efficiency of open cycle. Efficiencies: Turbine 85 per cent.; compressor 84 per cent. Air temperature 70 deg. F.

Since it requires no condenser circulating water, the simple open-cycle system can be employed where supplies of water are not available. On the other hand, high-grade oil is required as a fuel and metals capable of withstanding the elevated temperatures requisite for attaining the highest thermal efficiency have not yet been produced.

In order to compete with steam, a combustion gas-turbine power unit requires to be operated at above 1,000 deg. F. and to achieve very high efficiencies in its turbine and compressor components. According to data given recently by F. K. Fischer and C. A. Meyer of the Westinghouse Company alloys now available—subject to war conditions—will, at the low working pressures encountered (under 100 lb. per sq. in.), withstand a temperature of at least 1,200 deg. F. continuously.

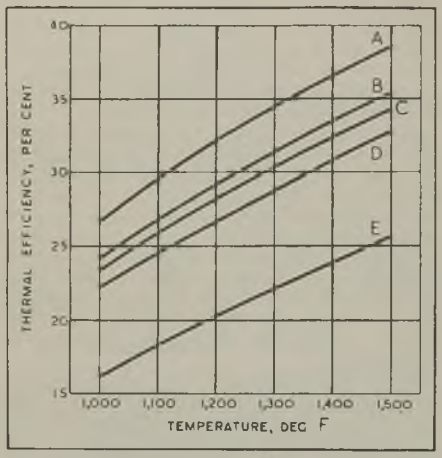
Early applications will, it is considered, be for temperatures not exceeding 1,500 deg., and not less than 1,000 deg. At 1,200 deg. for each kW at the alternator terminal about 4 kW must be produced by the turbine, the balance being used to compress the gas. A reduction of 1 per cent. in the efficiencies of the turbine and compressor (taken as 85 and 84 per cent.) decreases the useful output by 7 per cent. when the simple open cycle is employed. The output falls sharply as the temperature is lowered.

Three ways have been devised for improving gas-cycle efficiency—regeneration, inter-cool-



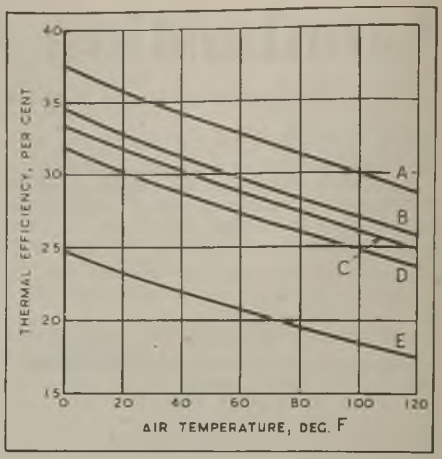
Open-cycle gas turbine with addition of inter-cooling, reheating and regeneration

ing and re-heating. In the first a heat exchanger transfers up to 75 per cent. of the heat of the turbine-exhaust gases to the air entering the combustion element. Intercooling during compression lessens the work of the compressor (owing to the smaller volume of the colder air) by some 15 per cent. for each stage, thus increasing the useful proportion of turbine capacity as well as improving cycle efficiency. Reheating consists of adding heat to the gas (which is about 85 per cent. air) between turbine stages. The colder the inlet air to the compressor, the higher the cycle efficiency and the capacity. In the simple open cycle 10 deg. change varies the efficiency by 3 per cent. and the capacity by about 4 per cent.



Effect of reheating, intercooling and regeneration on thermal efficiency. Air temperature 70 deg. F. and 5 per cent. pressure drop in regenerator :—
A, reheating, intercooling and regeneration.
B, one intercooling stage and regeneration.
C, one reheating stage and regeneration.
D, regeneration. (Regeneration in all cases 75 per cent.) E, simple open cycle

Whereas with steam Carnot cycle efficiency is obtainable only up to critical pressure (3,206 lb. per sq. in. (abs) at 705·4 deg. F.) the gas cycle could theoretically attain it, subject to losses in turbine and compressor and the provision of an infinite number of stages of intercooling and reheating and a regenerator of infinite size. Above 705·4 deg. the gap between the steam cycle and the ideal cycle widens. Above 1,000 deg. the gas-cycle efficiency increases approximately three times as fast as the steam cycle efficiency for a given top-temperature increase.

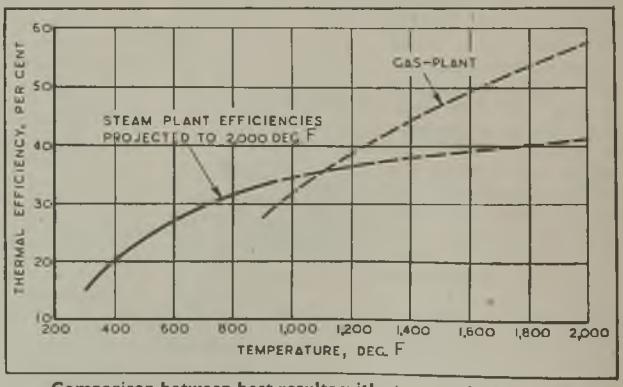


Thermal efficiencies of various cycle arrangements as affected by temperature of inlet air to compressor. Inlet-gas temperature 1,200 deg. F. A, reheating, intercooling and regeneration. B, one intercooling stage and regeneration. C, one reheating stage and regeneration. D, regeneration. (Regeneration in all cases 75 per cent.). E, simple open cycle

Small Energy Output

In view of the low working pressure of the gas turbine, the energy per lb. of gas is small compared with that of steam. For example, in a 5,000-kW, 3,600-RPM simple-cycle unit, the gas flow, with inlet pressure and temperature of 88 lb. per sq. in. and 1,200 deg. F., would be 510,000 lb. per hr. compared with 52,500 lb. of steam at 465 lb. per sq. in. and 825 deg. F.

In this example the ratio of exhaust to inlet volume for the same conditions would be only 3·95 with the gas turbine as against 250 with steam. The large blade dimensions limit the

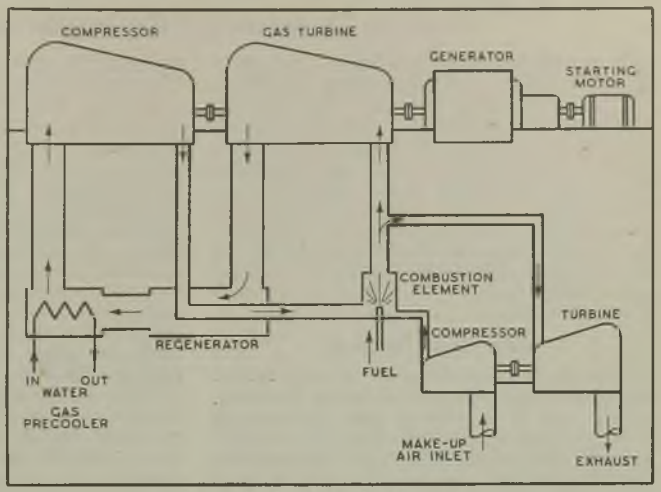


Comparison between best results with steam and with those expected with closed-cycle gas turbines

net output of the open-cycle, single-flow combustion gas turbine to about 7,500 kW, though the injection of liquids is considered to present a theoretical possibility of considerably extending this limit.

The maximum unit capacity can be increased by adopting a closed cycle in which the gas is at a relatively high pressure, thus enabling the physical dimensions of turbine and compressor to be reduced and making possible an approach to standard steam-turbine ratings. Gas is cooled before entering the compressor and the amount of heat given up to the cooling water is equivalent to that removed in the condenser of a similar steam unit. The quantity of water is less, however, as a higher temperature rise is permissible.

In the Escher Wyss externally fired closed cycle the products of combustion do not pass through the turbine and compressor, but heat is transferred from them to a recirculated working gas which is expanded in the turbine. The gas heater is larger than a modern steam boiler because gases are on both sides of the heater. The cycle is thus similar to the steam cycle, except that the working fluid does not undergo a change of state. The problem of using coal should be simpler of solution than in systems in which the products of combustion are circulated. The compressor-inlet pressure is maintained at about 150 lb. per sq. in. with a discharge pressure to the turbine of 600 lb. Hydrogen would have advantages as a working medium, since its density is one-fourteenth that of air, and its specific heat is fourteen times and its thermal conductivity 6·8 times as much as air.



Internally fired closed-cycle unit

An internally fired closed cycle system under development by the Westinghouse Company employs an auxiliary gas turbine and compressor to supply make-up air to maintain pressures at similar figures to those of the Escher Wyss system. It avoids the large gas heater required by the latter but calls for the removal of solid matter from the circulated products of combustion. In both cases turbine control is effected by regulating gas temperature through varying the rate of fuel supply. Governing valves are not needed. Efficient performance at less than full load can be obtained by the use of two turbines, one for variable speed driving a compressor, the other for constant speed driving a generator. Reheating and inter-cooling improve efficiency, as they do in the open cycle, but in the closed cycle almost full-load efficiency can be achieved by reducing gas pressure as the load is reduced. A big problem of the closed cycle method is the building of practicable heat exchangers, which is further complicated by the deposit of foreign matter, causing corrosion and erosion and reducing heat-transfer rate

EFFECT ON PERFORMANCE OF DIFFERENT OPEN-CYCLE SYSTEMS

Item	Simple cycle	With regeneration	With inter-cooling & regeneration	With reheating & regeneration	With inter-cooling, reheating & regeneration
Turbine rating	3·95	2·95	2·80	2·88	2·55
Compressor power	2·95	1·95	1·80	1·88	1·55
Useful output	1·00	1·00	1·00	1·00	1·00
Eff. at 1,200 deg. F. per cent.	20·2	26·6	29·2	28·1	32·2
Gas temperature deg. F :					
Turbine inlet	1200	1200	1200	1200	1200
Turbine exhaust	635	790	695	920	865
Leaving regenerator	—	455	350	560	520
Air temperature deg. F :					
Compressor inlet	70	70	70	70	70
Leaving compressor	490	340	230	440	405
Entering combustion element	490	680	575	800	750
Pressure lb. per sq. in. (abs.) at:					
Compressor discharge	88·2	51·5	73·5	73·5	102·9
Turbine inlet	88·2	50·2	71·7	71·7	100·4
Turbine exhaust	14·7	15·1	15·1	15·1	15·1

Rates and Water Power

Scottish Committee's Recommendations

IN the Report on Hydro-Electric Development in Scotland prepared by the Committee presided over by Lord Cooper reference was made to the manner in which local taxation methods impose on hydro-electric undertakings a much heavier burden than on equivalent steam stations. As briefly reported in our last issue, proposals to alleviate this handicap have now been made by a Committee appointed in June, 1943, by the Secretary of State for Scotland, the chairman being Mr. J. G. McIntyre (Report Cmd. 6526, Stationery Office, 4d.).

Detrimental Influence

Surveying the application of the revenue (or profits) principle of valuation the Committee says it is evident that the rateable value of the generating side of a hydro-electric undertaking (which requires massive civil engineering works) must be relatively higher than that of a steam station. In the case of the latter coal costs are deducted as a working charge, but there is no corresponding deduction in respect of hydro-electric generation. In the Committee's view the disparity in valuation between schemes of equal installed capacity would be in the neighbourhood of two to one, not three to one as given in the Cooper Report. It is satisfied that this may exert a detrimental influence in several ways. For instance, when the cost of construction per kW enters the higher reaches the rates to be paid may materially affect the decision whether or not a scheme is justifiable. Another important aspect is that to attract industries to the Highlands it is necessary for the cost of electricity generation to be reduced to the minimum.

Arguments Against Concessions

Objectors to the granting of concessions argued that notwithstanding the higher rates water power was still cheaper than generation by steam. Local authorities represented that, while appreciating the need for every encouragement to hydro-electrical development, they should not be called upon to sacrifice any rates. In particular, Highland authorities contended that concessions to the North of Scotland Board might not primarily benefit the local ratepayers as a large proportion of the energy produced, at least at the outset, would be sold to the C.E.B. for consumption outside the Highlands. The Committee says it is satisfied that the real interest of the local authorities lies in making some concession and points out that the assurance of a considerable bulk demand is essential for the financial success of the North of Scotland Board.

Dealing with the schemes to be carried out by the North of Scotland Board, the Committee concludes that these should be given a permanent measure of rating relief, but it cannot find any justification for recommending that this should extend to complete exemption. It considers that, in equity, the same degree of relief should be accorded to existing concerns. The Galloway Company already receives a substantial concession under its private Act and during the first five productive years the Grampian Company also enjoyed concessions which have not been continued.

With regard to the latter, the Committee says an assurance was given that " any relief of rates would unquestionably be utilised for the benefit of consumers in one way or another." It recommends that consideration should be given to the possibility of making the relief conditional upon the extension of the company's distribution system to the maximum economic limits and, after this has been fulfilled, on a requirement that the produce shall be applied in the reduction of the company's tariffs. No recommendation is made with regard to the hydro-electric schemes of the British Aluminium Co.; in each case the generating plant and electro-metallurgical factory are valued as a single industrial unit and derating provisions apply.

Proposed Relief

As to the form which the relief should take the Committee recommends one of three alternatives, namely, an additional deduction of 25 per cent. from the gross annual value of generation works; a deduction from the undertaking's gross revenue, in calculating its gross annual value, of a sum equal to 3½ per cent. upon the capital expended on generation works in excess of £30 per kW installed; or an adjustment of the valuation of the generation works in accordance with the proportion which £30 per kW bears to the actual constructional cost. No reduction in the valuation of the existing lands and heritages of a hydro-electric undertaking situated in any major rating area should become effective until other subjects of rateable value equal to that which is being lost have been created by the undertaking itself or by another hydro-electric undertaking and have been entered in the valuation roll for the area. The relief should be subject to periodical revision by the Secretary of State after consultation with the Electricity Commissioners.

Electrical Economy

Efficient Use in Industry

IN a lecture arranged by the Ministry of Fuel and Power on June 15th, Mr. VERDON O. CUTTS (G.E.C.) discussed practical ways of reducing consumption of electricity without adversely affecting production. Accurate records (preferably in graph form) should, he said, be kept in order to compare results with the target set. Energy supplied to individual departments should, if possible, be measured and tests should be taken of different motors, particularly if underloading was suspected.

After referring to the value of cleanliness of lamps and reflectors and giving a warning against uneconomical reduction of foot-candles, Mr. Cutts turned to the savings possible through the correct operation of electric furnaces. Energy usefully employed equalled the product of the weight in lb., the specific heat and the temperature rise in deg. F. divided by 3,412 and, in addition, when the furnace was used for melting, the product of weight in lb. and latent heat of fusion divided by 3,412. Radiation losses (in kWh per sq. ft. of wall area) could be closely estimated from experience and from data published by manufacturers of insulating materials. Open door losses (in kWh per sq. ft. of door opening per hr.) were in the control of the furnace operator and minutes counted.

Use of Stored Heat

The high thermal capacity of furnaces designed for continuous operation indicated a need for working them up to capacity so as to reduce radiation losses. With some types of melting furnace, the last melt of the day could be carried out by the heat stored in the refractories without any electrical input. If dispersed factories were not too far apart, electrical consumption could be materially reduced by centralismg heat treatment.

Several types of furnaces were required to give the different treatment called for in hardening various qualities of steel and for tools. Considerable savings would be possible if the work could be organised so that all workshop requirements were met on one to three days each week, as was usually possible. One complete set of tool-room furnaces, including low- and high-temperature salt-bath and forced-air-circulation equipment, was generally capable of serving a group of factories.

Electric furnaces and ovens for intermittent work should not have too great a thermal capacity. With automatic control the setting of pyrometers could sometimes be profitably reduced during any prolonged waiting periods. Continuous-type furnaces should not be allowed to run light avoidably. Heat recuperation with three or four pots, in which the outgoing charges gave up heat to the incoming, might save on an average as much as 15 per cent. in energy consumption, equivalent to about 30 kWh per ton.

Losses in induction furnaces were lessened by the fact that the heat was generated in the charge itself. A large proportion of drying ovens in this country were worked on a temperature basis, whereas many could work at very much lower temperatures with increased air volumes, since it usually cost more to raise temperature than to propel air. For large ovens the use of the drying power of recirculated air should always be considered.

Where a fan load had been lightened a reduction of motor speed was preferable to the use of dampers. Air mains should be tested periodically for leaks. Thermostatic control of space heating was a great energy saver. Large numbers of electric unit and thermal-storage (clear-of-peak) heaters and electrode steam raisers for process work had been installed during the war (*e.g.*, 1,500 kW in a single works). These had the advantage of low capital and labour and maintenance charges and materially reduced pipe losses, especially with scattered workshops. Automatic mixing valves were recommended for larger installations. In canteens where various goods were baked, bread and other items requiring high temperatures should be dealt with first, using the gradually falling temperature for articles requiring a longer baking period. Sometimes small unit ovens were more economical than large single-compartment ovens. Time switches often saved energy.

Keeping Down the Peaks

With regard to motive power, Fuel Efficiency Bulletin No. 13 (Ministry of Fuel and Power) should be studied. The use of heavy-powered machines should be restricted during the morning periods when the demand on the grid was heaviest, and co-operation between neighbouring power users might avoid coincident peaks.

Motors should not be rated above their duties. A duty cycle should be obtained for each drive as far as practicable and manufacturers should be consulted as to the most suitable type and size. Proper use should be made of overload capacity (this applied also to transformers). Underloading of motors and consequent low power factors increased fuel consumption by increasing

generator and transmission losses, even necessitating the running of further turbo-alternators to produce the additional kVA. Generally speaking, the power factor of induction motors improved with higher speeds; thus for a 20-HP 970-RPM machine the values would be 0·88 at full load and 0·77 at half load. Corresponding figures for a 480-RPM motor would be 0·76 and 0·58. By connecting a motor in star instead of in delta the flux, and therefore magnetising current, was reduced thus improving the power factor; iron losses and copper losses would both be less; capacity would be about half normal and torque one-third of the direct-to-line value.

Routing of work to avoid unnecessary crane handling, regrouping of machines running on night shift, shutting down motors when not loaded or during setting up of work and the use of stop buttons and indicating lamps all led to economy.

Improved Service Arrangements

Avoiding Inaccessibility and Inconvenience

AN ingenious arrangement by Mr. Hampton E. Blackiston, chief engineer and manager of the Swansea Electricity Department, for accommodating house service connections in a cupboard or other piece of furniture avoids the necessity for hiding the apparatus away in some inconvenient, inaccessible place. In the unit illustrated the depth is 7½ in., 4½ in. of which is recessed in the wall. The portion behind the glass contains the cable box, any type of slot or single-phase meter and the double-pole main switch, with room for the installation of a check meter and provision in the cable box for looping out to one or more houses. The portion behind the clock, which is optional, contains the household distribution heating and lighting fuses.

Cupboard used for housing service connections

If desired, a lighting bracket can easily be included in the design, thus saving the cost of a lighting point in the hall, while the addition of a flush type plug on the side of the case provides a point for a vacuum cleaner, etc. Further savings in installation costs result from the fact that the distance of the equipment from the wall of the building nearest the distribution cable need never be more than about 4 ft.

Mr. Blackiston emphasises that his idea is not intended as a new design of service apparatus, but only as a new way of concealing much existing or any new type of service apparatus in such a way that it will reduce costs in another direction, particularly in lengths of service; provide accessibility for the consumer, especially if a slot meter is used, and for the meter reader; and enable the whole of the equipment to be constructed and assembled in a workshop, leaving nothing to be done at the service point other than the connection of the cable and the distribution wires. The ability to use any type of apparatus avoids the necessity for scrapping every manufacturers' existing standard equipment, without restricting future development either of apparatus or methods of tariff.

Not only is the scheme suitable for houses in working-class areas, but also for blocks of offices, flats, etc. One other suggested form the idea might take is the incorporation of the equipment in a window seat.

A provisional patent has been taken out protecting the idea of using as housing for service apparatus the case or carcase of any furniture which is commonly used in a hall, reception room or office. A company, under the name "The Attractive Service Co." is now being formed either to manufacture, or licence others to manufacture, articles of furniture for this specific purpose.

Consulting Engineers

THE annual report of the Association of Consulting Engineers shows that during the year 1943-44 eight new members were enrolled, raising the membership to 182, the largest in the Association's history. There was one resignation and four deaths. During the year the chairman made 43 nominations in response to inquiries for the services of consulting engineers. Proposed amendments to the articles of association have been submitted to a recent extraordinary general meeting. They provide for the extension of the qualifications for membership so as to include associate (corporate) members of the Institutions of Electrical and Mechanical Engineers, but candidates whose age is less than 33 cannot be nominated for election unless the circumstances are exceptional. A sub-committee has been appointed specially to deal with post-war export problems; in particular to make representations on priorities and administration to stimulate development of schemes abroad.

ELECTRICITY SUPPLY

Gainsborough Rebates.

Chesterfield.—SUPPLY SCHEME.—In response to an application from Brampton Parish Council for a supply of electricity to Cutthorpe the Electricity Committee recommends that a scheme extending a supply to Pratt Hall estimated to cost £5,500 be submitted to the Electricity Commissioners. If the scheme is approved it is proposed that the charges for the supply shall be 33⅓ per cent. above the corresponding rates within the borough.

Falmouth.—OPTION TO PURCHASE UNDERTAKING.—The Council has the option to purchase the local electricity undertaking from the Electric Supply Corporation, Ltd., in 1945. As it would not be possible to come to a decision to give the required twelve months' notice on July 11th, the company was asked to agree to an extension of twelve months. In reply the company agreed to six months only. The town clerk was therefore instructed to inquire through the appropriate Ministry whether the option to purchase could be extended to take effect "twelve months after the end of the present emergency."

Fort William.—ATTRACTING NEW INDUSTRIES.—The first step to attract industries to the North of Scotland is to get the price of electricity published by the Hydro-Electric Board so that prospective businesses will know if it will be an economic proposition to start up new industries in the Highlands. Expressing this view at a meeting of the Town Council, the Provost added that if the price was going to be the same in the south as it was on the site there would be no attraction of industries to the Highlands.

Gainsborough.—ADDITIONAL REBATE.—Electricity consumers in the town are to benefit by an increased supplementary rebate of 20 per cent. in respect of March quarter only. Councillor S. Vickers, chairman of the Electricity Committee, who announced this at the monthly meeting of the Urban District Council, said that consumers under ordinary tariffs were receiving electricity at pre-war rates, despite the fact that coal, wages, etc., were all costing more. In spite of this, a rebate of 33⅓ per cent. was allowed to consumers in February, 1943, and subsequently a rebate of 7½ per cent., together with 2½ per cent. cash discount, had been allowed for each quarter. The additional 20 per cent. rebate for the March quarter, as recommended by the Electricity Committee, would apply to prepayment lighting, ordinary lighting and business premises, and also to rateable value and small industrial power and heating tariffs.

A scale of charges which we have received from Mr. R. C. Hammersley, the engineer and manager, shows that the lighting flat rate is 4d. per kWh and under the domestic rateable value tariff the running charge is ½d.

Lanarkshire.—SUPPLY TO VILLAGES.—The Clyde Valley Electrical Power Co. is being approached regarding supplies of electricity to the villages of Auchengray, Woolfords and Tarbrax.

Liverpool Lighting Test.

Liverpool.—"MOONLIGHT" ILLUMINATION.—In the early hours of one morning last week, about three miles of streets in the central area of the city were lighted to test the new "moonlight" system of illumination. About 160 lamps were controlled by a master switch. No new material had been used for the installation, old fittings having been adapted for the purpose.

London. — EXTENSIONS. — Poplar Borough Council Electricity Committee is seeking sanction to borrow £1,620 for feeder extensions. The borough electrical engineer has been authorised to supply electricity to the Old Ford pumping station for the Metropolitan Water Board.

Newcastle-on-Tyne.—EXTENSION OF TIME.—Powers granted to the City Council to acquire the undertakings in the city area of the Newcastle and District Electric Lighting Co. Ltd., and the North-Eastern Electric Supply Co., Ltd., expire on July 3rd this year. The Corporation is to apply for the further extension of the time limit by two years.

Newcastle (Staffs).—MAINS.—The Electricity Committee proposes to extend overhead and underground mains from Red Street to Mitchell's Wood Farm and Footrail Colliery and from Oak Lane to Miners' Hostel, Knutton.

Overseas

Canada.—CHEAPER ELECTRICITY IN MONTREAL.—General reductions in electricity charges in the Montreal metropolitan district, amounting to $2,210,000 annually, have been announced by Senator T. D. Bouchard, chairman of the Quebec Hydro-Electric Commission. The previous day the Commission had reported the conclusion of labour agreements designed to raise the salaries and wages of employees by $300,000 yearly. Senator Bouchard said that the former policy of maximum profits to shareholders had been replaced by a policy of maximum benefits to consumers.

TRANSPORT

Blackpool.—INCREASE OF CHARGES.—The Minister of War Transport on June 7th made the Blackpool Corporation Tramways (Increase of Charges) Order, 1944.

Bolton.—ELECTRIC CLOCKS.—At a meeting of the Transport Committee the general manager recommended that, in order to assist in the regularity of operation of vehicles, electric clocks should be fitted at outer termini and main turn-back points on the various routes. The Committee agreed to the purchase of 35 clocks for this purpose.

Gateshead.—TROLLEY-BUSES FAVOURED.—The Town Council has decided to inform the Ministry of War Transport that trolley-buses are the form of transport desired by the Corporation and the people of Gateshead. The Ministry is urged to approve the Provisional Order sought by Newcastle Corporation to introduce trolley buses into Gateshead over the Tyne and High Level Bridges.

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) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

AKT.-GES. für Technische Studien.—"Thermal power plants." 2062/43. January 21st, 1942. (561692.)

Babcock & Wilcox, Ltd.—" Walls comprising rows of tubes for effecting heat exchange." 16870/42. December 4th, 1941. (561756.)

H. A. Birch.—"Electrical resistances." 1989. February 6th, 1943. (561689.) " Electrical resistances." 1990. February 6th, 1943. (561690.)

British Tabulating Machine Co., Ltd.—" Magnetic-recording apparatus." 16903/42. November 29th, 1941. (561758.)

British Thomson-Houston Co., Ltd.—" Method of sealing vitreous material to oxidisable metal." 17731/42. December 24th, 1941. (561682.) " X-ray generators." 13800/42. October 2nd, 1941. (561771.)

J. A. Crabtree & Co., Ltd., H. F. McLoughlin and R. W. Morgan.—" Snap-action electric tumbler switches." 2230. February 10th, 1943. (561786.)

F. W. Davies and R. K. Davies (trading as F. W. Davies & Son).—" Starting switches for electric motors." 17558. February 10th, 1942. (561761.)

English Electric Co., Ltd., and E. A. Binney.—" Spur gearing." 17662. December 11th, 1942. (561714.)

English Electric Co., Ltd., J. A. Fraser and R. W. Humm.—" Mounting of electric hotplates." 1959. February 5th, 1943. (561669.)

R. Gidley.—" Rocker arm snap contact electric switch." 3177. February 26th, 1943. (561798.)

C. A. W. Harmer, J. W. Dalgleish and Pye, Ltd.—" Tuning devices for oscillatory electric circuits." 2829. February 19th, 1943. (561787.)

P. T. Hobson and Boosey & Hawkes, Ltd.—" Electrical musical instruments." 2631. February 17th, 1943. (561729.)

Igranic Electric Co., Ltd.—" Electro-magnetic brakes." 16721/42. November 28th, 1941. (561776.)

S. P. C. Jaina.—" Electric torch." 1732. February 2nd, 1943. (561719.)

Kapella, Ltd., M. H. Taylor and T. W. Clifford.—" Measuring apparatus." 17149. December 2nd, 1942. (561783.)

T. C. MacNamara, P. A. T. Bevan and C. G. Mayo.—" Radio-frequency output circuits of electrical transmitters." 15021. October 26th, 1942. (561705.)

C. G. Mayo.—"Impedance measuring apparatus." 2093. February 8th, 1943. (561693.)

Measurement, Ltd., F. H. Batt and C. F. Clifford.—" Rotors of electricity meters, small motors and the like." 3122. February 25th, 1943. (561795.) " Electricity meters and other induction type instruments." 3123. February 25th, 1943. (561796.)

Modinstal Electric Co., Ltd., and E. C. Malins.—" Electric infra-red heat generators." Cognate applications 13617/42 and 15891/43. September 28th, 1942. (561742.)

J. F. O'Brien.—" Electricity conductor unit." 2628/43. January 30th, 1942. (561728.)

Philco Radio & Television Corporation.—" Amplitude limiting system for frequency modulation receivers." 16886/42. January 12th, 1932. (561779.)

Santon, Ltd., and D. Kitcher.—" Rotary electric switches." 3074. February 25th, 1943. (561794.)

B. Schwarz, P. R. Mossay and P. A. H. Mossay.—" Construction of rotors for electric induction motors." 16895. November 27th, 1942. (561658.)

Simms Motor Units, Ltd., J. Ayres and G. H. F. Walton.—" Temperature-compensated battery charging systems." 16742. November 25th, 1942. (561680.)

Standard Telephones & Cables, Ltd., and C. H. Foulkes.—" Mechanical adjustment of elements mounted inside vacuum or gasfilled tubes." 16823. November 26th, 1942. (561710.)

A. M. Taylor.—" Electric power transmission." 16687. November 25th, 1942. (561775.)

J. B. Tucker.—" Means of mounting and securing electric switch mechanism or the like within a wall or other surface." 2950. February 23rd, 1943. (561792.)

F. S. S. Wates.—" Electric heating devices applicable for bed-warming and the like." 2891. February 22nd, 1943. (561789.) " Electric heating devices applicable for room-warming and the like." 2892. February 22nd, 1943. (561790.)

Western Electric Co., Inc.—" Electron-discharge apparatus." 10041/42. July 31st, 194. (561644.)

Westinghouse Electric International Co.—" Method and apparatus for coating the surface of containers for fluorescent lamps." 15622/42. November 29th, 1941. (561773.)

Winsor Engineering Co., Ltd., and J. Marshall.—" Ventilating units and fans for use therein." 16859. November 27th, 1942. (561657.)

Amended Specification

L. W. Meyer.—" Permanent magnets and processes of treating alloys for such magnets." (522731.)

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections may be made within a month from June 14th.

LUM-ARC. No. 626,503, Class 9. Cinematograph projectors, searchlights and spotlights, all adapted for use with an electric arc; and parts (not included in other classes).—Accrometer Manufacturing Co., Ltd., 22, High Street, Kingston-on-Thames.

SYNTHA. No. 627,399, Class 9. Parts (not included in other classes) of scientific, electrical, optical, signalling, checking, controlling and indicating apparatus and instruments, etc.—Ronald Trist & Co., Ltd., Bath Road, Slough.

Factory Rating Case

Terminus of "Main Transmission"

By F. E. Sugden, A.C.I.S., Barrister-at-Law

AN important rating case concerning electrical equipment (Thomas & Co., Ltd., *v.* the County Valuation Committee and the Assessment Committee) recently occupied the attention of the Court of Appeal.

Briefly the facts were these: Electricity was brought into a large works from the grid at a voltage of 11,000. From the first distribution board some of this supply was fed straight to machines operating at 11,000 V and the remainder taken through transformers to a 440-V second distribution board. From this some passed to the machinery and some to a 110-V distribution board. Similar arrangements applied to power, generated at the works, at 6,000 V and 2,200 V. The Court of Appeal held that all of the above were part of the "main transmission of power" and therefore part of the hereditament for rating purposes.

Lord Justice Scott, in delivering judgment, stated that the appeal turned solely on the interpretation of the provisions made by the Rating and Valuation Act, 1925, Section 24, which determine where the statutory line is to be drawn between those parts of the plant and machinery of a factory or works which are, for rating purposes, to be deemed part of the hereditament of the occupier and, therefore, rateable, and those parts in regard to which no account is to be taken of their value in arriving at the assessment. In fact, before 1925 there was a distinction between plant and machinery and a mere warehouse, and as a consequence Section 24 of the 1925 Act instituted a means whereby this could be decided once and for all. A "Statement" was prepared by a Committee duly appointed and issued with the approval of Parliament to enable all persons concerned to have precise information as to what machinery and plant was, and what was not, to become rateable. This was brought forward in the Plant and Machinery (Valuation for Rating) Order, 1927.

Supply and Utilisation

The classification in accordance with Lord Justice Scott's interpretation was based broadly on the distinction between supply and transmission of power on the one hand and the utilisation of such power in the manufacturing processes on the other. Electric power for driving plant and machinery had obviously to be dealt with separately from, though comparable with, supply and transmission by other forms of power.

Lord Justice Scott stated that the language of the Third Schedule was the key to the whole situation. It defines classes of machinery and plant which shall be deemed part of the property to be rated as follows: "Machinery and plant (together with . . . cables, wires and other appliances and structures accessory thereto) which is used or intended to be used . . . in connection with any of the following purposes . . . *(a)* the generation, storage, primary transformation or main transmission of power in or on the hereditament."

There is a further footnote, namely, that in the case of machinery or plant which is in or on the hereditament for the purpose of manufacturing operations or trade processes, the fact that it is used in connection with those operations or processes shall not cause it to be treated as falling within the classes of plant or machinery specified in this Schedule. The importance of this proviso is that it contrasts "the purposes of manufacturing operations" and "trade processes" with the purposes of "generation, storage, primary transformation and main transmission of power" and thereby indicates the boundary line between rateable and non-rateable plant.

Primary Transformation

The Statement drawn up by the Committee already referred to lays down that "primary transformation of power" means and includes any transformation of electrical power in or on the hereditament by any transforming plant which changes the pressure or frequency or form of current of the power as generated in or on or supplied to the hereditament to another pressure or frequency or form of current for distribution in the hereditament wherever such transformation is effected at some point in the main transmission.

"Main transmission of power" means and includes all transmission of power from the generating plant or point or points of supply in or on the hereditament up to and including (1) Where power is transmitted to any other hereditament, the point or points at which power passes from the hereditament . . . (3) Where electrical power is transmitted by means of cable or cables, the main distribution board or boards to which the cable or cables from the generator or generators or point or points of supply is or are led either directly or with the intervention of a transformer or transformers, and whose bus-bars carry or are intended to carry electrical energy at the pressure at which the power distributors are supplied . . .

The basis of the definition in (3) above of the terminus of " main transmission " on any transmission circuit is the " main distribution board " at which two things happen, namely (*a*) the supply comes in and goes out at the same voltage and (*b*) it goes out direct to one or more " distributing circuits," so that the only question of construction which remains is the meaning of " distributing circuits."

The Court of Appeal held that the phrase points to the same conception as " power used in connection with plant or machinery used for manufacturing operations or trade processes."

NEW BOOKS

Jig and Fixture Practice. By H. C. Town, M.I.Mech.E., M.I.P.E. Pp. 113; figs. 97. Paul Elek (Publishers), Ltd., Africa House, Kingsway, W.C.2. Price 10s. 6d.

Mass production methods in the engineering industry are usually associated with the manufacture of large numbers of units, but so economical have these methods proved to be in practice that there is a growing tendency to employ them on all repetition work even when the number of units involved is not large. In this book the author deals, not only with the problems of design, but discusses what may be termed the economic aspect of the subject, *i.e.*, the circumstances in which the use of a jig or a fixture is justified.

The jig is defined as a work-holding device provided with bushes or guides for the cutting tools, whereas in the fixture no such provision is made, but the primary function of both is to reduce the cost of production by the elimination of marking out and by enabling the work to be performed by unskilled labour. The problem of designing a suitable jig or fixture necessarily depends upon the nature of the job, but in every case it may be said to involve a complete knowledge of machine shop equipment and methods. The author discusses the general principles involved in the various types of jig and fixture and includes illustrated examples of the application of each, but in addition he has much to say upon the broader subject of modern machine shop production methods. This is a thoroughly practical and up-to-date work which should prove of great value, not only to the student and the tool designer, but also to the planning engineer.—A.R.

Substation Plant and Equipment. By C. H. Pike. Pp. 340; figs. 212. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 17s. 6d.

The object of this book is to present a survey of the types of plant and equipment and the trend of modern design in distributing, switching and converting stations. The subject has been approached from the practical viewpoint, and the text is largely descriptive. The main sections comprise circuit-breakers, transformers, converting plant, protective gear and fire protection, with a chapter on the application and uses of various insulating materials. The range of circuit-breakers discussed is extensive, from the 400-V air-break type and switch fuse to the 132-kV impulse breaker. The various methods of arc control used in oil circuit-breakers of all voltages are described and illustrated.

Transformers are fully treated on the same lines, with special chapters discussing natural and forced cooling and methods of measuring and controlling temperature, and designs for special purposes, *e.g.*, hermetically sealed units are detailed. A well-written chapter on AC voltage control, embodying on-load tap change units, voltage regulators, etc., completes the most interesting section of the book. Converting plant includes motor convertors and the modern water-cooled mercury-arc rectifiers. A chapter on DC batteries, so important in the successful operation of modern switchgear and plant, might, with advantage, have been included.

The section on protective gear, including the protection of DC plant, gives a brief review of some of the schemes now employed, although the field to be covered by such a chapter is, of course, very extensive. The methods of fire protection of plant and apparatus, including fire screen partitioning, protection of cables, automatic and manual systems and appliances employing gas, foam, water and chemical media are well described. Although gas is excellent for indoor plant, the effectiveness of water as a medium for outdoor plant cannot be disputed, and more space might have been devoted to its application.

The book is well illustrated with over 200 photographs and diagrams, and concludes with an excellent bibliography for all sections with particular reference to technical papers published in the *I.E.E. Journal*. The facts are well marshalled, and the book will be of value to all interested in the practical development of modern distribution plant and will give the student a very good insight into the practical application of modern equipment.—F.N.B.

Shorter Notices

Radio Waves and the Ionosphere. By T. W. Bennington. Pp. 81; figs. 27. *Wireless World*, Dorset House, Stamford Street, London, S.E.1. Price 6s.

Diesel Electric Shunting Locomotives. By V. Finegan. Pp. 192; figs. 84. George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Price 7s. 6d.

Porcelain and Other Ceramic Insulating Materials. Vol. I. By Dr. Ing. Ernst Rosenthal. Pp. 287; illus. Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price 28s.

Practical Electrical Wiring and Contracting. Edited by A. C. Greenwood. Pp. 384; illus. Odhams Press, Ltd., Long Acre, London, W.C.2. Price 8s. 6d.

Engineering Production Annual (Pp. 102) and **Engineering Materials Annual** (Pp. 106). Edited by H. H. Jackson, A.F.R.Ae.S., M.I.E.I. Paul Elek (Publishers), Ltd., Africa House, Kingsway, London, W.C.2. Price 8s. 6d. each volume.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Callender's Cable & Construction Co., Ltd.—The statement to be presented at the annual meeting on July 3rd by the chairman (Sir Malcolm Fraser, G.B.E.) shows that the profit for 1943, after providing for taxation, depreciation and directors' fees was £465,115 (against £451,031). The ordinary dividend and bonus is maintained at 20 per cent. and £175,000 is transferred to reserve for war contingencies, etc., and is earmarked for the reinstatement of employees in the fighting forces.

Last year the whole of the debenture stock was paid off, placing the preference and ordinary stockholders in a much stronger capital position. In addition to making full provision for maintenance the company in recent years has spent about £1,000,000 on up-to-date machinery and buildings. This has enabled the company to improve production efficiency for the benefit of the nation, its customers, the stockholders and employees.

Sir Malcolm, dealing with the company's strong financial position says that the total reserves now amount to rather more than the company's total issued capital. He also says that the company has expended large sums on research with marked effect upon products and efficiency of operation. In a tribute to employees in the forces and those still with the company Sir Malcolm says that provision for allowances for the former are included in the accounts.

The London Electric Wire Co. & Smiths, Ltd., reports that after providing for taxation and contingencies the net profit for 1943 amounted to £97,514, as compared with £100,379. Added to this are £25,000 (£50,000) for investment reserve no longer required, and £128,258 (£110,234) brought in. Fees take £1,050 (same), general reserve £7,500 (nil), special reserve £7,500 (nil) and additional appropriation for establishment of a superannuation scheme £25,000 (£50,000). A final dividend of 5½ per cent. is to be paid, again making 7½ per cent., and £128,417 is carried forward.

The Lightfoot Refrigeration Co., Ltd.—Mr. F. Ryder, chairman, reported at the ordinary general meeting on June 14th that negotiations in regard to the disposal of the Calcutta Ice & Cold Storage business for the purpose of redeeming debentures were making satisfactory progress and a very substantial payment on account had been received. Freed from the very heavy burden of the debentures the company would enter the post-war period as a company much better equipped than they entered the crisis and he had every confidence in the future.

The B.E.T. Electricity Supply Co., Ltd., a subsidiary of the British Electric Traction Co., Ltd., reports a revenue for the past year amounting to £79,339, as compared with £78,370 for the previous year. Taxation absorbs £32,310 (£30,874), debenture interest £14,000 (same), directors' fees £1,000 (same) and general expenses £650 (£606), leaving a profit of £31,379 (£31,890). The dividend is to be maintained at 5 per cent. and £12,457 (£12,800) goes to reserve, leaving £30,189 (£29,992) to be carried forward.

The Electrical Finance & Securities Co., Ltd., records a revenue of £100,192 for 1943, as against £100,061 for the previous year. The net revenue amounted to £68,184 (£62,093) to which is added £56,944 (£52,226 brought in). A final ordinary dividend of 6 per cent. is to be paid, making 10 per cent. (same), with a bonus of 3½ per cent. (2½ per cent.) and £64,003 is carried forward.

The English Electric Co. of Canada, Ltd., and its subsidiary, the Canadian Crocker-Wheeler Co., report a consolidated net profit of $61,867 for 1943, compared with $107,721 for 1942. The dividend was reduced to 25 cents quarterly in the second quarter. Mr. Andrew S. Tait, president, in his report states that during the year a very large proportion of the production represented orders for war equipment on which the profit was considerably below the normal peacetime rate. The volume of sales or shipments was 7 per cent. less than in 1942, due principally to changes in production methods and new developments during 1943. The volume of orders in hand at the end of the year assures a high production rate during 1944.

Venner Time Switches, Ltd., report a net profit of £28,677 for 1943 (against £75,593). The dividend is maintained at 15 per cent.

Franco Signs, Ltd., is to pay a dividend of 10 per cent., 2½ per cent. more than in 1942-43. The net profit of operating subsidiaries totalled £28,578, as against £19,550.

The Globe Telegraph & Trust Co., Ltd., proposes to pay a final dividend of 2 per cent., tax free, again making 5 per cent. tax free for the year.

The Telephone Manufacturing Co., Ltd., is paying a final dividend of 6½ per cent. (same), making a total of 9 per cent. (same) for the year.

Ruston & Hornsby, Ltd., from a net profit of £310,913 (against £312,121) are again paying an ordinary dividend of 12½ per cent.

The Electric Construction Co., Ltd., is again paying a dividend of 12½ per cent. for the past year.

The Electric Furnace Co., Ltd., is again to pay a final dividend of 4½ per cent., making 8 per cent. (same) for the year.

Mirrlees, Bickerton & Day, Ltd., have announced an ordinary dividend of 8 per cent. for the year ended March 31st last, the same as for the previous year.

Thomas de la Rue & Co., Ltd., are paying a final dividend of 30 per cent., making 40 per cent. for the year. This compares with 35 per cent. for the previous fifteen months.

The Anglo-Portuguese Telephone Co., Ltd., announces a final dividend of 5 per cent., again making 8 per cent. for the year. The net profit was £52,121 as against £52,627.

The Delhi Electric Supply & Traction Co., Ltd., is maintaining its final dividend at 5 per cent., tax free, making 9 per cent., tax free (same), for the year.

The Cawnpore Electric Supply Corporation, Ltd., is paying a final dividend of 5 per cent. (7 per cent.), making 7 per cent. (10 per cent.) for the year.

The Harland Engineering Co., Ltd., is raising its dividend from 5 to 6 per cent. for 1943.

New Companies

Ritchies Radio, Ltd.—Private company. Registered in Edinburgh June 7th. Capital, £1,000. Objects: To carry on the business of radio, electrical, mechanical and general engineers, etc. Directors: G. M. Ritchie, 35, Lorne Street, Leith, Edinburgh; C. Cruickshank, 13, Sloan Street, Edinburgh; D. Neilson, 60, Broomhall Avenue, Carrick Knowe, Edinburgh; and R. L. Rae, 52, Kekewich Avenue, Edinburgh. Registered office: 43, Ferry Road, Edinburgh.

J. D. Radio, Ltd.—Private company. Registered June 2nd. Capital, £500. Objects: To carry on the business of electricians, radio engineers, etc. Directors: J. Duran, 8, Belvedere Court, Upper Richmond Road, S.W.15; and Mrs. Q. A. Duran, 23, Greville Hall, Greville Place, N.W.6. Registered office: 241, Maida Vale, W.

N. Chamberlist, Ltd. — Private company. Registered June 6th. Capital, £100. Objects: To acquire the business of an electrical engineer and contractor, etc., carried on by N. Chamberlist at 465, Commercial Road, Stepney, as N. Chamberlist & Co. N. Chamberlist, 465, Commercial Road, E.1, is the first director.

Companies' Returns

Increase of Capital

J. L. Goldsman, Ltd.—An amended notice has been filed stating that the nominal capital has been increased by the addition of £4,000 beyond the registered capital of £1,000. The additional capital is divided into 80,000 ordinary shares of 1s. each. The original notice, dated March 20th, 1944, stated that the new capital was divided into 40,000 shares of 2s. each.

Statements of Capital

Tricity Cookers, Ltd.—Capital, £20,000 in £1 shares. Return dated January 12th. 19,990 shares taken up. £17,741 paid. £2,249 considered as paid. Mortgages and charges: £10,000.

T. M. C.-Harwell (Sales), Ltd. — Capital, £15,000 in £1 shares (all ordinary). Return dated December 10th, 1943 (filed February 3rd, 1944). 10,000 shares taken up. £10,000 paid. Mortgages and charges: Nil.

Rudkin, Hallewell, Ltd.—Capital, £2,500 in £1 shares. Return dated March 3rd. 2,226 shares taken up. £2,226 paid. Mortgages and charges: Nil.

Lamp Manufacturing & Railway Supplies, Ltd.—Capital, £9,000 in £1 shares (5,500 preference and 3,500 ordinary). Return dated February 11th. 4,500 preference and 3,003 ordinary shares taken up. £4,503 paid. £3,000 considered as paid. Mortgages and charges: Nil.

Forest City Electric Co., Ltd.—Capital, £5,000 in £1 shares. Return dated February 19th. 5,000 shares taken up. £2,210 paid. £2,790 considered as paid. Mortgages and charges: Nil.

Helsby Cables, Ltd.—Capital, £2 in £1 shares. Return dated February 23rd. £2 paid. Mortgages and charges : Nil.

Mortgages and Charges

Johnson & Tanner, Ltd.—(a) Two equitable charges on order moneys, dated June 5th, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd., not exceeding £4,000 and £8,300 respectively. (b) Debenture of same date, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd., charged on freehold property at Worcester Park, and the company's undertaking and other property, present and future, including uncalled capital.

Simmonds & Stokes, Ltd.—Debenture, charged on certain freehold and leasehold land and premises at Wandsworth, and the company's undertaking and other property, present and future, including uncalled capital, dated June 2nd, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd.

Metropolitan Relays, Ltd.—Satisfaction in full on May 1st of second debenture registered January 28th, 1937, securing £4,200.

Receiver Released

Electric Movement and Engineering Co., Ltd.—R. C. Deith, 123, Queen Victoria Street, E.C.4, ceased to act as receiver and manager on April 24th.

Bankruptcies

A. B. Greenbaum, lately carrying on business as Greens Electrical Supplies, 110A, Highbury New Park, London, N.5.—The public examination of this debtor was held on June 8th at the London Bankruptcy Court before Mr. Registrar Kean. The statement of affairs showed liabilities of £4,382, and there were no assets. Replying to the Official Receiver, debtor stated that he previously failed in September, 1928, with liabilities of £566 and no assets were disclosed. He obtained his discharge in May, 1936, subject to a suspension of six months. He started business again about the end of 1937 with capital provided by his wife. After the outbreak of war he dealt mainly in torch batteries. In September, 1943, he was prosecuted for having submitted improper returns for purchase tax and was sentenced to twelve months' imprisonment. The examination was concluded.

A. C. Cooper, electrical engineer, carrying on business at 1A, Sherwood Street, Scarborough.—Application for discharge to be heard at the Court House, Castle Road, Scarborough, on July 4th.

F. Taylor, electrical and general contractor, carrying on business at 4, Mercer Court and 46, Fenwick Street, Liverpool.—Trustee, Mr. P. S. Booth, 5, Rumford Place, Chapel Street, Liverpool, 3, appointed June 9th.

STOCKS AND SHARES

TUESDAY EVENING.

THE renewal of air-raids by the enemy induced an element of caution but the invasion of Europe did nothing to check the incursion of buyers into the Stock Exchange markets that deal with shares in industrial companies. People are looking well ahead in the endeavour to estimate what is likely to happen in this, that and the other industry when the war is over. Prices of industrial ordinary shares have been raised to levels at which the return on the money is little better than that obtainable from gilt-edged securities. Occasionally a bout of selling has served to keep the rise in check, but the amount of stock so realised has been barely sufficient to satisfy the appetite of would-be purchasers. The hope is expressed that politics will not be allowed to interfere with the industrial advance that is expected to follow immediately upon the restoration of peace. The struggle between private enterprise and public control seems likely to become intensified.

Manufacturing and Equipment

More than a score of rises in the market for equipment and manufacturing shares bear witness to the demand of capital for employment in this market. The money comes from all parts: overseas sources contribute their thousands of pounds to the sums that are going into industrials. Buyers do not seem to trouble themselves about the yields that shares return at present prices. The Government is pledged to maintain the policy of low money rates, and this is held to justify acceptance of negligible yields. In this week's rises are included £1 shares such as English Electrics, Electric Constructions, General Electrics, Hopkinsons, Callenders, Tube Investments; and five-shilling shares, of which Ever Ready, Brush, Crompton Parkinson and Veritys are examples. Crabtree 10s. shares gained 1s. 6d. to 40s. Ferranti 7 per cent. preference are a florin up at 32s., International Combustions 2s. 6d. higher at 6⅝. These rises follow upon a steady advance that has extended over most of the weeks during this year.

Radio Rises

Radio shares have developed fresh buoyancy. The liveliest shares, from the market point of view, are Electric & Musical. Thousands of shares changed hands as the price rose rapidly to 35s. 6d., showing a gain of 1s. 6d. On profit-taking, it reacted to 35s. Pye deferred gained 1s. 6d., hardening to 30s., and Philco advanced to 15s. 3d. E. K. Cole remained at 33s. 6d. Upon completion of a sale of 35,000 A. C. Cossor shares, the price rose 1s. to 26s. 6d. Marconi Marines at 34s. 3d. and Canadian Marconis at 9s. 9d. are better by 9d. and 6d. respectively.

Price Fluctuations

Home electricity supply ordinary shares hold all their previous gains, and further improvements of 6d. each have occurred in nearly a dozen cases. In the foreign list, there seems to be a touch of the ironical in Tokyo Electric sixes being another 2 points higher, after last week's rise of 3. Victoria Falls ordinary at 83s. 9d. have recovered their recent slight decline. Kalgoorlie and Perak Hydro-Electric are both 6d. better.

Great Northern Telegraphs at 24½ have added another £1 to their price, on the news from Normandy. Cable & Wireless ordinary stock, now ex dividend, is 10s. lower at 80. Globe ordinary hardened to £2: the previous dividend of 5 per cent. net for the year is repeated. Telephone shares are firm. Automatic Telephones at 67s. put on 1s. and Orientals at 48s. continued their advance. Telephone Properties are better at 17s. 6d.

Home Rails Languid

The Home Railway group suffers from neglect. In the mild excitement which is taking place around industrial shares, Home railway stocks become relegated to the background, and it is only now and then that any animation occurs in the market. Prices retain their firmness but fresh developments are few from one end of the month to the other. The approaching finish of the year's first half has occasioned no speculative activity on account of dividend announcements. It is assumed that they will repeat those of a year ago.

B.E.T.

British Electric Traction deferred stock, following upon its last week's rise of 60 points, has added a further 30 and now stands close upon 1,300. At the beginning of the year, B.E.T. deferred was quoted at 1,075. In the present-day scramble for investments this stock attracts the notice of the larger capitalist who considers that there may possibly be in the future the cutting-up of a melon which might justify the payment of to-day's high figure. The company's report, recently published, showed steady progress, and the dividend, as mentioned previously, is repeated at 45 per cent.

Thomas De La Rue

Thomas De La Rue ordinary shares have risen to 9 9/16 on the announcement of a final dividend of 30 per cent., making 40 per cent. for the year which ended on March 31st last. This compares with 35 per cent. paid for the fifteen months to March 31st, 1943. At one time last year the price of the shares stood at 4¼. The company formed

(*Continued on page* 903)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price June 20	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	61/6	+6d.	4 1 2
British Power and Light	7	7	33/–	..	4 4 10
City of London	7	5½	29/–	+6d.	3 14 7
Clyde Valley	8	8	41/6	..	3 17 0
County of London	8	8	42/–	+6d.	3 16 0
Edmundsons:					
7% Pref.	7	7	34/6	..	4 1 4
Ord.	6	6	29/6	+6d.	4 1 4
Elec.Dis.Yorkshire	9	9	45/6	..	3 19 6
Elec. Fin. and Securities	12½	13½	56/6	..	4 15 5
Elec. Supply Corporation	10	10	47/–	..	4 5 0
Isle of Thanet	Nil	Nil	18/–	..	—
Lancs. Light and Power	7⅛	7⅛	36/–	..	4 3 4
Llanelly Elec.	6	6	26/–	..	4 12 4
Lond.Assoc.Electric	3	4	24/–	+6d.	3 6 8
London Electric	6	6	28/–	..	4 5 9
LondonPowerRed. Deb.	5	5	104½	..	4 14 7
Metropolitan E.S.	8	8	40/–	..	4 0 0
Midland Counties	8	8	41/–	+6d.	3 18 0
Mid. Elec. Power	9	9	44/–	..	4 1 9
Newcastle Elec...	7	7	31/–	+6d.	4 10 4
North Eastern Elec. Ordinary	7	7	34/–	+6d.	4 2 4
7% Pref.	7	7	35/–	..	4 0 0
Northampton	10	10	48/6	+6d.	4 2 6
Notting Hill 6% Pref. (£10)	6	Nil	11	..	—
Northmet Power: Ordinary	7	7	39/6	+6d.	3 11 0
6% Pref.	6	6	30/6	..	3 18 8
Richmond Elec.	6	6	25/6	..	4 14 1
Scottish Power	8	8	40/6	+6d.	3 19 0
Southern Areas	5	5	23/–	..	4 7 0
South London	7	7	28/–	..	5 0 0
West Devon	5	5	23/6	..	4 5 1
West Glos.	4½	3½	24/6	..	2 17 4
Yorkshire Elec...	8	8	43/–	..	3 14 5
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	7/9	..	—
Calcutta Elec.	6*	6*	41/6	+1/6	2 17 0
Cawnpore Elec...	10	7	35/6	..	3 19 0
East African Power	7	7	33/6	..	4 3 7
Jerusalem Elec...	7	5	28/6	..	3 10 2
Kalgoorlie (10/–)	5	5	10/6	+6d.	4 15 3
Madras Elec.	4*	Nil	23/6	+6d.	—
Montreal Power	1½	1½	24	−1	6 5 0
PalestineElec."A"	4*	5*	41/–	..	2 8 9
Perak Hydro-elec.	6	7	11/–	+6d.	—
ShaweniganPower	83cts.	90cts.	16	−¼	—
Tokyo Elec. 6%	6	6	20	+2	—
VictoriaFallsPower	15	15	4⅛	+⅛	3 11 7
WhitehallInv.Pref.	—	6	24/–	..	5 0 0

Company	Dividend Previous	Dividend Last	Middle Price June 20	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	103½	..	3 7 8
1974–94	3½	3½	100	..	3 5 0
London Elec. Trans. Ltd.	2½	2½	97	..	2 11 3
London & Home Counties1955–75	4½	4½	113	..	3 19 8
Lond.Pass.Trans.:					
A	4½	4½	121½	..	3 14 1
B	5	5	121½	..	4 2 4
C	3	3¼	72	..	4 10 3
WestMidlandsJ.E.A. 1948–68	5	5	108½	..	4 12 4
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	120½	..	4 19 7
Def.	1½	1½	30	−1	5 0 0
Anglo-Portuguese	8	8	27/–	+1	3 18 6
Cable & Wireless:					
5½% Pref.	5½	5½	113½	..	4 17 0
Ord.	4	4	80xd	−½	5 0 0
CanadianMarconi$1	Nil	4cts.	9/9	+6d.	—
Globe Tel. & Tel.:					
Ord.	8½*	5*	40/–	+6d.	2 10 0
Pref.	6	6	30/–	..	4 0 0
GreatNorthernTel. (£10)	Nil	Nil	24½	+1	—
Inter. Tel. & Tel.	Nil	Nil	22	+4	—
Marconi-Marine	7½	7½	34/3	+9d.	4 7 7
Oriental Tel. Ord.	16	10	48/–	+1/–	—
Telephone Props.	6	Nil	17/6	+6d.	—
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	1295	+30	3 9 6
Pref. Ord.	8	8	180	..	4 9 0
Bristol Trams	10	10	56/6	..	3 10 10
Brazil Traction	$1	$1¾	27½	−¼	6 7 3
Calcutta Trams.	5½	6½	49/–	+3/6	2 13 2
Cape Elec. Trams	5	6	25/6	−6d.	4 14 1
Lancs. Transport	10	10	45/6	..	4 8 0
Mexican Light:					
1st Bonds	5	5	104½	+1	4 15 7
Rio 5% Bonds	5	5	105½	..	4 14 9
Southern Rly.:					
5% Prefd.	5	5	79	−½	6 6 9
5% Pref.	5	5	118½	..	4 4 9
T. Tilling	10	10	59/6	..	3 7 3
West Riding	10	10	44/6	..	4 10 0

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price June 20	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron.Elec.Ord. ..	10	15	60/–	..	5 0 0
Assoc. Elec. :					
Ord.	10	10	55/6	+6d.	3 12 3
Pref.	8	8	40/6xd	+6d.	3 19 0
AutomaticTel.&Tel.	12½	12½	67/–	+1/–	3 14 9
Babcock & Wilcox	11	11	51/–	..	4 6 3
British Aluminium	10	10	47/6	..	4 4 1
British Insul. Ord.	20	20	5 5/16	..	3 11 9
British Thermostat (5/–)	18½	18½	21/–	..	4 8 1
British Vac. Cleaner (5/–)	15	30	30/–	..	5 0 0
Brush Ord. (5/–)	8	9	10/3	+6d.	4 7 10
Burco (5/–) ..	15	17½	16/–	..	5 9 5
Callender's ..	15	20	5 7/16	+ 1/16	3 13 8
ChlorideElec.Storage	15	15	82/6	..	3 12 10
Cole, E. K. (5/–)	10	15	33/6	..	2 4 9
ConsolidatedSignal	24	27½	6½	..	4 4 6
Cossor, A. C. (5/–)	7½*	10*	26/6	+1/–	1 17 9
Crabtree (10/–) ..	17½	17½	40/–	+ 1/16	4 7 6
Crompton Parkinson Ord. (5/–) ..	20	22½	32/3xd	+ 1/16	3 9 6
E.M.I. (10/–) ..	6	8	35/–	+1/–	2 5 10
Elec. Construction	10	12½	54/–	+2/–	4 12 7
Enfield Cable Ord.	12½	12½	57/–	..	4 7 9
English Electric	10	10	53/3	+9d.	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	43/6	+3d.	4 12 0
Falk Stadelmann	7½	7½	33/6	..	4 9 7
Ferranti Pref. ..	7	7	32/–	+2/–	4 7 6
G.E.C. :					
Pref.	6½	6½	34/–	..	3 16 6
Ord.	17½	17½	96/–	+1/–	3 13 0
General Cable (5/–)	15	15	15/–	..	5 0 0
Greenwood&Batley	15	15	45/–	+1/9	6 13 4
HallTelephone(10/–)	12½	12½	28/–	..	4 9 3
Henley's (5/–) ..	20	20	26/9	..	3 14 9
4½% Pref. ..	4½	4½	24/–	..	3 15 0
Hopkinsons ..	15	17½	67/–	+2/–	5 4 6
India Rubber Pref.	5½	5½	23/6	..	4 13 9
Intl. Combustion	30	30	6½	+½	4 10 8
Johnson & Phillips	15	15	74/6	..	1 0 6
LancashireDynamo	22½	22½	97/–	..	4 12 9
Laurence,Scott(5/–)	12½	12½	13/–	..	4 16 2
London Elec. Wire	7½	7½	40/–	+1/–	3 15 0
Mather & Platt..	10	10	52/6	..	3 16 4
Metal Industries(B)	5	8	50/–	+6d.	3 4 0
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	105/9	..	3 15 6
Pye Deferred (5/–)	25	25	30/–	+1/3	4 3 4
Revo (10/–) ..	17½	17½	42/6	..	4 2 4
Reyrolle ..	12½	12½	70/–	–6d.	3 11 5
Siemens Ord. ..	7½	7½	34/–	+6d.	4 8 3
Strand Elec. (5/–)	7½	10	7/9	..	6 9 0
Switchgear & Cowans (5/–) ..	20	20	18/6	..	5 8 1
T.C.C. (10/–) ..	5	7½	22/6	..	3 6 8
T.C. & M. ..	10	10	55/–	..	3 12 6
TelephoneMfg.(5/–)	9	9	11/9	..	3 16 8
Thorn Elec. (5/–)	20	20	25/–	..	4 0 0
Tube Investments	20	20	97/6	+6d.	4 2 0
Vactric (5/–) ..	Nil	Nil	14/6	..	—
Veritys (5/–) ..	7½	7½	8/3	+6d.	4 11 0
WalsallConduits(4/–)	55	55	49/–	..	4 9 7
Ward & Goldstone (5/–)	20	20	27/3	..	3 13 6
WestinghouseBrake	12½	14	75/–	..	3 14 9
West, Allen (5/–)	7½	7½	7/3	..	5 3 5

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 901)

a subsidiary about eighteen months ago in order to deal with plastics, and is now said to be the largest concerned with plastic mouldings in this country.

Northmet Debenture

It may be of service to mention that during the past few business days £1,000 Northmet Power 4 per cent. debenture stock has come on offer at 103½, ex the July interest; and, also, £2,000 Northmet Power Station 3½ per cent. second mortgage debenture stock, Series " B," at 102, March and September interest. In both cases the security is gilt-edged, but in either stock the prospective purchaser should make himself acquainted with the various terms upon which the companies have the right to redeem the issues.

Calcutta Trams

Calcutta Tramways ordinary shares have had a further sharp rise on the anticipation, of course, that the Corporation of Calcutta will make a definite bid before the end of the present month for the whole of the undertaking. Optimism allows itself liberal scope in making guesses as to the amount which Calcutta will offer, if it should decide to take over the tramways, and the amount per share which might be provided for holders of Calcutta Tramways ordinary. The rise in these shares has had the effect of directing attention to other Indian utilities. Calcutta Electric, Delhi, Madras and other Indian issues have come to the fore. It is unfortunate that the Cawnpore Electric Supply Company should have reduced the dividend on its ordinary shares to 7 per cent. after an uninterrupted ten years of 10 per cent. per annum.

India's Utilities

Apart from the Calcutta Tramways incident, it is argued that India after the war will inevitably experience an enormous expansion of trade, and that in the handling of this, the utility companies will play an important part. The U.S.A. is looking to India as likely to offer a profitable theatre for commercial operations on a large scale. These are some of the reasons why Indian utility stocks and shares are being bought by investment which is content to put away the shares for future reference.

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.

Salford.—June 30th. Electricity Department. Mercury arc rectifiers. (June 16th.)

Stornoway.—June 26th. Town Council. Various works, including electrical, at thirty-eight houses. Schedules from T. O. W. Gratton, architect, 216, West Regent Street, Glasgow, C.2; tenders to town clerk.

Orders Placed

Aberdeen.—Harbour Board. Accepted. Two 30-cwt. electric jib cranes (£9,250). J. M. Henderson & Co.

Sunderland.—Education Committee. Accepted. Installation of electric lighting in connection with the reinstatement of the Valley Road School (£240).—Gee & Brown, Sunderland.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Batley.—School kitchen Junior Technical School, for Education Committee; borough surveyor.

Bolton.—Central school kitchen, eastern area for Education Committee; borough engineer.

Bootle.—Reconstruction, 235, Markfield Road (£1,427); North Western Estates Development, Ltd., Liverpool.

Bradford.—Completion of houses, Canterbury Avenue and Birksland Street; J. H. Pitchers & Son, builders, Bolton Street.

Brighouse.—Central kitchen, Rastric Common; borough surveyor.

Clydebank.—Proposed buildings to be used as ambulance rooms, lecture and drill halls for local section of St. Andrew's Ambulance Corps; secretary.

Huts at St. Stephen's R.C. School, Dalmuir, and St. Mary's R.C. School, Duntocher (£1,400 and £1,500); burgh surveyor.

Consett.—Completion of 30 houses for the U.D.C.; Council surveyor (fresh tenders to be obtained).

Coventry.—Recreation Room, Exhall Social Welfare Committee (£1,650); D. E. E. Gibson, city architect, 1a, Warwick Row.

Dumfrieshire.—Conversion of Barras Church, Lochmaben, into cinema; D. J. Cumming, Lochmaben.

Gateshead.—Alterations to farm buildings at the Mental Hospital (£1,700); borough engineer.

Greenock.—Schemes of community buildings, schools, etc., for Corporation; director of housing.

Harrogate.—Erection of 65 Portal houses for the City Council; city engineer.

Helensburgh.—Housing scheme; burgh surveyor.

Hertfordshire.—Nurses' home, Welfield Hospital, Hatfield (£3,500); county architect.

Jarrow.—A.T.C. headquarters, Bede Burn Road; J. M. Black, jun., Victoria Road West, Hebburn-on-Tyne.

Loughborough.—School kitchen, Hathern Council School, for Education Committee; borough surveyor.

Middleton.—Communal kitchen, Scouts Hall, Middleton Junction; borough engineer.

Motherwell.—Extensions, water undertaking (£500,000); water engineer.

Newcastle-on-Tyne.—Canteen, etc., for Spillers, Ltd., St. Lawrence Road; Cackett, Burns Dick and McKellar, architects, 21, Ellison Place.

North Riding.—Senior schools, Northallerton; J. R. Whitem, county architect, County Hall, Northallerton.

Salford.—Extension, kitchen and dining room, Pendleton High School for Girls (£1,500); borough engineer.

Sheffield.—British Restaurant, Holly Street; M. J. Gleeson, Ltd., 822, Chesterfield Road.

Stafford.—Catholic Church (£12,000); priest-in-charge, St. Patrick's.

Stoke-on-Trent.—Control house and pumping plant; Potteries Water Board, Engineer's Office, Stoke-on-Trent.

Sunderland.—Factory; particulars from town clerk.

Swindon.—Water works (£10,000); borough engineer.

Wolverhampton.—Dining centres at Intermediate and St. Andrew's Schools; W. M. Law, borough engineer, Town Hall.

Forthcoming Events

Monday, June 26th.—*London.*—At Northampton Polytechnic, E.C.1, 5.30 p.m. Electrodepositors' Technical Society. "Estimation of Ammonia in Electrolysed Cyanide Plating Solutions," by Messrs. C. M. Blow, N. G. Hiscox and M. W. Smith. After the discussion there will be an exhibition of films entitled "Manufacture of Accumulators" and "Electrodeposition."

Friday, July 14th.—*London.*—Conference Room (8th floor), Brettenham House, Lancaster Place, Strand, W.C.2, noon. Public Transport Association Incorporated. Second annual general meeting.

Saturday, July 15th.—*London.*—Hotel Russell, Russell Square, 3 p.m., Institution of Factory Managers. Annual general meeting.

Saturday, July 29th.—*London.*—Oak Restaurant, 18-24, Kensington High Street, 6 to 10 p.m., I.E.E. London Students' Section. Summer dance.

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Here is an officer with the experience of two wars to his credit, he is keen and energetic and commands one of the most up-to-date and progressive cable manufacturing plants in the country.

General Cable is at present very much "on active service" but when he leaves the forces at the end of the war, his wide knowledge will once again be at the disposal of industry.

In the meantime the General is conducting extensive and intensive research work in connection with rubber and plastic cables of all types.

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"ERSATZ"

. . . . . The literal meaning of this word is simply "substitute," but through German misuse it has become distorted into "cheap" or "inferior."

In this country, however, not all substitutes which have become necessary owing to shortage of imported material are inferior. Many new ideas which would never have been considered but for war conditions, will prove to be either better or more economic than the originals which they have replaced.

For example, where electrical engineers have specified non ferrous metals in the past because steel fitments have been prone to rusting, they will find that the substitution of "PARKERIZED" and "BONDERIZED" iron and steel in lieu of brass, copper, etc., is practical and economical.

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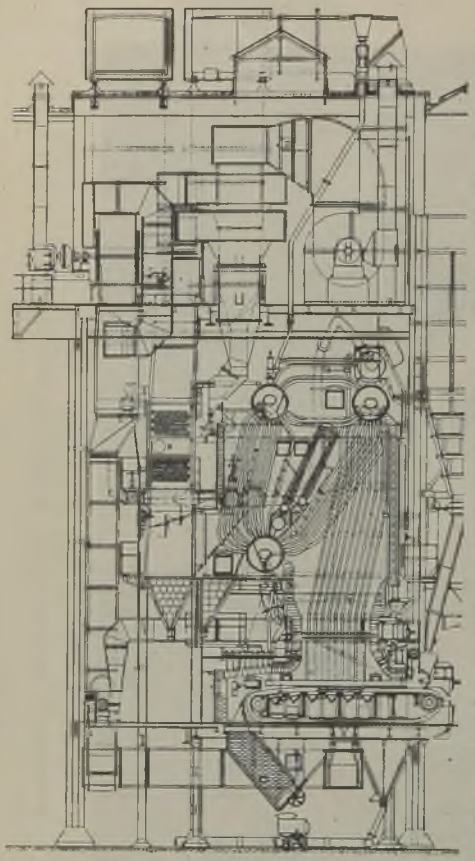

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EVAPORATION (Each Boiler) 120,000 lbs. pr. hr.
WORKING PRESSURE - - 300 lbs. per sq. in.
HEATING SURFACE - - - 12,000 sq. feet.

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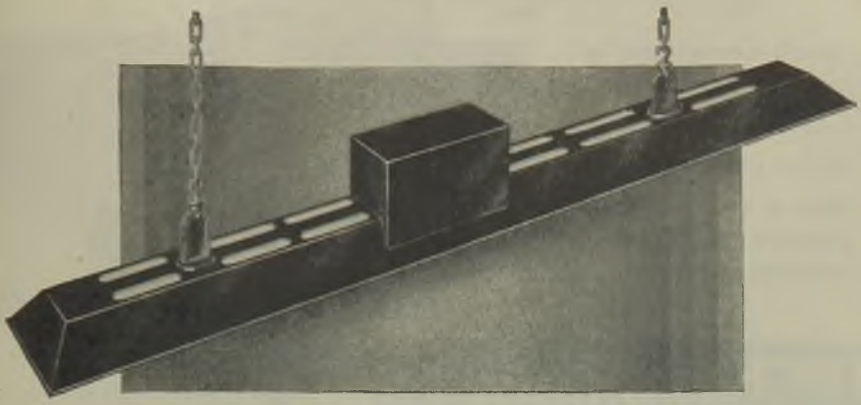

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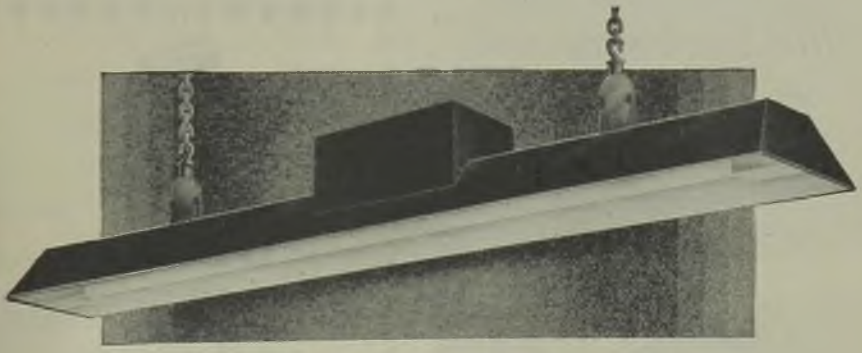
1748	1 Lamp with Box	**£3**	**0**	**0**	+	25%
1749	1 Lamp without Box	**2**	**7**	**6**	+	25%



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1764	1 Lamp with Box	**£3**	**0**	**0**	+	25%
1762	1 Lamp without Box	**2**	**7**	**6**	+	25%

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Scientific lighting means the right light in the right place. It can increase production materially, as the following actual results, taken from a Government Committee's report, demonstrate :

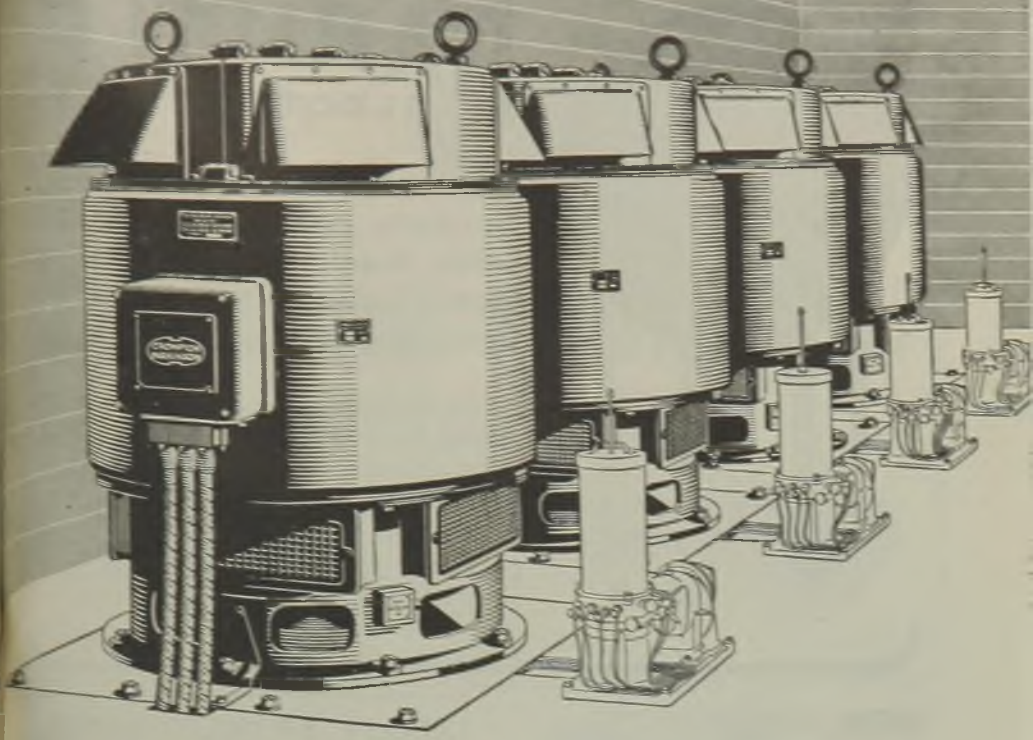
KIND OF WORK	Increase in Production
Stamping and Pressing	12.2%
Manufacturing Piston Rings ...	25.8%
Metal Bearing Manufacturing ...	15.0%
Semi-Automatic Buffing ...	8.5%
Carburettor Assembly	12.0%
Heavy Steel Machining	10.0%

The need to back up our fighting men with our utmost in production is this year more urgent than ever. If your lighting has not been examined within the last few years, let us do it for you. An E.L.E.C.O. expert will gladly visit your works and submit his report without cost to you.

SEND FOR FOLDER *NOW!*

ENGINEERING & LIGHTING EQUIPMENT CO., LTD.,

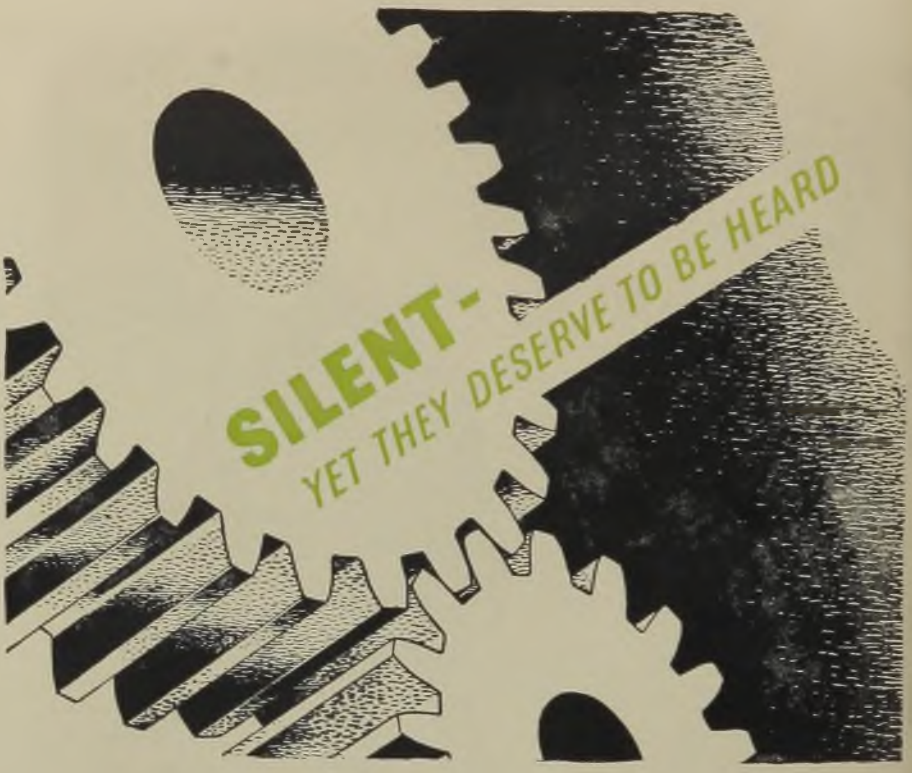
Dept. W.S., Sphere Works, St. Albans, Herts. Phone: 2258/9.



Keeping the pumps going.

A town's water supply depends on these Crompton Parkinson 315 h.p. vertical spindle slip-ring motors. Again and again Crompton Parkinson Motors are specified for duties of responsibility such as this.

CROMPTON PARKINSON
LIMITED



IS it because gear wheels made of Bakelite Plastics run so silently that only the instructed few seem ever to have heard of them? For obviously they deserve to have made a great noise in the world!

For years, gears of toughened steel have been meshed with Bakelite gears—and they run for years ! . . . There is less wear on the steel gear wheel. Where resistance to corrosion is imperative, the Bakelite gear cannot be beaten.

Gear wheels may not be your particular problem: yet it may be important to you to remember that there is available to you to-day a man-made material capable of standing up to hardened steel.

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ELECTRONIC

DEVICES *for* SCIENCE *and* INDUSTRY

G.E.C. CATHODE RAY TUBES ETC **Osram** Valves **Osram** PHOTO CELLS

The G.E.C. are specialists in valves and other electronic devices which find many applications in industry and scientific research.

The following are a few of the classes of electronic tube which have already found their place in industry.

VACUUM AMPLIFYING VALVES

For all cases in which the amplification of small voltages is required, with continuous control of amplification over a wide range of frequencies.

As self oscillators for generation of high frequency voltage and power.

VACUUM RECTIFIERS

For Extra High Tension Voltages in cable and condenser testing, etc.

For power rectification at medium and high voltages.

For radio frequency detection.

In peak voltmeters.

HOT CATHODE MERCURY VAPOUR RECTIFIERS

For high current rectified outputs in radio transmitters and power circuits.

GASFILLED RELAYS (THYRATRONS)

For trigger controls and various industrial research work. Used where an instantaneous release of power is required from a low voltage source.

PHOTO CELLS

Vacuum or gasfilled—with various characteristics both in applied voltages and colour response.

ELECTROMETER VALVES

Used in conjunction with glass electrode for pH determination.

CATHODE RAY TUBES

For acoustic tests, sound and waveform analysis, pressure indication, chemical analysis, educational demonstrations, monitoring, laboratory instruments, electro-medical and biological investigation, navigation aids, etc.

Advt. of The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2

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.*

COUNTY BOROUGH OF CARLISLE

Electricity Undertaking

APPLICATIONS are invited for the position of SWITCHBOARD ATTENDANT at Willow Holme Power Station.

Applicants should be technically qualified and have had practical experience in the operation of modern Power Station Switchgear.

Salary and conditions of service will be in accordance with the N.J.B. Agreement, Class G, Grade 9a (present salary £297 per annum).

The successful applicant will be required to pass a medical examination and contribute to the Council's Superannuation Scheme.

Applications, giving age, details of training and experience, to be sent to the undersigned in sealed envelope endorsed "Switchboard Attendant" not later than Monday, 10th July, 1944.

C. W. SALT,
City Electrical Engineer.

Electricity House,
Castle Street,
Carlisle.

304

HEYWOOD CORPORATION ELECTRICITY DEPT.

Appointment of Rotary Substation Attendant

APPLICATIONS are invited for the position of Rotary Substation Attendant for shift duty in the Corporation Electricity Works. Applicants should have sound experience in the control of high and low pressure switchboards, and in the operation of rotary converting plant.

Conditions of service and rates of pay are in accordance with District Council No. 3, N.W. Area, capacity in kWs 1,001/2,000. The position is NOT subject to superannuation.

Applications, giving age, details of experience, and enclosing copies of recent testimonials, to be delivered to the undersigned on or before Friday, June 30th, 1944, and endorsed "R.S.A."

H. C. DAY,
Borough Electrical Engineer.

291

APPRENTICE CONTROLLER

LARGE Engineering Works in the North of England requires an Apprentice Controller whose experience and ability would enable him to deal with the problems of an expanding organisation in all that pertains to the selection, training and well-being of apprentices. Effective guidance in the transition to post-war conditions and outlook will be of particular importance. Apply, giving details of age, experience and background, to—Box 208, c/o The Electrical Review.

SHIPLEY URBAN DISTRICT COUNCIL

Electricity Department

Appointment of Rotary Substation Attendants

TWO vacancies for Rotary Substation Attendants for shift duties in the above undertaking occur due to retirements.

Conditions of service and rates of pay (at present £5 8s. per week) are in accordance with 2,001-4,000 kW Grade, Section A, D.J.I.C., No. 2 Area. The positions will be superannuated, subject to six months' satisfactory service and the passing of a medical examination.

Applicants with good experience in the control of high and low pressure switchboards and the operation of rotary converting plant should send details of experience, present employment, age and copies of recent testimonials to the undersigned by not later than Friday, 7th July, 1944.

NIGEL L. DUNCAN,
Engineer and Manager.

Electricity Works,
Dockfield, Shipley, Yorkshire.
17th June, 1944.

301

STRETFORD & DISTRICT ELECTRICITY BOARD

Appointment of Junior Shift Engineer

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

Terms of Appointment: N.J.B. Schedule and conditions, Class G, Grade 9. Successful candidates will be required to pass a medical examination and contribute to the Board's Superannuation Fund.

Applications detailing age, training and experience, with copies of not more than three recent testimonials and endorsed "Junior Engineer," should be delivered to the undersigned on or before Monday, July 10th next.

C. TREWAVAS,
Clerk to the Board.

Town Hall, Stretford.
22nd June, 1944.

295

PERSONNEL CONTROLLER

LARGE Engineering Works in the North of England requires a Personnel Controller whose experience and ability would enable him to deal with the problems of an expanding organisation in all that pertains to the control and well-being of all grades of personnel. Effective guidance in the transition to post-war conditions and outlook will be of particular importance. Apply, giving details of age, experience and background, to—Box 209, c/o The Electrical Review.

RUNWELL HOSPITAL, nr. WICKFORD, ESSEX

POWER HOUSE DRIVER REQUIRED for the Power House of the above hospital. Thorough experience in running and maintenance of Steam and Diesel Electric Generating Plant essential. Wages £4 19s. 6d. per week of 48 hours. Application to be addressed to the Physician Superintendent, Runwell Hospital, nr. Wickford, Essex. 298

LONDON COUNTY COUNCIL

South-East London Technical Institute, Lewisham Way, S.E.4

REQUIRED IMMEDIATELY, a full-time Lecturer in Engineering subjects. Candidates should be qualified to teach up to Higher National Certificate standard. Salary: London Burnham Technical scale, plus war bonus. Incremental allowances for industrial and/or teaching experience. Application forms (T.1/40) may be obtained from the Education Officer (T.1), County Hall, Westminster Bridge, S.E.1, to whom they should be returned immediately. Stamped addressed foolscap envelope necessary. 292

A Temporary Electrical Inspector of Factories is required in the North-West of England by the Factory Department of the Ministry of Labour and National Service. Salary between £450 and £650 p.a., according to qualifications. Applicants should have had experience of electrical manufacturing installation work or electrical supply. Qualifications equivalent to A.M.I.E.E. preferred. Applicants should write, quoting D.798A, to the Ministry of Labour and National Service, Room 432, Alexandra House, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 5th July, 1944. 284

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

ENGINEERING Sales Assistant required for Glasgow branch of large manufacturing firm making heavy electrical equipment. State age, salary, experience.—Box 283, c/o The Electrical Review.

FIRM manufacturing H.T. Dry Batteries require the services of a Production Manager experienced in battery manufacture. Good remuneration and bonus to suitable applicant. Please give full particulars of experience and when free to take up appointment to—Box 277, c/o The Electrical Review.

HEAD Foreman required for factory producing electrical apparatus, transformers, etc. Applicants must be specialised in this class of work. Write, with full particulars, to—Box 255, c/o The Electrical Review.

LEADING electrical manufacturers of wide range of equipment require an Editorial Writer in London of proved ability and with experience of house journal production. Electrical technical knowledge combined with ability to write sound articles essential. Position is permanent and full time (part time and free lance not considered). Good post-war prospects. Commencing salary, according to qualifications, from £500/£700 p.a. Apply by letter, giving full particulars, to—Box 290, c/o The Electrical Review.

LEADING electrical manufacturers require Sales Assistant in London, capable handling enquiries throughout normal business stages. Prepared to spend considerable periods inside. Sound knowledge motors up to 450 h.p. necessary, together with some experience transformers, switchgear, mains cables. Permanent position, good salary, superannuation fund. Apply—Box 291, c/o The Electrical Review.

LEADING firm of cable manufacturers require services of a Sales Engineer with live connection among electricity supply undertakings and large buyers in London and the Home Counties. Fullest details of past experience and salary expected to—Box 289, c/o The Electrical Review.

PATENT Agent. Well-established firm requires Patent Agent, preferably specialising in electronics, as assistant in Patent Department, permanently or for duration of war. Subjects: mechanism, control apparatus, electronics. Salary: £600-£700 or upwards, according to qualifications and experience. Applicants should write, quoting F.2592XA, to the Ministry of Labour and National Service, Room 432, Alexandra House, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 5th July, 1944. 288

RELIEF Shift Engineer wanted for power station in Scotland. Commencing salary £306, including war bonus, subject to deduction for superannuation. Applications in writing, giving full particulars of age, training, experience, present appointment and position under the National Service Acts, to be accompanied by copies of three recent testimonials, and sent not later than 8th July to—Box 297, c/o The Electrical Review.

STOREMAN required by London office of Wholesale Distributors. Please write, stating experience, age, salary required, etc., to—Box 254, c/o The Electrical Review.

SALES Engineer to develop post-war sales required. Send particulars to—Box 285, c/o The Electrical Review.

SALES Engineer required for London office of firm specialising in high-class radio, telegraph and allied apparatus. Successful applicant would be required to handle sales correspondence and telephone enquiries and take charge of office. Permanency with good post-war prospects. Reserved. Reply, giving full details of age, experience and salary required, to—Box 286, c/o The Electrical Review.

WELL-educated Woman required for London office of Electrical Engineers. Conversant with terms used in electrical engineering and capable of handling enquiries on own initiative. Details of experience and salary required to—Box 287, c/o The Electrical Review.

YOUNG Lady, matriculation standard, required for electrical engineers' office. Knowledge of electrical calculations and some typing experience preferred. Apply—Personnel Dept., British Electric Transformer Co. Ltd., Hayes, Middx. 282

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 qualified Production Manager, A.M.I.P.E., A.M.I.W., M.Inst.B.E., free for immediate activity, seeks managerial appointment, labour training, personnel, production, planning, progress, inspection, or if desirable, will act in part-time advisory capacity. Radio, electrical, aircraft or automobile. All replies will be acknowledged.—Box 5970, c/o The Electrical Review.

ADMINISTRATIVE post by Chartered Engineer (49), wide experience electrical, heating, ventilation, contract engineering. Unrivalled personal contacts with leading engineers, good negotiator with personality, conversant Government procedure. London preference. Salary £750. Reply in strict confidence.—Box 5963, c/o The Electrical Review.

ADMINISTRATIVE or progressive post required by qualified Engineer, 8 years' experience in laboratories of leading radio manufacturer. Release obtainable.—Box 5991, c/o The Electrical Review.

ADVERTISER has 30 years' experience of the manufacture of precision electrical apparatus, measuring instruments, f.h.p. motors, radio components, etc., 15 years of above as supervising experience as foreman, superintendent, production manager and works manager, experienced at toolmaking, tool and mould design, rate-fixing, planning and estimating with up-to-date plant, desires position as Chief Engineer or Works Manager with firm prepared to offer 4-figure salary.—Box 5998, c/o The Electrical Review.

ADVERTISER having splendid contacts Northern Counties, especially with supply authorities, seeks additional agencies or would represent reputable firm. Specialised knowledge of water heating, cookers and domestic appliances generally over 24 years. Can furnish the very highest credentials as to past record. Alternatively open to consider executive position.—Box 5997, c/o The Electrical Review.

AGE 43 years, experience electrical generation, distribution and maintenance, 28 years, medium plants, desires change as Foreman, Representative or Service Engineer with post-war prospects.—Box 5989, c/o The Electrical Review.

A.M.I.E.E. (41), single, seeks senior post abroad, present post 11 years Engineer Surveyor, previously tropical oil, mining.—Box 5986, c/o The Electrical Review.

ELECTRICAL Contracting Supervisor desires change or would be interested in partnership in good class business with good post-war prospects.—Box 5937, c/o The Electrical Review.

ELECTRICAL Engineer, shortly open to transfer, desires executive post in the repair and maintenance of power plant, personally known to power plant merchants throughout the country.—Box 5985, c/o The Electrical Review.

ELECTRICAL Engineer, university trained, with wide experience, England and abroad, in design and production, seeks responsible executive position.—Box 5996, c/o The Electrical Review.

ELECTRICAL Engineer (36), college/works trained, 15 years estimating, contracting, distribution (all branches) and supply company managerial duties, present Govt. post terminating, seeks responsible position offering scope for individualism and conscientious application.—Box 5987, c/o The Electrical Review.

ENGINEER, with experience, [illegible] abilities, age 41, desires to undertake management of small electrical works and to develop and extend organisation for an agreed proportion of results obtained. Present [illegible] [illegible].—Box 5040, c/o The Electrical Review.

ESTIMATING Engineer desires change. Technical education, apprentice, 22 years since. D.O. and estimating. Experience in [illegible] class mechanical and elect. apparatus, automatic machinery, commercial products, jigs and tools. Present post chief estimator 14 years, well familiar with modern designs, production methods and costs, estimating government and commercial contracts. Executive post desired. N.W. Lond., Watford or near. Salary £600 p.a.—Box 5047, c/o The Electrical Review.

GENTLEMAN, 44, seeks post as stores manager, head storekeeper or similar. Two years' experience head storekeeper and clerk with electrical contractors on marine work. Change required with view to post-war permanency.—Box 5042, c/o The Electrical Review.

GRAD. I.E.E., Triple Finalist of City and Guilds, P.M.G. [illegible], experienced installation, maintenance, estimating, aircraft, etc. Immediate release, travel anywhere. Any offer given consideration.—Box 5040, c/o The Electrical Review.

KEEN young man, secondary school education, recently discharged forces, seeks post as Representative, S.W. England, would [illegible], pre-war income £300 per annum.—Box 5044, c/o The Electrical Review.

OFFICE Manager, age 44, fully experienced, stock control and stores routine, [illegible] [illegible], industrial and domestic heating and cooking appliances.—Box 5043, c/o The Electrical Review.

SALES Manager, 20 years' experience in electrical sales, including domestic appliances and accessories, industrial switchgear and motors, would [illegible] supply authorities and manufacturers, seeks position with firm contemplating re-development of home and overseas markets.—Box 6006, c/o The Electrical Review.

SWITCHGEAR Engineer, age 32, seeks change. A.M.I.E.E., A.M.C.T., A.I.I.A., experienced in design, contracts, costs, sales and administration, exempt military service. Permanent executive position desired.—Box 5043, c/o The Electrical Review.

WINDING Shop Foreman, thorough experience in winding, assembling and testing of fractional to 100-h.p. machines, production work or repairs, desires progressive position.—Box 5050, c/o The Electrical Review.

WORKS Electrical Engineer desires change, present position 25 years. Good reasons.—Box 5045, c/o The Electrical Review.

FOR SALE

Traders buying and selling second-hand goods should observe the Restriction of Resale Order, S. R. & O. 1942 No. 958.

TWO 50-kVA. Diesel-driven Alternator Sets, each comprised of 75-h.p., vertical, 4-cylinder, water-cooled Diesel engine, 1,500 r.p.m., direct coupled to 50-kVA B.T.H. alternator, 400 volt, 3-phase, 50 cycles, 1,500 r.p.m., complete with switchboard, engine arranged for electric starting and complete with fuel and cooling tanks, etc. New 1939.

Two 60-kW. Diesel-driven Generating Sets, each comprised of vertical, 6-cylinder, water-cooled A.E.C. Diesel engine, 1,050 r.p.m., direct coupled to 60-kW CROMPTON PARKINSON, 230-volt D.C., compound wound Generator, 1,050 r.p.m., with regulator, engines arranged for electric starting and complete with all accessories. New 1936.

20-kW Diesel Generating Set, comprised of 30-h.p., vertical, 2-cylinder, water-cooled NATIONAL Type D Diesel engine, 1,000 r.p.m., direct coupled to 20-kW, 230-volt D.C. compound wound generator with shunt regulator, engine arranged for hand or compressed air starting and complete with accessories. New 1939.

20-kW Diesel Generating Set, comprised of 45-b.h.p. PETTER, vertical, single-cylinder, airless Diesel engine, 375 r.p.m., direct coupled to 460-volt D.C. compound wound generator with shunt regulator and accessories. New 1934.

For Disposal cheap ex site.

NEWMAN INDUSTRIES LIMITED, YATE, BRISTOL

ELECTRIC MOTORS & 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:—

BRITANNIA MANUFACTURING CO. LTD.,
22-23 BRITANNIA STREET,
CITY ROAD, LONDON, N.1.
Telephone: 5512-3 Clerkenwell. 13

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

A.C. and D.C. Motors, all sizes, large stocks, fully guaranteed.—Milo Engineering Works, Milo Road, East Dulwich, S.E.22 (Forest Hill 4422). 5881

A.C. Motors, 1/50th h.p. to 2 h.p., from stock, for essential work only.—Johnson Engineering, 86, Great Portland Street, W.1. Tel. Museum 6373. 15

AERIAL Cables, all sizes quoted for; good deliveries against Government contract numbers.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5974

ALTERNATOR, 500 kVA, 3-p., 50 c., 400/440 c., 750 revs., direct coupled exciter, 2 brgs., on bedplate.—Stewart Thomson & Sons, Fort Road, Seaforth, Liverpool, 21. 58

BELT Grinders or Sanders, 4" wide belt, £5 5s.; 6" wide belt, £10 10s.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 52

BEST English Cables, 1/.044 up to 127/.103, deliveries against M.O.S. requirements.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5975

CARBONS, large stocks assorted sizes, solid and cored.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5976

COMPLETE Substation Electrical Equipment, consisting of 2 250-kVA Hackbridge Transformers, 6,000 volts, 24 amps., to 400 volts, 360 amps., capable of being run in parallel with an output of 500 kVA; 12,500-volt, 3-phase H.T. Oil Circuit Breaker, Voltmeters, Ammeters, Protection Gear Fuses, etc. All in first-class condition. Apply—Pan Britannica Industries Ltd., 14, Waterloo Place, London, S.W.1. 278

EXHAUST Fans, new, 14", 1-phase, 200/250 v., 1,900 cu. ft./min., £11 15s.—Southern Ignition Co., Ltd., 190, Thornton Road, Croydon. 75

FOUR identical 150-kW. "Weir Sulzer/E.C.C.," Diesel driven Generating Sets, 220 volt D.C.—Stewart Thomson & Sons, Fort Rd., Seaforth, L'pool, 21. 74

GENERATING Sets for sale, petrol and crude oil, A.C. and D.C., including 10 kW, 400/3/50, and 2½ kW, 230/1/50 petrol set.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. 299

HEAVY duty Arc Welding Plants, 200 amps. Price £31 10s. complete. Also Spot Welders, £36 15s.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 50

LEAD-covered and Armoured Cables, P.I. and V.I.R., various special lines at low prices.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5977

MONOMARK. Permanent London address. Letters redirected. 5s. p.a. Write—BM/MONO53, W.C.1. 44

MOTOR Generator Sets and Convertors, all sizes and voltages from ¼ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, City Road, London, N.1. Telephone, Clerkenwell 5512, 5513 & 5514. 28

MOTORISED ¼" Bench Drilling Machine, 13 speeds, £11 11s.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 51

NAMEPLATES, Engraving, Diesinking, Stencils, Steel Punches.—Stilwell & Sons Ltd., 152, Far Gosford Street, Coventry. 14

NUMBER of I.C. Bells, 6" gong, 12 v., A.C. or D.C.—Box 238, c/o The Electrical Review.

PORCELAIN Cleats, 2 and 3 groove, various sizes ex stock, price list.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5978

PORCELAIN Insulators and Spindles, also Cleats, cheap.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5979

QUANTITY single stroke, 6" gong, traction type Bells, good quality.—Box 294, c/o The Electrical Review.

ROTARY Converter, "Bull," input D.C. 220 v., output 220/230 v., 1-ph., 50-per.: 1 kVA, perfect.—Southern Ignition Co., Ltd., 190, Thornton Road, Croydon. 76

SELF-Priming Electric Pumps, 300 g.p.h., £11 11s.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 53

ROTARY Converters, Electric Dynamic Construction Co., primary 230 v. D.C., 4.7 amps., 1 h.p., secondary 230 v. A.C., 6.5 amps., single-phase, complete with starter and 10-amp. switch fuse; Lancashire Dynamo & Crypto Ltd., primary 220/240 v. D.C., 7.2 amps., 2 h.p., 3,000 r.p.m., secondary 230 v. A.C., 8.7 amps., 2 kVA, single-phase, complete with starter and 30-amp. switch fuse. Can be seen in London.—Box 5995, c/o The Electrical Review.

ROTARY Converters in stock, all sizes; enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 16

SINGLE-core V.I.R., Braided Flexible, heavy insulation, carry 24 amps., cheap.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5980

STAFF Time Checking and Job Costing Time Recorders (all makes) for quick cash sale. Exceptional condition. Write—Box 528, Smiths, 100, Fleet Street, London, E.C.4. 31

SWITCH and Fuse Units, Conduits and fittings, works requirements stocked.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5981

T.R.S. Cables and Flexibles supplied to M.O.S. requirements.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5982

WAITES Rotary Converter, volt 200, rev. 3,000, excellent condition, £20. Write—Buttemer, 3 Waldegrave Park, Twickenham. 5992

10-h.p., 415/3/50, variable speed, 720/950-r.p.m., B.T.H., totally enclosed Motor, complete with controller and resistance, in perfect order. Best offer around £40.—Greens, 20, Welford Road, Leicester. 5999

25, 30 and 50-volt M.F. Lamps, special line, cheap.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5983

60 yds. 920/.029 (1 sq. in.), single core, V.I.R. Braided Flexible.—Edwardes Bros., 20, Blackfriars Road, London, S.E.1. 5984

75-kVA steam-driven Alternator, Browett Lindley engine, 2 crank compound, coupled to English Electric 3-phase Alternator on self-contained bed.—Thomas Mitchell & Sons Limited, Bolton. 271

75-kW Motor Generating Set, input 400/3/50, output 205 volt D.C., and switchboard; 150-kW Motor Generating Set, input 400/3/50, output 220 volt D.C., complete with control gear; one 50-kW Motor Generating Set, input 400/3/50, output 110 volt D.C., complete with control gear.—Stewart Thomson & Sons, Fort Road, Seaforth, Liverpool, 21. 61

150-kW Ashworth & Parker/Siemens Steam Generating Set, three crank compound engine, 550 revs., coupled to 460-volt D.C. Generator on self-contained bed, sliprings and third wire for 230 volts, with static balancer.—Thomas Mitchell & Sons Limited, Bolton. 270

200 h.p., 400/3/50, 485-rev., S.R., Mather & Platt, 3-bearing type, with Ellison switchgear.—Greenhalgh Bros., Burton's Field Mill, Atherton. Phone 117. 41

250-kVA Alternator, 400 volts, 3-phase, 50 cycles, 750 revs., with direct coupled exciter.—Midland Counties Electrical Engineering Co. Ltd., Grice Street, Spon Lane, West Bromwich. 36

360-kW steam-driven A.C. Generating Set, Browett Lindley 2 crank compound engine, totally enclosed high-speed vertical, 375 revs., coupled to Westinghouse Alternator, 3/50/400, 650 amps., with direct coupled exciter on self-contained bed, also Hick Breguet Jet Condenser with Extraction Pump.—Thomas Mitchell & Sons Limited, Bolton. 269

400-kW Belliss Steam Set, 460/230 vo. D.C.; 50-kW Hindley ditto; 75-h.p. National Diesel Engine; 35-kW Tangye Diesel Set, 220 vo. D.C.; 3,000-gal. Fuel Tank.—Harry H. Gardam & Co. Ltd., Staines. 30

500 Electric Motors, Dynamos, Transformers, Converters, etc., etc., at low prices.—S. C. Bilsby, A.M.I.C.E., A.M.I.E.E., Crosswells Road, Langley, near Birmingham. Phone, Broadwell 1359. 21

600-cu. ft. per min., vertical, water-cooled, 4-cylinder Air Compressor by Broom & Wade, 100 lbs. sq. in. working pressure, vee-rope, driven by 100-h.p. S.R. motor for 400 volt, 3-phase, 50 cycles, complete with starter and control gear. Complete with receiver. New 1932. Inspection near Leeds.—Newman Industries Limited, Yate, Bristol. 227

1,000-kW Turbo-Alternator Set, made by Metropolitan-Vickers in 1920, 3-phase, 50 period, 400 volts, steam pressure 200 lb.; Jet Condenser. Apply—Patons & Baldwins Ltd., Halifax, Yorks. 251

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SUBSTATION Plant and Equipment, by Charles H. Pike. A work of reference for electrical power, substation and railway engineers and all responsible for the supply and distribution of electrical energy. 17s. 6d. net (post, 18s. 3d.).—George Newnes Ltd., Tower House, Southampton Street, W.C.2. 129

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COMPANY MEETINGS

THE RHEOSTATIC COMPANY

Increased Profit

THE Seventh Annual General Meeting of The Rheostatic Company Limited was held at the company's office, Farnham Road, Slough, on Wednesday, June 14.

The report of the directors submitted showed that the profit for the year, after making provision for depreciation, managing director's remuneration, income-tax, N.D.C. and E.P.T., amounted to £8,784, as compared with £8,071 in 1942. To that had to be added the profit brought forward of £4,055, making a total of £12,839, against £12,255 in 1942. From this the Preference dividends and an interim Ordinary dividend of 4 per cent., less tax, had been paid, leaving a balance of £9,939. From this amount the directors had transferred £3,000 to general reserve and recommended the payment of a final dividend of 8 per cent., less tax, on the Ordinary stock, requiring £2,800, leaving a balance to be carried forward of £4,139.

The Chairman, Mr. L. Satchwell, in his speech, which was circulated with the report and accounts, said:—

The balance sheet, auditors' certificate and directors' report for the year ended September 30, 1943, are in your hands. You will note that the trading profit is £35,626, showing an increase, and the directors are recommending to you that the dividend be the same as for last year.

The company continues to be very fully engaged and its standard products are vital in the national interest, including fuel economy.

The pension scheme which I mentioned a year ago has now been inaugurated, and, judging by its reception, the employees welcome the security provided and the contribution towards the cost made by the company.

My thanks are due to all employees who have done their part to make increased production possible, and the amicable relations existing are appreciated by the board.

281

Index to Advertisers

(*Continued on page* 80)

Index to Advertisers

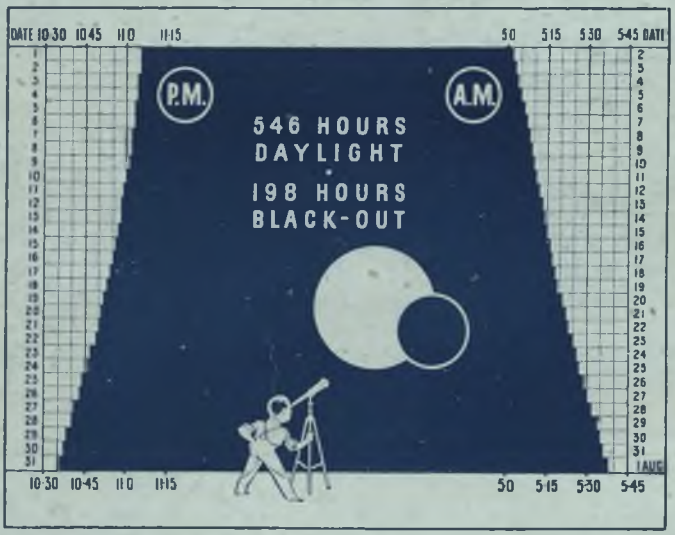
(*Continued from page* 78)

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this Journal should not be taken as an indication that they are necessarily available for export

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.

The Time to Plan . . . .

BLACK-OUT CHART FOR JULY



★ *Times shown are those for the London area.*

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Summer it may be, but black-out hours are lengthening again. It is time to think of lighting and how best it can be applied to assist output during the still darker months. Does your lighting system need any revision? . . . If so, complete your plans in good time. The subject of lighting always brings Osram to mind — for wherever you find good lighting, there you will find OSRAM.

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