

ELECTRICAL REVIEW

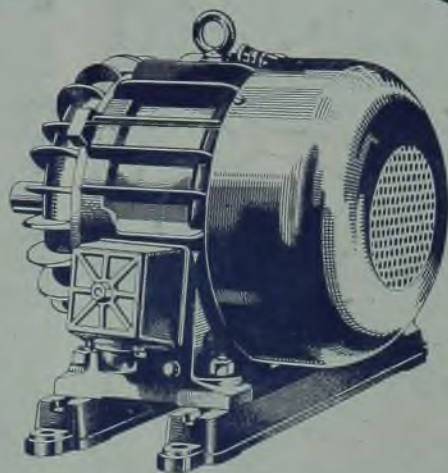
VOL. CXXXIX.

NOVEMBER 22, 1946

NO. 3600

2442/12.02

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TOTALLY ENCLOSED
SURFACE COOLED
giving continuous power where
damp and dirt are present

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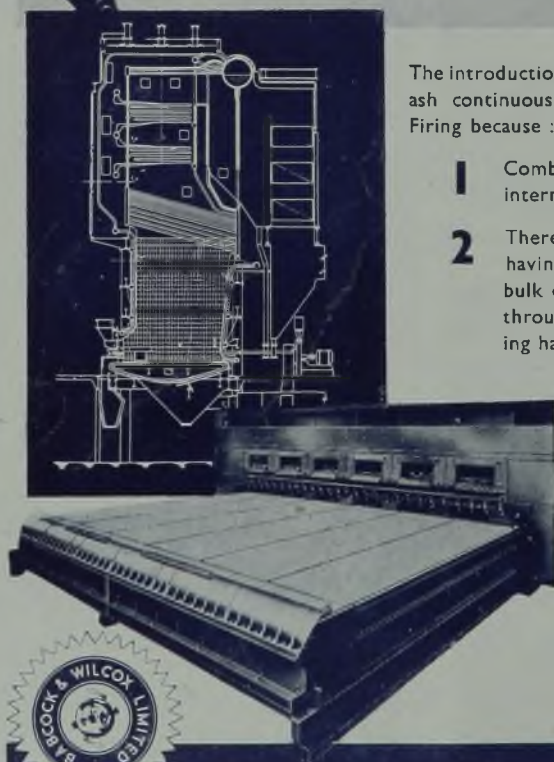


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- 3 Automatic control is simply applied.
- 4 High burning rates are readily attained, as the fuel and the air are evenly distributed over every square foot of grate area.

The illustrations show one of eight boiler units now under construction for the Kearsley Power Station of The Lancashire Electric Power Company, each for a load of 172,500 lb. of steam per hour at 620 lb. per square inch pressure, and 820°F final steam temperature.



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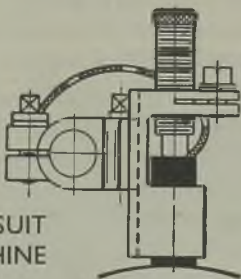
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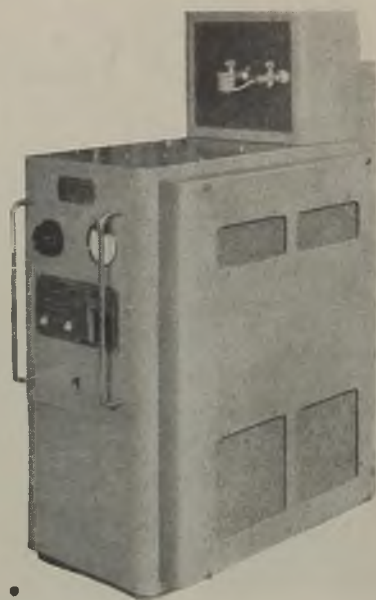
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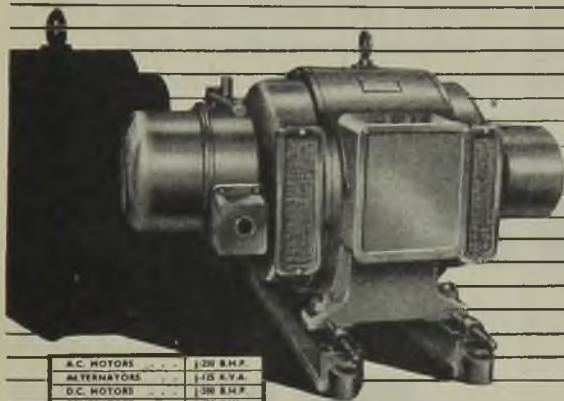
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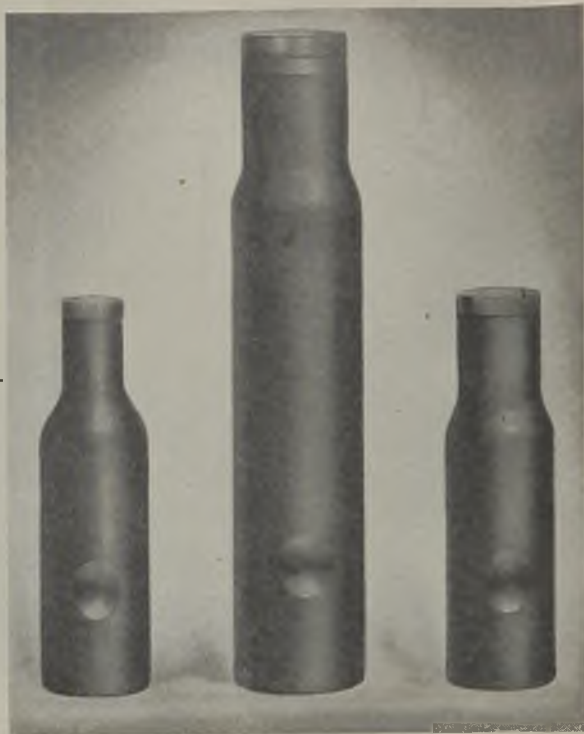
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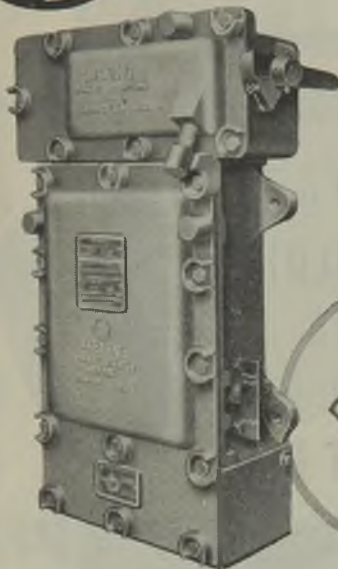
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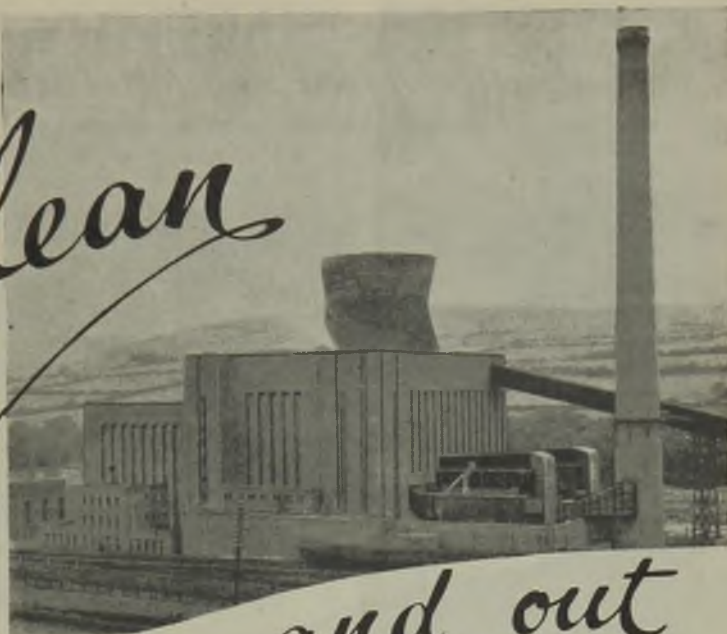
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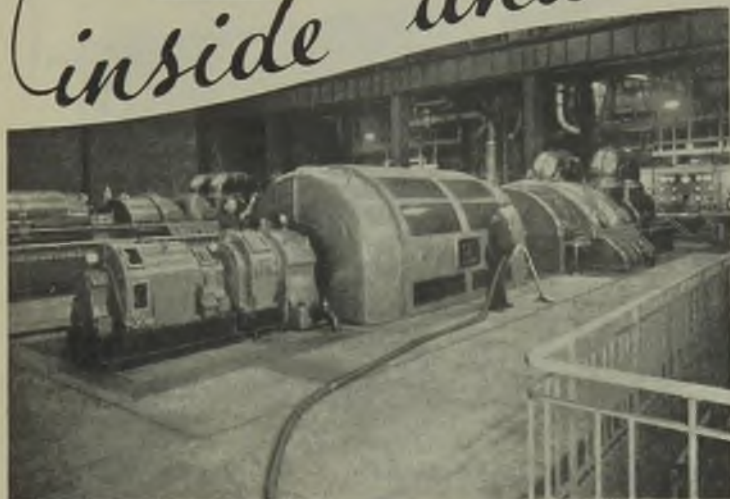
A 3501



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inside and out



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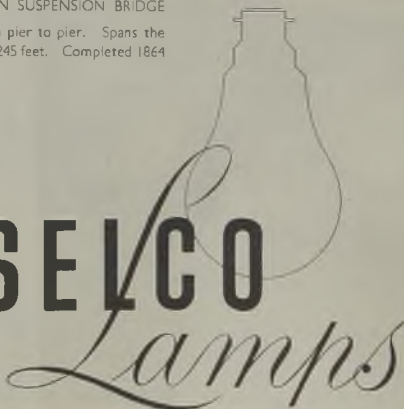


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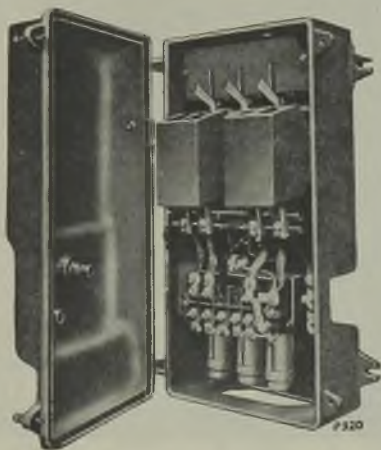
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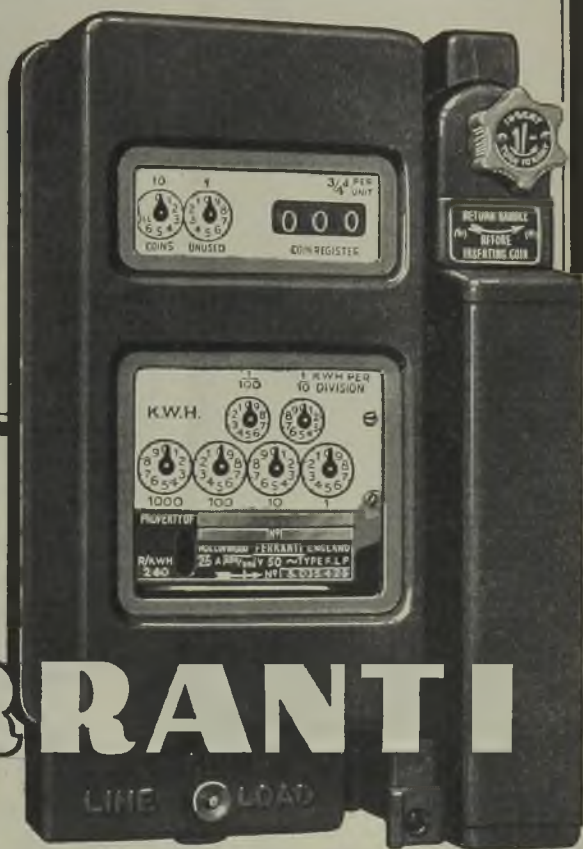
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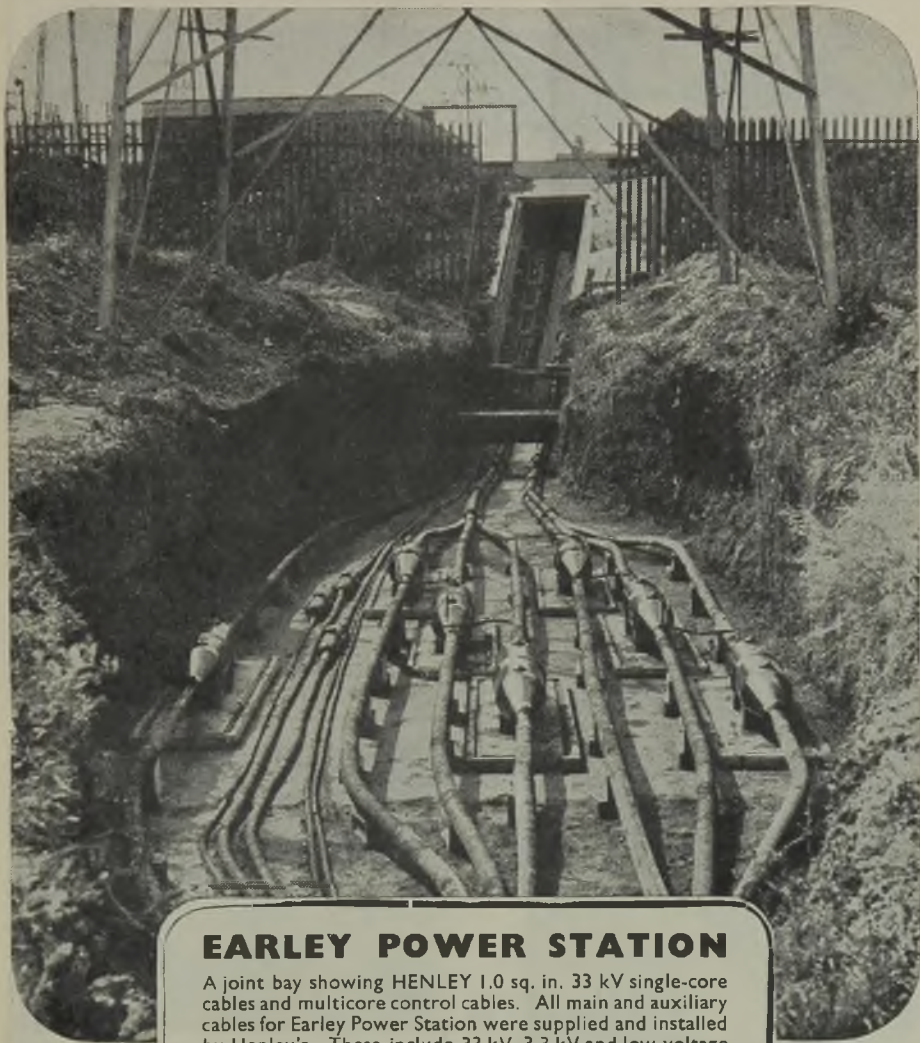


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EARLEY POWER STATION

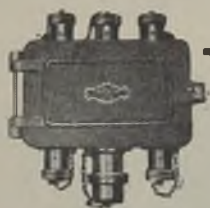
A joint bay showing HENLEY 1.0 sq. in. 33 kV single-core cables and multicore control cables. All main and auxiliary cables for Earley Power Station were supplied and installed by Henley's. These include 33 kV, 3.3 kV and low voltage cables, together with sealing ends, straight through joints and specially designed terminal boxes, for auxiliary and control circuits.

(Photo by courtesy of C.E.B.)

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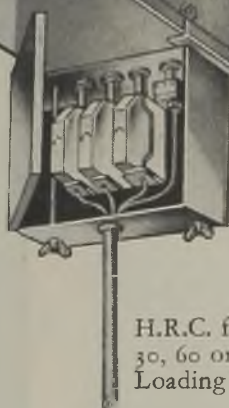
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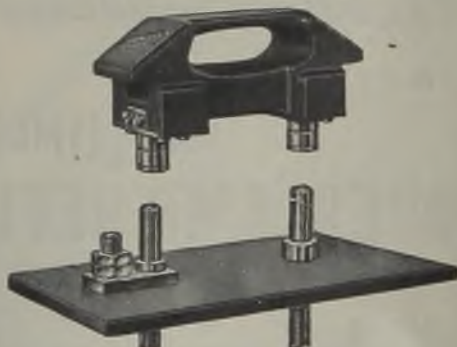
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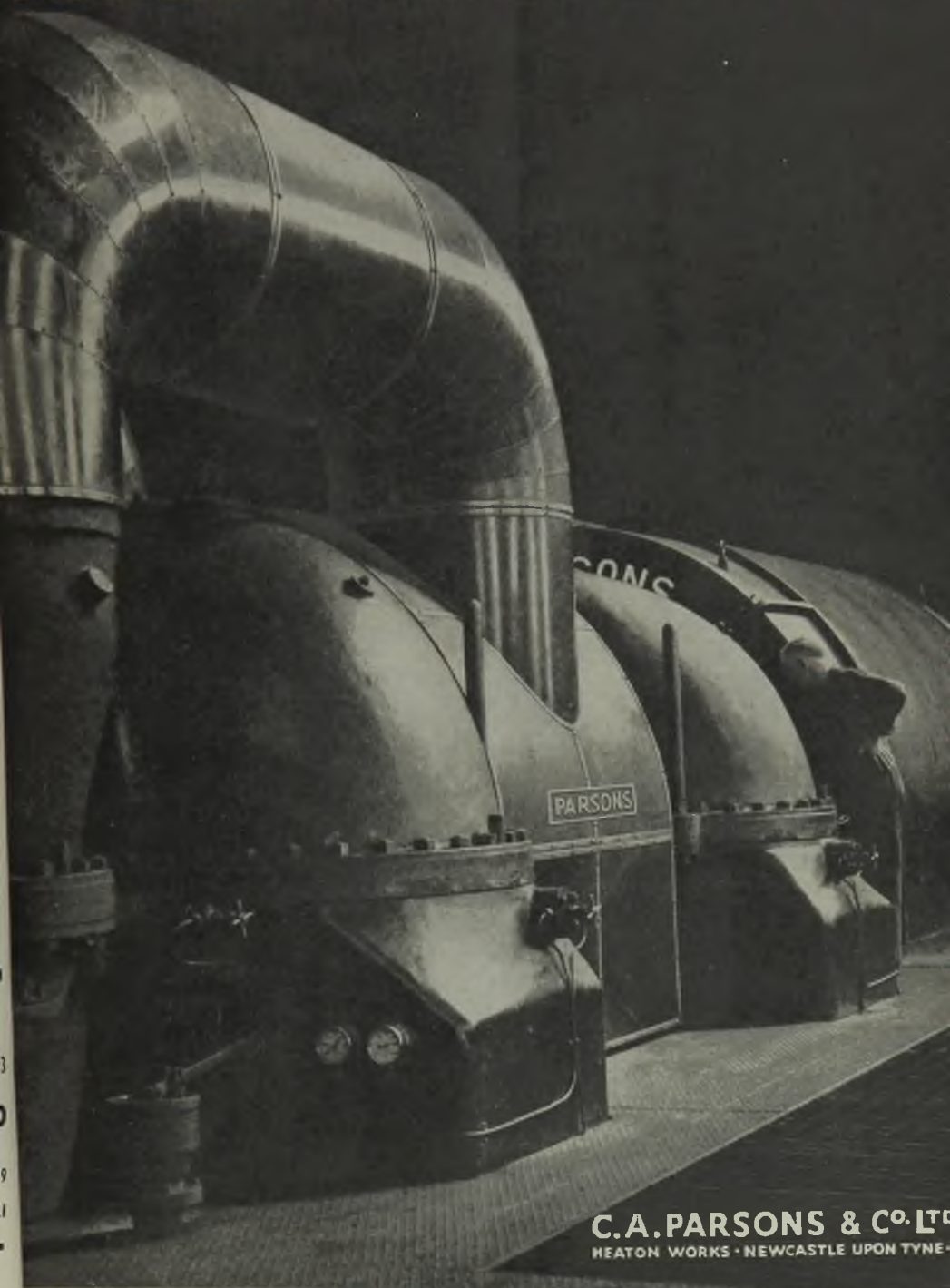
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Electrical Review, November 22, 1946

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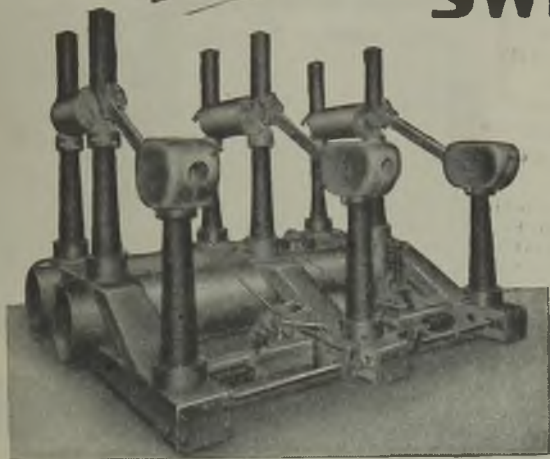
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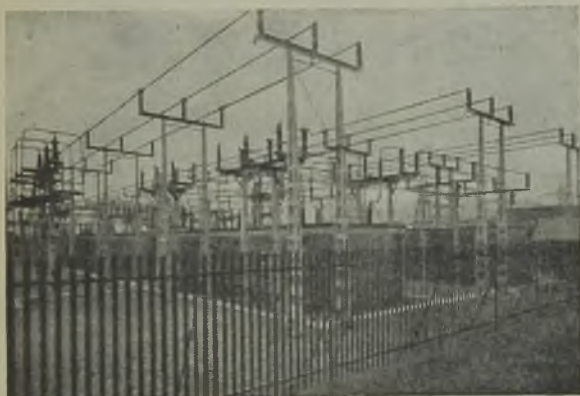
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Part of a 66 kV. outdoor substation, showing black-houses containing "English Electric" Air-Blast Circuit-Breakers



Publication SG/105B obtainable on request from Switchgear Dept. Stafford.

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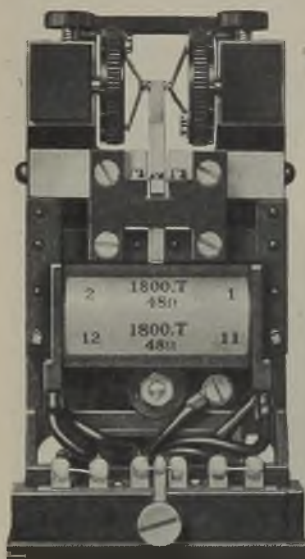
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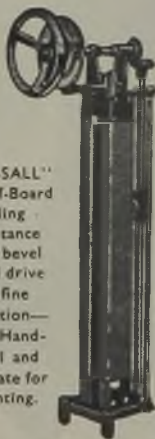
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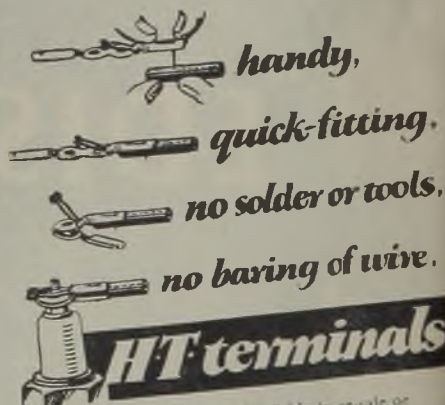


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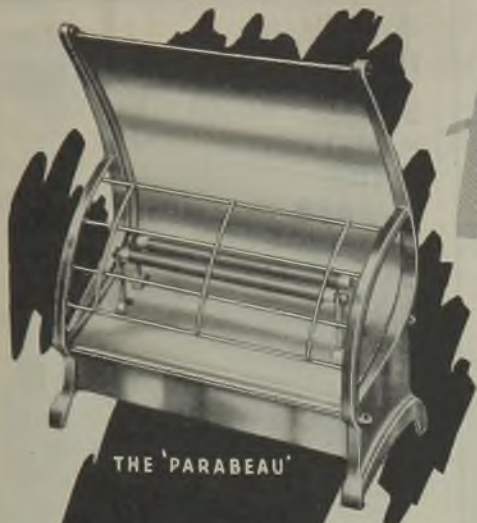
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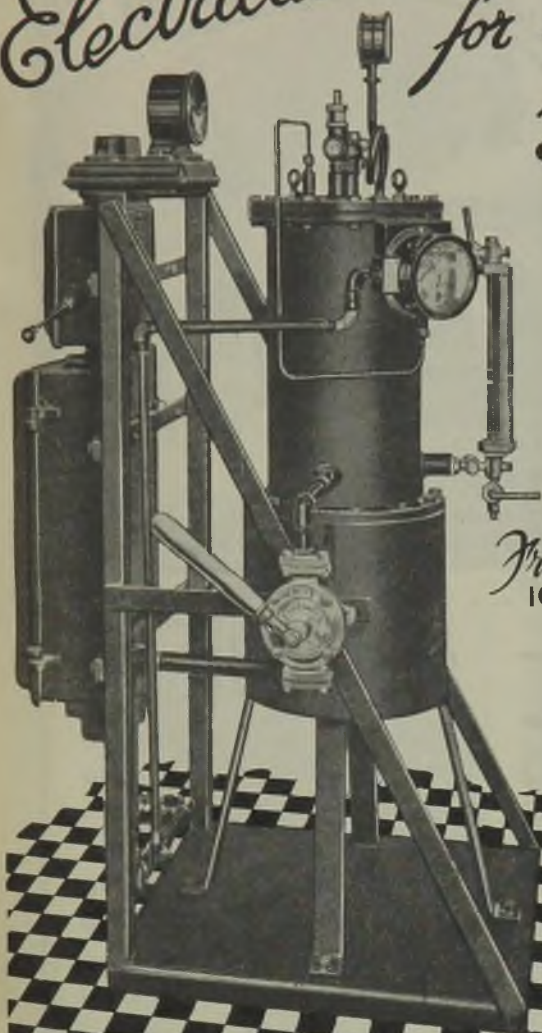
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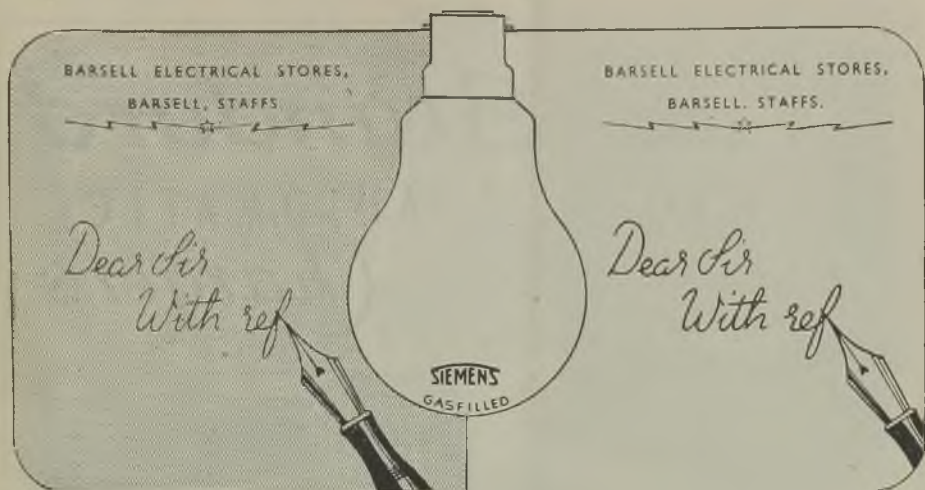
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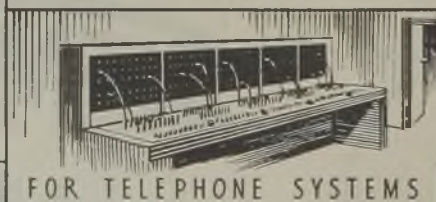
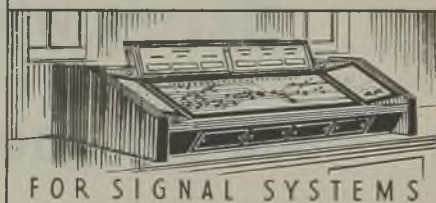
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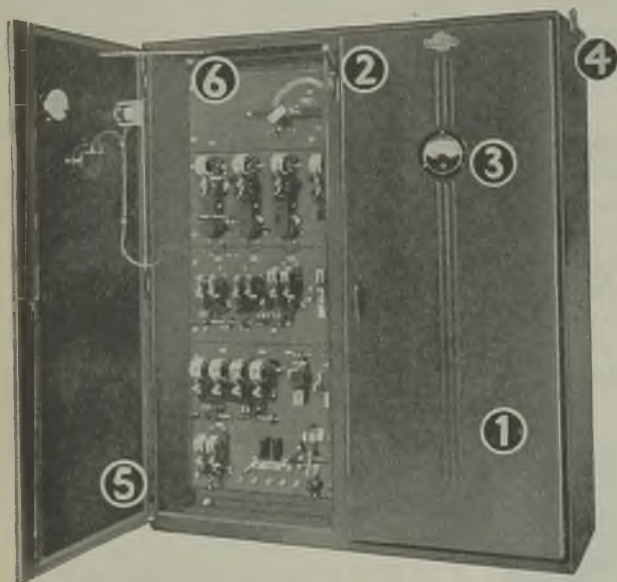


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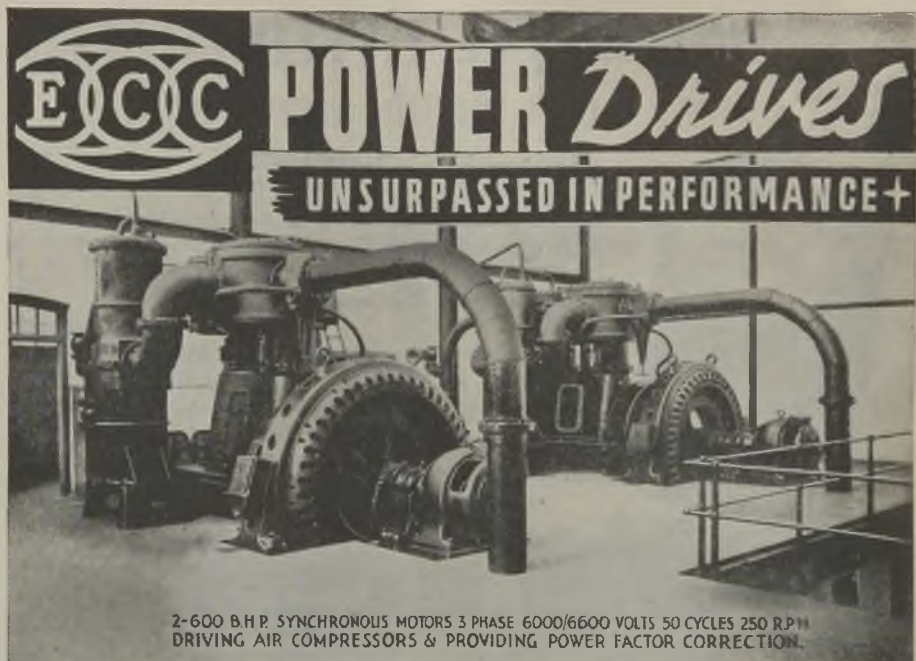
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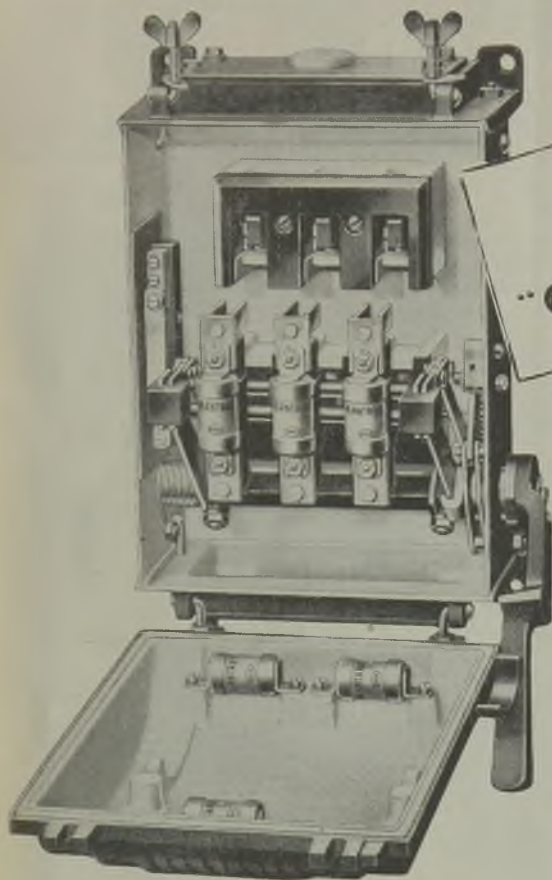
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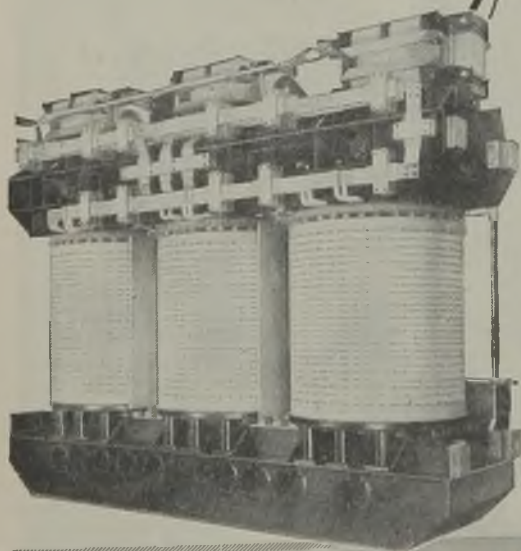
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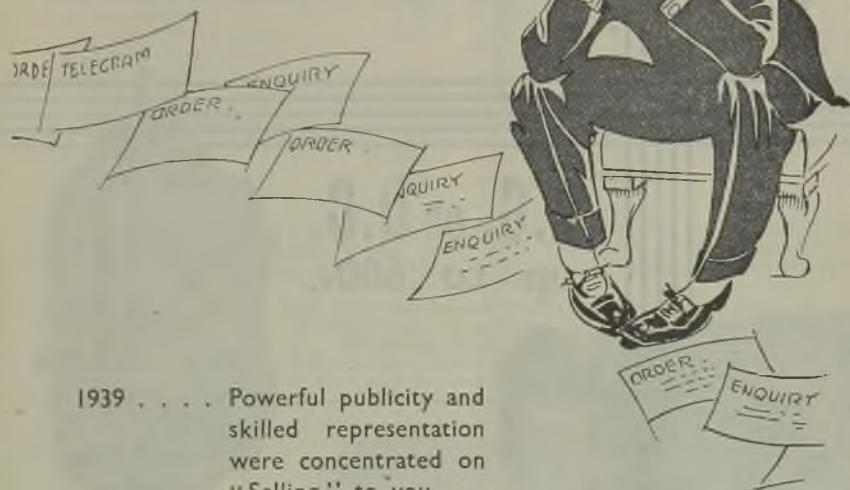
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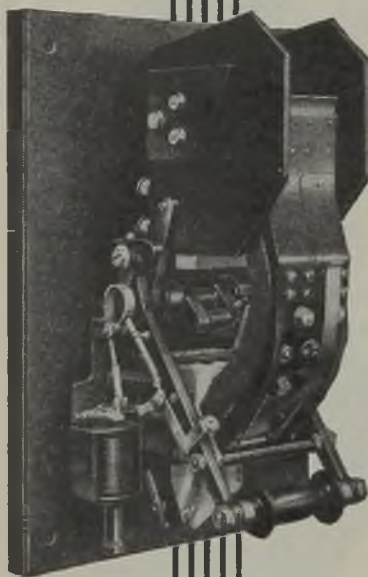
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November 22, 1946

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ELECTRICAL REVIEW

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Trade and Tariffs

British Electrical Manufacturers' Position

ELECTRICAL manufacturers to-day find little difficulty in disposing of their production, which is limited in quantity by labour and material considerations. The whole world is short of supplies; two of their principal competitors have been eliminated and others are in no better position than they themselves to meet the demand. These conditions will not continue and the shape of the future has to be studied.

One potent influence in international trade is import duties and other measures of "protection" and this subject is one of the chief features of all discussions on trade and employment. Lately it has cropped up in the Commons debate on the Address. This is a many-sided question, for tariffs may be regarded as beneficial or detrimental according to the position of the observer.

Dumping Countered

It is not open to question that the British electrical industry benefited very considerably from the duties imposed in 1932 which countered the dumping to which this country was being subjected by, notably, Germany and Japan. They had the effect of improving our manufacturers' home market, thereby strengthening their ability to export, with the result that by 1938 we had become the world's principal electrical exporters.

This was accomplished in spite of reactions in the form of tariff increases on the part of other countries. At the same time some Empire countries (which took

three-quarters of our electrical exports) intensified their efforts to foster secondary industries by imposing on imports duties which were sometimes prohibitive. It is true that lower rates were generally charged on British goods, but they still constituted a growing handicap. Nevertheless this preference has been deprecated in some quarters and strong pressure has been exercised to secure its reduction or abolition.

American Loan Conditions

It is widely thought that one condition attached to the American loan to this country was aimed at this, but the view is a false one. We certainly agreed to discuss the matter, with a view to arriving at arrangements satisfactory to both parties, but in such discussions the Dominions would be entitled to a voice.

With regard to the position as between the Dominions and ourselves there is room for adjustment apart from any arrangements with the United States. For their agricultural products the Dominions are accorded a measure of preference which enables them to compete here on favourable terms with foreign suppliers. In return we are entitled to expect that they will not raise tariff walls to exclude our manufactured goods, by which we must pay for our food imports, even though higher walls are presented to countries outside the Empire. The matter is one which affects the electrical industry very closely, for the manufacture of electrical goods is prominent in the industrial

programmes of the Dominions. This is true not only of the smaller, "consumers'," goods but of a growing range of industrial equipment.

We are placed in the somewhat anomalous position of demanding lower duties upon our exports while desiring to maintain tariffs against imports of manufactured goods. It may seem a selfish, one-sided arrangement but our position in the world compels us to seek it. The claim that we must "export to live" is no mere slogan but a stern economic fact.

High-Voltage Two examples of the diverse ways in which

Cables cable makers have overcome ionisation in the dielectric inter-spaces of cables up to the highest voltages are cited in this issue. These are the gas-cushion cable, the subject of Mr. T. R. P. Harrison's I.E.E. paper, and the compression cable. Superficially such brilliant technical results of years of patient research might seem to have received scant reward in the few miles that are so far in regular operation at 132 kV. Yet although underground transmission at grid voltage is heavily handicapped by a capital expenditure in a ten-to-one ratio as compared with overhead lines, economic considerations are frequently not the deciding factor.

D.C. Transmission It is of the greatest importance that, with the co-operation and encouragement of the Central

Electricity Board, cable manufacturers (among others) can prove the reliability of their products under working conditions. They are thus able to accept with confidence any opportunities at home or abroad. For more extensive underground transmission, technique is well ahead of the potential market, since no practicable means are in sight for controlling capacity currents and regulating voltage over long distances. D.C. transmission, foreshadowed by Lord Forrester, would obviate these difficulties and open up a field for under-water transmission, as an example. In this connection the ability to design cables for 264-kV a.c. operation argues that 550-kV or so on d.c. systems should be quite feasible. Here again cable makers are ahead and must await a commensurate advance in the development of mutators.

Rising Output SUPPORT for expectations of appreciably increased consumption of

electricity as the weather becomes colder is furnished by the latest returns of the Electricity Commissioners. These reveal a 17.4 increase in kWh generated by authorized undertakings in October, i.e., 3,733 million (3,526 sent out) as against 3,179 kWh generated in the same month of 1945. The new figures bring the total kWh generated during the past ten months to 32,930 million (31,060 million sent out), which is 9.2 per cent more than the 30,145 million kWh generated in the corresponding period of last year and entailed the burning of an approximately equivalent tonnage of additional coal. The extent to which the other shortage, i.e., generating plant capacity, is affected is not so clear since, unfortunately, comparative figures relating to aggregate maximum demand are not available.

I.E.E. and Training Grants

PARTICULARS were given in our issue of November 1st of a system of grants for men whose training for the electrical industry was interrupted by war service. One outstanding feature of the arrangement is the recognition by the Ministry of Labour (which administers the grants) of the position of the Institution of Electrical Engineers in this matter. To be eligible for the grant candidates must have university degrees in electrical engineering or have qualified in some other way as graduates of the I.E.E., and the specially-designed course of practical training conforms to the requirements of the Institution's Bye-Law No. 12a, which sets out the qualifications for associate membership. The length of the course depends on a number of factors.

Americans in Britain

ABOUT eighteen months ago the American Chamber of Commerce in London published a pamphlet on "American Participation in British Industry," in which the view was expressed that the British desire to limit imports would lead the American manufacturer to consider the possibility of manufacturing in Great Britain. Since then there have been examples of this trend and now it is reported from Scotland that nearly all of the 40-acre Vale of Leven industrial estate has been taken by two American concerns.

Ladybower Reservoir

Electrical Features
in Construction
and Operation of
the Dam



IN September last the King inaugurated the new Ladybower Reservoir of the Derwent Valley Water Board which has been created by the construction of a huge earthwork dam across the Derwent Valley at a site in the Derbyshire Peak District, between the villages of Bamford and Ashopton, near Hope, or across the valley from Win Hill to Bamford Edge. The reservoir is the third to be constructed in the valley, and it completes the vast programme initiated by the Board at its inception many years ago for supplying water to Sheffield, Derby, Leicester and Nottingham. The other two reservoirs are up-stream

from Ladybower and have been created by masonry dams across the valley.

The new reservoir presents a water-surface area of 504 acres at the normal high-water level, at which it has a surface perimeter of 13 miles. The maximum depth of water is 135 ft, and the villages of Derwent and Ashopton have been submerged, evidence of which is the weird spectacle of the steeple of the Derwent village church projecting out of the water.

In the *Electrical Review* of April 1st, 1938, we described the electrical applications to some of the very early work involved in the construction of the dam, which was commenced in 1935, and we can now add an account of many other features of electrical interest relating to both the dam and the reservoir. Although the dam is now virtually completed, in that the reservoir is actually in existence, the consulting engineers, G. H. Hill & Sons, and the con-



Ladybower completes the vast scheme for three reservoirs; the photograph above is taken looking at Ladybower over one of the earlier reservoirs and masonry dam

... the weird spectacle of the steeple of Derwent village church projecting out of the water



tractors, Richard Baillie, are still on the job, and it looks as though work will continue for several months yet. We therefore propose to refer to the reservoir and the dam as we saw them during a recent visit.

The dam, which is believed to be the largest earthwork dam in the British Isles, is 1,260 ft long, 140 ft high above the original river bed, and measures 650 ft across at its greatest width. Underlying the dam proper is a huge trench filled with concrete to prevent water leakage through the ground on which the dam is founded. The trench was excavated to an average depth of 180 ft below the bottom of the dam, the maximum depth being 250 ft. The strata encountered during the excavation consisted of alternating beds of grit-stone and shale in varying thicknesses from 6 in. to 10 ft. Near the surface, the grit-stone beds were very much fissured, but the cracks diminished in size as the depth increased, until reasonable watertight strata was encountered at the bottom. During the greater part of the period of excavation, water was issuing into the trench through the sides and had to be removed by three self-priming centrifugal Drysdale motor-driven pumps

which dealt with about two million gallons per day. Eventually the trench was filled with concrete to about the original ground level, 100,000 tons of concrete being used.

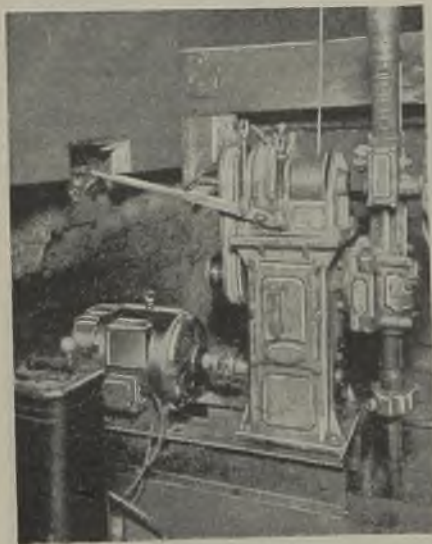


The Blondin ropeway was used mainly for transporting the clay puddle

During this work 6-in. diameter holes were left in the concrete at 7-ft centres. Later on, through these holes, the strata below was drilled to depths from 50 to 100 ft below the bottom of the concrete, and into these holes grouting cement was pumped as a final precaution against seepage under the body of the complete structure. Similarly, to prevent leakage through the hillsides round the ends of the embankment, headings were driven into the hillside to a distance of 500 ft at each end.

Each heading measures about 10 ft by 10 ft in section. Below each heading a 6-ft wide trench was excavated to a depth varying from 30 to 50 ft, and the trench was filled with concrete. Work is still going on at one of these headings and we were able to see some of it in the tunnel forming the working head for the trench and the concrete block.

At the open end of the tunnel is a large concrete mixer with an output of 20 tons per hour. It is driven by a 20-H.P. motor and the motor speed of 720 r.p.m. is reduced to a drum speed of about 16 r.p.m. by transmission first by belt to a countershaft and then via a pinion shaft and gear to a rack around the periphery of the drum. A special travelling overhead crane in the tunnel is used for transporting the concrete from the mixer to the points required in the trench. It carries 1 cu yd skips and has two motions, travel and hoist, which are both served



The strata is bored for grouting the fissures by a chilled shot rotary drilling machine in the hillside tunnel

by the same 27-H.P., 730-r.p.m., 400-V motor.

The strata in the hillsides was found to be very badly fissured within about 100 ft from the top water level, so again holes were formed in the concrete, and through them the strata was, and in some cases still is being, bored to a depth corresponding to those under the main trench. We saw an electrically driven boring machine at work on this task. It is a chilled shot rotary equipment which has at the working end of the hollow boring shaft a flat-edge tool. Water and shot are fed down to the tool through the boring shaft, so that the actual cutting operation is one of grinding the rock by the abrasive action of the shot between the tool face and the rock. The considerable weight of tool assembly is taken by a pulley under the control of a winch at the top of the machine. Feed adjustment is effected by means of a hand-controlled rack at the top of the boring head. The driving motor is a 15-H.P., 955-r.p.m. slip-ring equipment with drum-type starter control, and transmission is via an adjustable shaft head to which is imparted a speed of about 80 r.p.m. A high-speed Harland pump is used for

Above the trench or concrete block of the dam proper is a watertight core of clay forming the middle of the embankment. This core was constructed of about 100,000 tons of clay puddle which was put down in 6-in. layers and consolidated by heeling, so as to form one homogeneous mass throughout the core. The clay was obtained from a site about three miles from the dam and brought to the dam vicinity by locomotives. Before being further transported to where it was required in the core it was mashed to the consistency of plasticine in electrically driven mills.

With a span of 1,600 ft from hillside to hillside there is immediately above and along the line of the dam a Blondin ropeway which



Grit-stone blocks are cut to size by special saws with toothless steel blades



Pneumatic stone-dressing tools are served by a motor-driven compressor

supplying the boring machine with water, and it is driven by a 20-H.P., 2,000-r.p.m. motor.

Evans horizontal steam pumps are used for delivering the grouting cement to the fissures through the holes in the concrete, and they receive the material from simple mixers with paddles on vertical shafts, each belt driven from a small motor surmounting the mixer. Altogether about 8 miles of holes have been driven through the dam and heading concrete blocks, and about 14,000 tons of grouting cement has been used.

was used principally for transporting the clay puddle from the mill to the core, although it was used extensively for other constructional purposes. Its performance varied considerably with the working conditions,

but an average daily duty was the transportation of 83 loaded 4.5-ton skips. It has an endless-rope travelling system with three rope turns round the travelling drum of the haulage equipment, and a single-rope hoisting system. Both the travel and hoist motions are served by the same 110-H.P., 580-r.p.m. motor through simple transmission gears, so arranged that the two drums can be driven together to provide "pay-out" of the hoisting rope during travelling, or the hoisting drum can be operated separately.

Next to the clay core of the embankment is selected material which is of a clayey nature, but somewhat stony, while the out-

used for these walls, like those used for the facing of the up-stream side of the embankment, are of grit-stone in varying sizes averaging, say, 24 in. by 18 in. by 12 in. The blocks are cut to size on site by special saws in which toothless steel blades are disposed horizontally as they are worked by a reciprocating action down through the stone. The blades are corrugated vertically throughout their length, and during operations a mixture of shot and sand is fed through the corrugations down to the cutting edge of the blade where the stone is worn away by the abrasive action of the shot and sand. The saws are motor driven, and in one



Bell-mouthed shafts take the flood-water; over each valve shaft is a control tower

side of the embankment is built up of a more stony material. There is about a million tons of earthwork in the embankment, and this was largely obtained from the bed of the valley up-stream, from the trench excavations, and from the tunnels to be referred to later. The up-stream side of the embankment is faced with stone which protects the embankment from erosion caused by wave action. The down-stream face is soiled and grassed.

There is a roadway right along the top of the dam from hillside to hillside, and on either side of this is a stone wall built without

case a 20-H.P., 720-r.p.m. motor transmits by belt to a pulley shaft carrying a crank which engages with a beam which imparts the reciprocating motion to the blade frame. The sawn blocks are also dressed on site, and for this purpose pneumatic dressing tools are



The tail-bay is now virtually the source of the River Derwent



Turbo-generators, supply pumps and switchboard are all housed in a chamber (left) in the tail-bay

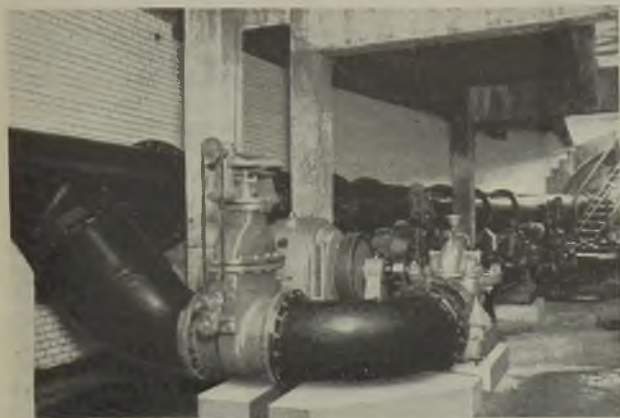
used. We saw two of these tools at work with supplies of compressed air at 100 lb per sq in. from a 250-cu ft per min compressor. This is driven by a 60-H.P. motor to which it is directly coupled.

any cement, mortar or any other jointing or bonding, so that the inevitable subsidence of the earth of the dam below the walls will not result in wall cracks. The stone blocks

To take care of the flood water in the reservoir in wet seasons, etc., there are two vertical circular shafts in the reservoir, one at either end of and near the dam. The top

of each shaft is bell-mouthed, opening outwards, and the top level is 5 ft below the top of the dam. The shaft diameter at the lip

a control table from which the hydraulic valves are normally operated. The hand-operated valves are intended for emergency use. The hydraulic pressure required for operating the valves is supplied by motor-driven pumps. The compensation water is taken from the bottom inlet of the valve shaft, and the supply water is nearly always taken from the top inlet. Through each discharge tunnel run two 36-in. diameter pipes which are connected to the down pipes—one for the supply water and the other for the compensation water. Through suitable branch pipes and valves the tunnel supply pipe communicates with three Harland Engineering centrifugal pumps by which the supply water is



Three 185-H.P. motor-driven pumps pass the supply water on to the filter beds

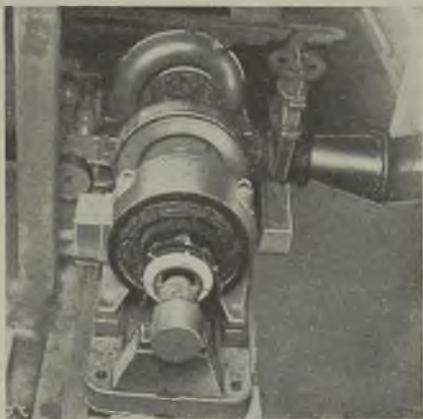
is 80 ft, and the mouth is stepped inside, so that the water cascades into the shaft. Each shaft is 120 ft high and at the bottom it is connected to a 15-ft diameter tunnel which carries the flood water to the tail-bay of the dam. Thence the water flows into the River Derwent.

There are two normal water outlets from the reservoir. One is for the supply water for which the reservoir has been created, and the other is for the compensation water required to keep the River Derwent flowing down-stream to the extent of a minimum of 16½ million gallons of water per day. The supply and compensation waters are taken from the reservoir by means of down pipes in one of two vertical valve shafts, one near each end of the dam. Each shaft has a diameter of 12 ft 6 in., is lined with glazed white brick and is 140 ft high. It sits on a discharge tunnel which extends from the toe of the embankment, inside the reservoir, to the tail-bay. Into the down pipes there are three inlets from the reservoir, one at 25 ft below the top-water level, one at 75 below the top-water level, and one at the bottom of the shaft. At each inlet there are two valves—one hand and one hydraulically operated—by which the flow of the water may be controlled.

Surmounting each valve shaft is a control tower to which access is gained normally from the dam roadway, and in the tower over the shaft containing the down pipes is

passed on to the Board's filter beds and plant before it is delivered to the cities. Each pump will deliver five million gallons of water per day and is directly coupled to a 185-H.P., 1,600-r.p.m. B.T.H. motor.

The compensation-water pipe is branched at three points on its way from the shaft to the gauge basin in which the flow is measured before the water passes on to the tail-bay which is now virtually the source of the River Derwent. Each branch pipe communicates with the turbine of one of three hydro-turbo-generator sets, two of which generate the electricity used for driving the



Two (one shown) 240-kW hydro-turbo-generators provide electricity for the supply pump motors

supply pumps, the third and smaller one serving for lighting and auxiliary supplies throughout the dam installation. All three turbo-generators have Gilkes & Gordon turbines and Harland Engineering generators. Each turbine of the two larger sets for the supply pumps has an output of 297 H.P. when running at 850 r.p.m. under a 130-ft head, and its 240-kW dynamo generates at 440 V. The smaller set has a 49-H.P. turbine and a 33-kW dynamo, with the same water and electrical conditions. An Erskine Heap open-type nine-panel switchboard controls the supply from the generators and to the pumps and lighting and auxiliaries, and it is equipped with high-speed air-break circuit-breakers and Metrovick voltage regulators. The nine panels comprise three for the turbines, three for the pumps, one for lighting and auxiliaries and two for voltage regulation. The turbo-generators, the supply pumps and the switchboard are all housed in a chamber within the tail-bay structure and communicating with the discharge tunnel. A similar chamber at the other side of the tail-bay will provide accommodation for additional generating plant if it is required.

The generation and supply scheme just described is designed to afford the maximum degree of flexibility of operation. This is essential on account of the dissimilar heads of water available at different times of the year consequent on the varying levels of the reservoir. It will be appreciated that direct use of the water for driving the pumps would rob the scheme of such flexibility, as the output would then be largely dictated by the water conditions. D.C. is used on account of the variable speeds required.

The larger part of the valves and ironwork employed on the installation was supplied by J. Blakeborough & Co., Ltd. Electricity supply for the constructional works is taken from the system of the Yorkshire Electric Power Co., which has on the site a suitable substation.

We are indebted to G. H. Hill & Sons (Manchester), the consulting engineers responsible for the design and supervision of the construction of the works, to Mr. A. R. C. Ball, their resident engineer, as well as Mr. C. Vivian, the chief inspector, for the information upon which this article has been compiled.

Companies and Nationalization

THE electricity supply companies of Great Britain issued a statement last week declaring that nationalization of electricity, with its inevitable uncertainties, would seriously dislocate the country's whole industrial system. The substitution of State monopoly for competitive enterprise would result in management becoming increasingly centralized and stereotyped, which must entail increased prices and inefficient service. Interference with development in this country, particularly at the present juncture, would be an economic disaster.

The Government had stated that for many years to come man-power would be inadequate for the nation's industrial needs. The expansion of the use of electricity was the best way of compensating for this shortage and of reducing needless toil for the housewife in the home.

The history of the electricity supply industry was one of reducing prices and increasing efficiency. Since "VJ Day," in the face of every difficulty, electricity had been supplied to nearly 200,000 new consumers. Nationalization would drive the best brains and hands out of the industry, and would slow down, if not stifle, its development at a time when the nation was engaged in a life and death struggle for an expanding economy.

Given the necessary priorities and freedom of action, the companies reaffirmed their ability to carry out their five-year programme of

general development, at a cost of £150 million, and the proposals to expand electricity supply in the rural areas, at a cost of £72 million, of which £45 million would be found by the companies and £27 million by the agricultural industry. No Government subsidies were required for these tasks, which would confer immense benefits on the nation.

The companies did not base their opposition to nationalization on political, but on economic and practical grounds. They were certain that the Government's proposals, if adopted, would vitally damage the interests of the community.

Stretford Board's Accounts

GROSS income of the Stretford and District Electricity Board during the year ended March 31st last was £991,681, an increase of £15,532 on 1944-45. Working expenditure, at £836,174, was up by £41,227, and the gross profit for the year was £155,507 (against £181,202). Loan charges and income tax amounted to £123,198 (£141,237), making the net profit £32,309 (£39,965). The Board (chief engineer, Mr. A. E. Clarke) generated 163.9 million kWh during the year. Sales aggregated 281.1 million kWh (299.2 million), the reduction being wholly due to a fall of 22.5 million kWh in power supplies.

A.C. Motor Starters—I

Protective Features Necessary

OF the many types of motor starters available there should be little difficulty in obtaining a standard article which is suitable for most conditions. One of the first matters to be decided is whether a starter shall be hand operated or automatically controlled by push buttons or other means. Direct-on-line push-button starters are little more expensive or complicated than hand-operated designs having the same protective gear. The automatic type is less liable to suffer from hesitant closing of the contacts than is the hand-operated type and is readily arranged for remote control.

Connections for a direct-on-line push-button starter for a three-phase motor are shown in Fig. 1. This has thermal overload trips (O) and a contactor coil (N) with fixed contacts (F) and moving contacts (M). Pressure on the "start" button energizes the contactor coil to close the starter, auxiliary contacts (A) maintaining the coil circuit when the start button is released. Remote-starting buttons can be connected in parallel with the start-button contacts, and remote "stop" buttons in series with the stop-button contacts.

Star-delta and Auto-transformer Types

Push-button star-delta and auto-transformer starters are rather more complicated than hand-operated gear, as they usually incorporate one contactor to close the starting contacts, another to close the running contacts, and a time-relay device for energizing the second contactor after the motor has speeded up. The timing gear may comprise contacts which are closed by a solenoid the action of which is delayed by an air or oil dashpot or by an eddy-current time lag having a metal disc revolving between the poles of a magnet, or else contacts carried on a bi-metal strip which gives a thermal time lag. However, there is much to be said for push-button starters when operated by unskilled labour, as hand-operated starters of these types are frequently misused.

Smaller automatic slip-ring motor starters may have a stator-circuit contactor and a dashpot-controlled solenoid which closes a series of contacts in turn to cut out rotor resistance. In larger starters the rotor

By "Rotor"

circuit is usually controlled by two or more contactors energized by contacts operated by a dashpot-controlled solenoid. Unless a very expensive starter is used, having many rotor-circuit contactors, the number of resistance steps is thus less than in the normal hand-operated starter. In most cases it is a sound plan to use hand-controlled starters for larger slip-ring motors, preferably in the care of one or two responsible persons

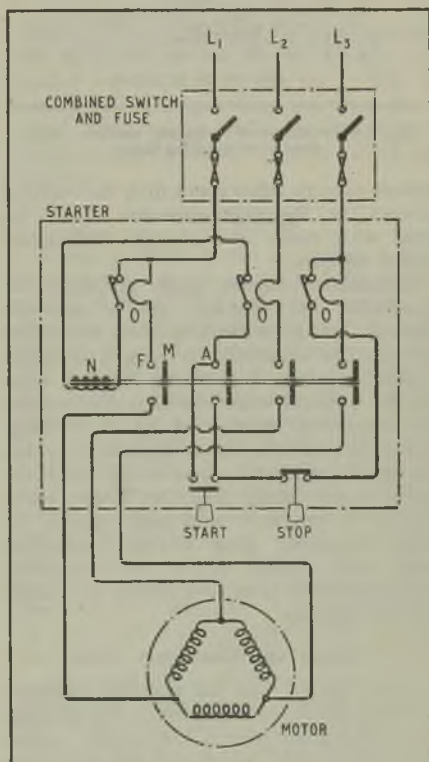


Fig. 1.—Connections for direct-on-line starter for three-phase motor

only. Automatic starters are, of course, necessary if the motor is to be controlled by some independent device, such as a pressure or water-level switch.

Where starters have to be used for "inching" or moving the motor in jerks in order to pull on a heavy belt or to get a driven

machine into a certain position, the interruption of heavy starting currents calls for the use of robust contacts. These should have a knuckle action so that the circuit is

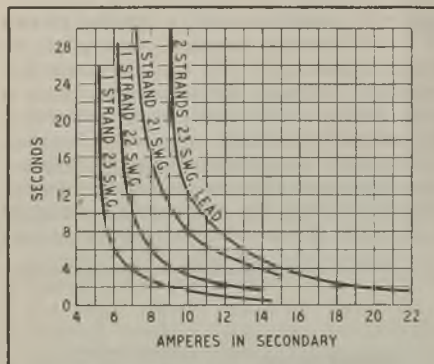


Fig. 2.—Variation of tripping current with change of time-lag fuses

broken at some other point than the working contact, or the main contacts should be fitted with easily and cheaply replaceable arcing contacts.

Substantial contacts, easily accessible for inspection and renewal, are a desirable feature. In the writer's opinion horizontal contacts are unsuitable for a dusty position, as foreign matter is liable to fall and lodge on the contacts when the starter is opened for inspection, thus resulting in burning. For most positions totally enclosed switches are to be preferred. Starter oil tanks are often rather heavy and the larger tanks should be provided with some device for ready lowering; long screws, supporting wires and winding drums or a separate hook-on lifting lever attachment are useful for this purpose.

Voltage and Emergency Trips

Every starter, with the possible exception of those for fractional-horse-power motors, should be fitted with a low-voltage release or "no-volt coil," which will trip the starter if the supply fails, thus preventing restarting of the motor itself when the supply is resumed. On a hand-operated starter this device usually comprises an electromagnet coil, which is energized when the starter is closed and raises an iron plunger to be held suspended over a hold-on catch when the motor is running. Failure of the supply de-energizes the coil, releasing the plunger to fall on and trip the catch so that the

starter returns to the off position under the action of gravity or springs. A possible defect of this "trip" type is that, if the supply voltage drops gradually, the plunger may float down with insufficient force to trip the catch. In some hand-operated starters of the interlock type the no-volt coil is energized by auxiliary contacts which are closed before the main contacts touch and arranged so that the starter cannot be fully closed unless the coil is energized. No-volt protection is inherent in the push-button starter, which is closed by a contactor coil.

Compliance with the Factories Act entails the provision of means near the driven plant by which the power can readily be cut off the machine and any mechanical power transmission medium in an emergency. Where the driven plant is some distance from the starter one or more push buttons, of the normally closed type, are usually fitted in series with the no-volt coil. With the "trip" type of starter there is no real safeguard against a motor, which has been stopped by the emergency button, being restarted by someone unaware of the emergency. For this reason one or two persons only should be designated to operate the gear. On the other hand the interlock and contactor types can be used with remote switches having definite on and off positions, so that the motor cannot be restarted until the remote switch has been reset to close the no-volt circuit.

The starter should incorporate protection

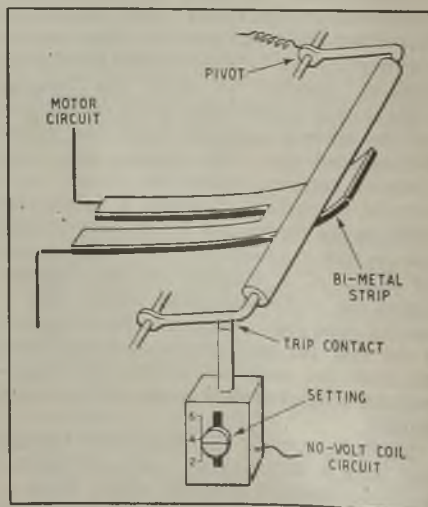


Fig. 3.—Principle of direct-heated bi-metal over-load trip

against heating of the windings due to mechanical overload, except possibly small motors driving simple machines, such as fans, which are unlikely to become overloaded. For proper overload protection one trip element should be connected in each pole of a system which is not earthed. The overload trip is the medium by which the current is usually cut off should an earth fault cause the metallic sheathing or casing of the conductors to become alive, with accompanying risk of fire or shock.

In order to avoid tripping on overloads, such as starting currents, which do not persist long enough to damage the motor by overheating, time-lag dashpots are usually fitted to magnetic overload trips. On larger starters the overload-trip elements may be fed through current transformers, thermal time lags being provided by connecting fuses across the trip coils; the trip then operates only after an overload long enough to melt the fuses. The ratio of the current transformers is usually such that 5 A flows in their secondaries when the circuit is fully loaded. Fig. 2 shows the inverse time lag obtained with shunting fuses and how the trip current can be altered by changing the time-lag fuses.

Thermal Overload Protection

Thermal overload trips are now commonly used in the smaller starters. The bi-metal element comprises a strip of two metals having different co-efficients of expansion which are joined throughout their length (see Fig. 3). Each strip may be heated directly by the passage through it of the whole or a portion of the motor current (the remainder in the latter case being carried by a small shunt piece connected across the strip). Alternatively, in the largest starters the strip may be heated by the secondary current of a current transformer connected in the motor circuit. Excessive current causes the free end of the strip to curl sufficiently to trip the starter, either mechanically by tripping the hold-on catch or electrically by opening contacts connected in the no-volt coil circuit.

Some types of bi-metal trip are automatically compensated for ambient temperature by means of another bi-metal strip which controls the setting, whilst other types can be adjusted for a particular ambient temperature; these types are useful where a motor in a cool position is controlled by a starter in a hot place. Other types are not

compensated, thus tripping at a lower current if the surrounding temperature is high, and are used where the motor and starter are subject to the same temperature conditions. Usually the bi-metal trips can be adjusted to vary the operating current.

Another form of thermal overload release consists of a receptacle containing a metal of low melting temperature; embedded in this metal is a rod which normally holds closed a pair of contacts connected in the no-volt coil circuit. The receptacle is surrounded by a heating coil carrying the motor current, excessive current causing sufficient heat to melt the metal and release the rod, which then turns under the tension of a spring to open the trip contacts. After the starter has tripped and the metal solidified the contacts can be reset by means of a ratchet on the top of the rod. This trip usually has a longer time lag than the bi-metal type, but in order to alter the trip setting heating coils of different rating must be fitted.

Trip Setting

Where a motor is run up against a heavy load, there is much to be said for using a starter in which the overload elements are out of circuit during the long starting period in order to avoid overheating of the elements and to avoid having to set the trips abnormally high. The trips should preferably operate if the sustained overload is 25 per cent in excess of the full-load current shown on the motor nameplate. Some thermal overload devices reset themselves when the starter has tripped and the element cooled, whilst others have to be reset by hand. The latter should always be used in a starter which is mechanically controlled, as by a float switch; otherwise the starter is likely to open and close by itself under overload conditions.

The ideal overload device would be a trip having the same thermal characteristics as the motor protected, but the heating and cooling conditions inside a motor are so different from those in the starter that this will probably not be realized. For this reason it is sometimes difficult to provide proper protection for a motor which works on a widely varying load. In such cases a thermal device may be fitted inside the motor, having contacts in the starter no-volt circuit arranged to open at a predetermined temperature. Such a device, however, offers little protection against short-circuit.

Views on the News

Reflections on Current Topics

THE London Passenger Transport Board's decision, announced last week, to convert the whole of the trams in South London to fuel-oil buses apparently puts paid to any further extension of the use in London of trolley-buses. This decision is not due to power shortage, as might have been thought, but has been taken because the Board considers oil-driven buses to be more "flexible" than trolley vehicles. It is also said that they present wider opportunities of co-ordination with other transport services. In view of the satisfactory operation of the Board's existing trolley-bus services the decision must be regretted. Also from the fuel standpoint the proposed conversion, taking what I hope is a long-term view, is unfortunate. A few years ago it was one of the most telling arguments in favour of trolley-buses that they used home-produced fuel. There is, I understand, no suggestion that the existing trolley-buses shall be abandoned.

* * *

Although no electric vehicles were reported as taking part in the run to Brighton of veteran motor-cars (i.e., those built before 1905) last Sunday, which celebrated the jubilee of "emancipation day," a number had been in service for shorter journeys many years before. A patent taken out as far back as 1896 in the names of J. R. Quain and F. W. Dunlap in relation to one-lever control of speed and steering referred specifically to vehicles driven by electricity as well as other means. Examination of the specification indicated some of the difficulties encountered by the pioneers of motoring, which caused the sponsors of the rally to plead with the public to give the old cars plenty of road room.

* * *

Electricity cuts continue and are likely to go on during the winter for demand is still well above plant capacity at certain times of the day. Undertakings are adopting different methods of acquainting their consumers of the cause and appealing to them to "go easy" during peak hours. From Guildford's engineer, Mr. W. E. Affleck, I have received a copy of a message by the acting chairman of the Electricity Committee to each consumer. It asks that fires shall be switched off during the crucial hours to give the

cookers a chance. An inducement is held out in the shape of a further rebate in accounts in March. There is already to be one in December; in fact this is becoming a regular practice at Guildford.

* * *

At Derby an endeavour is being made to apportion the cuts fairly between industrial and domestic consumers. In the first place a rota of industrial concerns is being prepared which is designed to secure voluntary reductions in load in regular order. Then it has been decided to confine cuts on Mondays and Wednesdays to industrial loads, the domestic consumers taking their turns on Tuesdays, Thursdays and Fridays. In announcing these arrangements Alderman A. Sturgess said that although the Derby station could provide for all Derby's own needs, the undertaking, through the grid, had to help others who were less fortunate. If only international arrangements operated as smoothly as the grid!

* * *

In the wish to avoid adding unduly to first cost, insufficient use is often made of electrical methods of control of machinery that would prevent mechanical accidents. Yet, as Mr. Fordham Cooper has told the I.E.E. Installations Section, the cost of simple and robust devices is generally negligible, always provided they are incorporated in the earliest stages of design. Moreover any additional cost is usually offset when, as is usual, these devices facilitate maintenance. His preference for positive interlocks over warnings is justified by the large proportion of accidents that is caused by absent-mindedness of experienced men. Often, too, dislike of delays due to rigid adherence to instructions which are not "red tape," as they appear to be, have had unfortunate consequences.

* * *

Although water may be the principal interest of the North of Scotland Hydro-Electric Board, its employees evidently have other ideas. The *Weekly Scotsman* reports that the Dingwall District Licensing Court has granted a public-house licence to the Board at its Lochluichart works and similar licences have been granted in respect of other projects.

—REFLECTOR.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Electricity Supply Joint Committee has elected Mr. W. N. C. Clinch of the Incorporated Association of Electric Power Companies as its chairman to succeed Mr. L. Gordon, and Mr. F. Newey, of the I.M.E.A., as the vice-chairman for the ensuing year.

Dr. P. Dunsheath, C.B.E., who has recently been appointed consulting engineer to W. T. Henley's Telegraph Works Co., Ltd., was



Left to right: Dr. P. Dunsheath, Mr. W. C. Barry (research manager), Mr. S. E. Goodall (chief engineer) and Dr. H. A. Tunstall (assistant research manager)

presented with a cigarette lighter, constructed as a miniature scale model of the super tension impulse generator and cathode ray oscillograph now in use in Henley's Research Laboratories, by the staff at a ceremony held in the laboratories last week. Over a hundred research personnel were present, and Mr. W. C. Barry, research manager, in making the presentation, reviewed Dr. Dunsheath's career from 1919, when he became the first head of the department, until 1929, when he became research and technical manager, to be followed by promotion to chief engineer in 1934 and director in 1937. It was a source of some pride to the staff that the laboratories had supplied a President to the Institution of Electrical Engineers.

In accepting the gift, Dr. Dunsheath recalled the early days of the laboratories and said that they had grown from small beginnings to occupy a position of responsibility at a time

when scientific and technical developments in cable design were passing through a very important phase. As his new duties would prevent his maintaining personal contact, he would like to leave a reminder of their happy collaboration by presenting an enlarged portrait of himself which he hoped would find a place on the walls of the laboratories. This memento was accepted by Mr. Barry on behalf of the staff.

The new Lord Mayor of the City of Stoke-on-Trent is Alderman Harry Leason, J.P., A.M.I.E.E. Mr. Leason was articled to the late John Neale, chief electrical engineer to the North Staffordshire Railway. He has been chairman of the Stoke Electricity Committee, and also chairman of the North-West Midlands Joint Electricity Authority (of whose Technical Committee he has been chairman for five years).

Dr. H. Buckingham, head of the Electrical Engineering Department of Barnsley Technical College, has been appointed head of the Department of Electrical Engineering at Bradford Technical College in succession to Mr. W. H. N. James, who is retiring.

Mr. I. A. Marriott has joined the boards of Associated British Oil Engines, Ltd., and British Oil Engines (Export), Ltd. Mr. A. P. Quarrell, A.M.I.Mech.E., has been appointed managing director of British Oil Engines (Export), Ltd., and sales manager of Associated British Oil Engines, Ltd.

The Witton Engineering Works of the General Electric Co., Ltd., recently gave a farewell party to mark the retirement of five members of the senior staff. The accompanying picture shows Messrs. P. F. Harris, E. S. Fry, S. Allen, H. W. Richardson and W. Louthwaite, retiring members, with Mr. J. J. Gracie and Dr. C. C. Garrard, joint general managers of the works.



G.E.C. party to retiring staff members of the Witton Works showing (standing, left to right): Messrs. P. F. Harris, E. S. Fry and S. Allen. (Seated left to right): Dr. C. C. Garrard and Messrs. H. W. Richardson, J. J. Gracie and W. Louthwaite

At a complimentary dinner given in Birmingham last week by the directors of McKechnie Bros., Ltd., to two old servants of the company, the chairman, Mr. J. Rae, said that together they had served the company for well over a century. Mr. J. A. Bower, with sixty years' service, and Mr. J. L. Morewood, with fifty-one years' service, were each presented with a cheque from the company. From the senior staff Mr. Bower received a clock and treasury notes and Mr. Morewood a silver salver.

Mr. A. B. Strachan, M.Inst.C.E., M.I.Struct.E., has relinquished the position of constructional engineer of the General Electric Co., Ltd., for health reasons. His association with the



Mr. A. B. Strachan

company, which extends over the past twenty-eight years, will be continued, however, in a consultative capacity. He has been responsible for building development schemes at the company's works and branches in various parts of the country, including a considerable amount of rebuilding and repair of damaged premises as a result of enemy action during the war. Mr. Strachan has been succeeded by Mr. R. Bennett, A.M.I.Struct.E., who has had twenty-five years' experience of constructional engineering. He served as a captain in the Royal Engineers during the war, and was attached to the Indian Army as a garrison engineer.

Mr. J. Neal has been appointed assistant regional manager for the Northern area of the raw materials group of George Cohen Sons & Co., Ltd. Mr. Neal, who has been in the Army for six years, holding the rank of lieutenant-colonel in the Salvage Unit of the Pioneer Corps, was a departmental manager of the company before the war. His new headquarters will be at the Coborn Works, Tinsley, Sheffield. Mr. R. B. Pocklington has been appointed area manager in Newcastle. Mr. Pocklington was also in the Salvage Unit of the Pioneer Corps, attaining the rank of captain. Before joining up, he was attached to the Newcastle office of the raw materials group of the company.

Five years ago the Johnson & Phillips, Ltd., Staff Association was formed with the object of looking after the welfare of the members of the staff. It was not until last year that it was possible to hold an annual dinner, and the second of these functions took place on Friday last at Pyne's Restaurant, Lewisham, being presided over by Mr. W. Glass, works manager and assistant managing director. Mr. G. L. Wates (chairman of the company) and Mrs. Wates were also present. The toast of the chair-

man was proposed by Mr. P. M. Hollingsworth, and in replying Mr. Glass extended a welcome to those members of the staff who had returned from the Forces. Mr. R. T. Lythall proposed the toast of the Association, and Mr. H. J. Olley, chairman of the Association, responding, mentioned that the Australian branch had sent over 200 gift parcels to the London staff. The total amount now invested in the benevolent fund, he said, was £15,000 and in ten years it would be £50,000, of which the management would have contributed £25,000. Following the speeches there was dancing, interspersed with cabaret items.

Major-General A. W. Sproull, C.B.E., A.C.G.I., B.Sc.(Eng.), M.I.Mech.E., M.I.E.E., has accepted the invitation of the Council to become president of the Junior Institution of Engineers for the 1946-47 Session. At the annual meeting of the Institution held on November 15th, Mr. R. Wailes, M.I.Mech.E., was elected chairman of the Institution.

Mr. S. Bacharach, A.M.I.E.E., has relinquished his position as manager of the export sales department of the Hopkinson Motors & Electric Co., Ltd., to take up full-time duties as consulting engineer. The position has been filled by Mr. E. P. Williams, first assistant in the department. Mr. H. G. Midgley has been appointed manager, home sales department, in place of Mr. R. J. Paul, who is now responsible for the service organization. Mr. J. P. Bosco has been appointed London sales engineer.

Mr. R. A. Barber, of Southend-on-Sea, has been appointed showroom manager to the Barking Corporation Electricity undertaking.

Air Commodore W. C. Cooper, C.B.E., has been appointed manager of the Beeston and Sunderland factories of Ericsson Telephones, Ltd. Air Commodore Cooper joined the Royal Air Force in 1922 as an aircraft apprentice.

Having been awarded the Hyde-Thompson Memorial prize he proceeded to the R.A.F. Cadet College. In 1930 he was posted to the Electrical & Wireless School for the officers' long signals course and obtained first place in the final qualifying examination. After two years in the Engineering Department at Cambridge University he obtained the degree of M.A. He has been employed at the Royal Aircraft Establishment, Farnborough, as service adviser to the head of the Radio Department, has been head of the Application Section in the Radio Department, Royal Aircraft Establishment, and has been in charge of the Special Unit responsible for the assembly and installation of "Queen Bee" and other pilotless aircraft.



Air Commodore
W. C. Cooper

In October, 1942, with the rank of group captain, he was posted to the Ministry of Aircraft Production as Deputy Director of Communications Research and Development, and in July, 1945, he was promoted to air commodore and appointed Director of Communications Development. He is a member of the Institution of Electrical Engineers, and is on the Council of the British Institution of Radio Engineers. In the last Birthday Honours List he was awarded the C.B.E. He retired from the R.A.F. at the end of September.

The Finchley Corporation, at the request of the Secretary of State for the Colonies, has agreed to release Mr. C. R. Westlake, M.I.E.E., general manager and engineer of the electricity undertaking, for a further visit to East Africa for a period of two months. Mr. Westlake has already submitted to the East African Governments a preliminary report on electricity supplies throughout the three territories. He expects to leave by air early in January.

The following new appointments have been announced by the Leeds City Transport Committee: Mr. J. R. Blakeborough, technical assistant, to be chief civil and mechanical draughtsman, and Mr. H. S. Lister, technical assistant, to be chief electrical engineering draughtsman. Both entered the service of the Department as pupils of the then general manager, Mr. R. L. Horsfield.

Mr. G. L. Ford has joined Frank Westerman (Wholesale), Ltd., as sales manager. He was with the G.E.C. for some years and then with Crompton Parkinson, Ltd.

Mr. G. A. Woodeson and Mr. L. Thompson have been elected directors of Clarke, Chapman & Co., Ltd.

Alderman J. L. Dirkin, J.P., was elected Mayor of the City of Lancaster on November 9th. Alderman Dirkin has been chairman of the Electricity Committee for eleven years. He is a member of the District Joint Board, District Joint Industrial Council and Joint Committee (Electricity Supply Industry) for North-West England, and is on the Council of the I.M.E.A.

Mr. C. A. Baker, A.M.I.E.E., has been appointed manager of the electric control gear business of William Geipel, Ltd., in succession to the late Mr. W. West. During the war he served in the R.A.F. and was a squadron leader in the Engineer Branch of Bomber Command.

The Johnson Matthey Dramatic Society is presenting its second post-war play, "Death Takes a Holiday," by Alberto Casella, at St. George's Hall, Tottenham Court Road, on December 5th, 6th, and 7th. (Box office: Holborn 9277.)

Mr. R. C. Kilob, assistant to the depot engineer at Wood Lane, is to retire from London Transport after twenty-eight years' service on the engineering side of London's Underground. He was elected to the Battersea Borough Council in 1919 and two years later became the borough's

first Labour mayor. He has been a member of the London and Home Counties J.E.A. and of the I.M.E.A., and is at present chairman of the Battersea Electricity Committee.

Mrs. K. M. Garrard, wife of Dr. C. C. Garrard, of the General Electric Co., Ltd., has been elected Mayor of Sutton Coldfield.



Mr. Harold Hobson and Sir Johnstone Wright (Central Electricity Board) discussing with Lord Forrester the Enfield compression cable dealt with on page 845 of this issue

Mr. A. E. Green, A.M.I.E.E., assistant distribution engineer at Woolwich, has been appointed assistant mains engineer with the Erith Corporation Electricity Department. Mr. F. D. Merriman, who becomes assistant charge engineer at Erith, is at present with the Hove undertaking.

Obituary

Mr. G. H. Swinger, M.I.E.E., M.I.Mech.E.—The sudden death earlier this year at the age of sixty-two, of Mr. G. H. Swinger, who for twenty-six years was city electrical engineer of Cape Town, is recorded in the *South African Electrical Review*. Mr. Swinger went to South Africa from England in 1902, when the Dock Road power station was being built.

Mr. J. P. Simpson.—The death has occurred at Murton, at the age of sixty-five, of Mr. James P. Simpson, electrical engineer at the Murton Colliery of the South Hetton Coal Co., Ltd., for forty years.

Mr. A. Greenwood.—The death has occurred at the age of fifty-four of Mr. Arthur Greenwood, supplies controller for David Brown & Sons (Huddersfield), Ltd. He joined the company as a buyer nineteen years ago.

Wills.—Mr. Reginald Harry Toynbee, of Leeds, electrical engineer, who died on August 21st last, left £2,919 gross, with net personality £1,729.

Mr. Wilfred Lawson Ashworth, of Rochdale, retired manager of the Rochdale Electric Co., Ltd., who died on January 22nd last, intestate, left £625 gross, with net personality £361.

North-Eastern Co. Appointments

New Chief Electrical and Mechanical Engineers

A NUMBER of new appointments have been made by the North-Eastern Electric Supply Co., Ltd., to take effect as from January 1st next.

Mr. T. M. Ayres, M.I.E.E., who becomes chief electrical engineer, was an articled pupil with the Urban Electric Supply Co., Ltd. (a subsidiary of Edmundsons' Electricity Corporation, Ltd.), and later he was appointed a junior engineer in the Loughborough Corporation Electricity Department. In 1914 he joined the Cleveland and Durham County Electric Power Co. as an assistant engineer and was employed on work in connection with both generation and distribution. After serving with the R.A.F. in the first world war Mr. Ayres was transferred to the Newcastle-upon-Tyne Electric Supply Co., Ltd., which was then managing the Cleveland Company, and in 1924 he was placed in charge of electrical construction work in the Cleveland and South Durham area. In 1935 he was transferred to Newcastle as chief assistant in the Electrical Construction Department and, in 1937, he was appointed deputy engineer, Operation Department (Transmission and Distribution). He became head of the latter Department in 1943. During the last war he was a member of the Northern Regional Commissioner's Special Committee dealing with arrangements for the immobilization of the North East ports, being mainly concerned with the electrical aspect of emergency defence plans to meet the possibility of enemy invasion. Mr. Ayres is chairman of the North-Eastern Centre of the I.E.E.



Mr. T. M. Ayres

Mr. J. C. Mitchell, A.M.I.Mech.E., A.M.I.E.E., M.Inst.F., who has been appointed chief mechanical engineer, received his mechanical training with Corsar Brothers, Arbroath, and then obtained electrical experience as a pupil at the works of the British Electrical Plant Co., Alloa. After a year with the Arbroath Electric Lighting Co., he joined the Dundee Corporation Electricity Department and subsequently became senior charge engineer, Carolina Port generating station. In 1920 he was appointed assistant charge engineer at the Carville power station of the Newcastle-upon-Tyne Electric Supply Co., Ltd. (now the North-Eastern Co.) and shortly afterwards was transferred to the company's new station at North Tees, where he was made charge engineer, and, a year later, became superintendent. Mr. Mitchell was appointed

deputy superintendent of the company's power stations in 1935, and in 1936 became chief superintendent. Since 1938 he has been head of the Operation Department (Generation). He has a number of patents to his credit, amongst them being the "flicker" boiler-gauge glass which was taken over by Babcock & Wilcox Ltd.

Mr. J. B. Jackson, A.M.I.Mech.E., A.M.I.E.E., has been appointed head of the Operation Department (Generation). He began his engineering career as an apprentice with the North Eastern Marine Engineering Co., Ltd., and studied at Sunderland Technical College, joining the Newcastle-upon-Tyne Electric Supply Co., Ltd., in 1929 under the company's three-year student engineers' scheme. In 1932 he became an assistant engineer in the Construction Department (Mechanical & Civil) and in 1934 was transferred to the Operation Department (Generation), subsequently becoming personal assistant to the head of the latter department.

Mr. H. Esther, B.Eng., A.M.I.E.E., will be the new head of the Operation Department (Transmission and Distribution). After serving an apprenticeship with Campbell and Isherwood, Ltd., electrical engineers, Bootle, he graduated at Liverpool University. In 1923, he became a student engineer with the Newcastle-upon-Tyne Electric Supply Co., Ltd., and in 1925 he was appointed an assistant engineer in the Electrical Construction Department. He was then posted to the Cleveland and South Durham area, where he remained until 1940, in which year he was transferred to the Operation Department (Transmission and Distribution). This resulted in his being employed at head office, Newcastle, where he became personal assistant to the head of his department.

Mr. W. S. Ramsdale, A.M.I.E.E., has been appointed head of the Construction Department (Electrical and Wayleaves). Mr. Ramsdale received his technical training as a pupil engineer in the Whitby Urban District Council's Electricity Department and, in 1919, he joined the Newcastle-upon-Tyne Electric Supply Co., Ltd., as a junior engineer in the Operation Department, where later he became an assistant district engineer and was subsequently placed in charge of relay work. In 1930 he was appointed assistant to the superintendent of the company's Southern area, centred at Middlesbrough, and retained this position until 1937, when he was transferred to Newcastle to take over the duties of deputy head of the Electrical Construction Department, a post which he has held up to the present time. During the first world war Mr. Ramsdale served with the Royal Engineers in France, Egypt, Mesopotamia and Persia. He is a past chairman of the Tees-side Sub-Centre of the I.E.E.

CORRESPONDENCE

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

Synchronous Clocks

THE number of occasions on which the supply frequency is forced below 50 cycles has introduced a problem in the use of synchronous clocks.

While the resulting unwonted inaccuracy of timekeeping is regrettable, it is not of itself of cardinal importance, since eventually the clocks will right themselves. The real difficulty arises when, for any reason, clocks have to be restarted. During the winter months it is impossible to do so with any confidence that they have been correctly set. For instance, if at the time of starting electric time is, say, ten minutes slow, then the clocks should be set that amount slow and will eventually right themselves.

The only way in which it is possible to obtain a datum line at present is to ask the supply authority's control room for a statement as to the relation between electric time and actual time. As it seems probable that frequency variations are with us for some time to come, it appears necessary to establish some method of making this information readily available, either through the B.B.C. or by setting up an inquiry service to enable the information to be obtained by telephone.

Edgware.

MARTIN GAUGHAN.

Unsafe Installations

THE correspondence on this subject appears to be getting us nowhere rapidly. Most of your correspondents seem concerned with one aspect of the subject, or one piece of apparatus only, but the matter goes much deeper.

I should like to see anybody define what is a "safe" installation, or tell me how, having made one, we can ensure its remaining that way. One comes across innumerable instances where the users have rendered an installation "unsafe," probably within a few minutes of the contractors' departure. Stapled flexibles, unearthed lead-covered cable extensions, overloads of all descriptions, "stepped up" fuses, etc., are only a few of the abuses that the average contractor comes across regularly (especially among small domestic consumers).

And what of those manufacturers' abominations, such as small jug-type immersion heaters, or even the open element type of fire

(which can be a bigger danger under certain conditions when earthed than otherwise)?

The fact is, that under present conditions a 230/400-V supply is dangerous whichever way you look at it; and since most supply authorities are reluctant to exercise even what meagre powers they have, and the cost of transformers and low-voltage installations is prohibitive, the solution lies outside the industry.

Constructive ideas, either technical or legal, are obviously not within the scope of this correspondence. My main point is that until we can curb the enthusiasm of the amateur, and the rapacity of the unscrupulous manufacturer, let's not talk of "unsafe" installations.

Stoneleigh, Surrey.

E. LANGRIDGE.

YOUR correspondent, Mr. A. Milne, in the *Electrical Review* of November 1st leaves me with the impression that he is a little impatient and he seems to assume that the mere fact of gaining compulsory registration will automatically make installations perfectly safe. We do not appear to have had the views of users on this subject and it is hardly fair to assume that their ideas are necessarily synonymous with Mr. Milne's.

My own pet opinion is that the voltage should be stepped down to about 25 for all domestic work, for a large proportion of fatalities are not due to installations, "safe" or "unsafe," but I have not an atom of evidence that the increased cost warrants it (although I have done it once).

If any control is necessary it should be in the hands of an independent authority and certainly not the trade, but control never keeps pace with development, in fact it retards it, so I suggest that the hoeing be done up the right row.

RATIONAL.

Razors in Bathrooms

WHY all this talk about electric shavers in bathrooms?

The beauty of an electric shaver is that it can be used anywhere. I have used mine in the bedroom for the last ten years. The resulting "dust" is not objected to on the distaff side, as the vacuum cleaner does all that is necessary.

Thornton Heath, Surrey. J. F. STANLEY.

Turbo-Electric Propulsion

Features of the "Beaver" Liners' Equipment

DETAILED reasons why reheated steam has been adopted for the propulsion by turbo-electric plant of four cargo liners for the North Atlantic service are set out, with tabulated data and many diagrams, in a paper prepared by Mr. A. W. DAVIS (Fairfield Shipbuilding & Engineering Co., Ltd.) for the North-East Coast Institution of Engineers and Shipbuilders.

The ships are of the *Beaver* class built to the order of the Canadian Pacific Railway Co. in conformity with the "standard" requirements of the Admiralty; they are 465 ft long and 64 ft broad, of 17,180 tons gross displacement with 9,000 S.H.P. for 15 knots.*

Competing claims of alternative systems were examined. Direct comparison did not favour the electric drive, but astern propulsion was a prominent factor and, from the reliability aspect, it was considered safer to employ high-temperature steam in a non-reversible turbine. Also from the durability aspect with special reference to the low-pressure turbine, the direct cycle would be at a disadvantage because of the greater wetness of the exhaust steam; so it was from these aspects rather than that of efficiency that the reheat-electric combination appealed.

Emergency Arrangements

In the case of these ships electric transmission has the further advantage of enabling emergency propulsion to be utilized at short notice. One of the three 400-kW, 220-V, d.c. auxiliary Diesel generating sets has been arranged to drive in tandem an alternator capable of energizing the main propulsion motor through the main a.c. switchgear, so providing enough power to keep steering way on the ship to bring her into port.

The availability of so big an auxiliary generator on cargo ships is due to the large refrigeration load, the need for heavy excitation of the propulsion alternator and motor, and to the generous provision of cargo-handling equipment for quickly unloading the vessels in port when the steam boiler is shut down. A further safeguard permitted by the electric drive is the division of the propulsion motor, its two portions energized through separate cables from the main switchboard, thus enabling half power to be developed in the event of failure of the windings in one portion. The arrangement would also usefully increase the efficiency of transmission should the emergency alternator have to be used, when half the motor would be isolated.

The respective qualities of electric and geared drives were examined in detail from the point of view of manoeuvrability of the ship; in no other respect was such difficulty experienced in estab-

lishing the respective merits of the two methods. The propulsion plant consists of a single water tube boiler of the modernized Johnson type operating at 850 lb per sq in. and 850 deg F with two "Melesco" convection superheaters, one of which reheats the steam to the same temperature between high- and low-pressure turbines. The latter are of the Parsons impulse reaction type arranged in tandem to drive at 3,450 r.p.m. a three-phase alternator, delivering 7,000 kW at 3,000 V and 57 c/s through a twin group of cables to a 64-pole synchronous motor developing 9,000 B.H.P. at 108 r.p.m. The non-standard voltage and frequency were chosen to permit the highest turbine speed to be utilized without causing the motor design to become unreasonable.

Excitation System

The alternator windings terminate on two slip-rings into which d.c. excitation is fed, normally at about 100 V; this is derived from the ship's 220-V d.c. auxiliary mains. The voltage reduction is effected by either of two boosters connected in series with the rotor windings. When starting, the booster is not excited so 220 V is available to strengthen the alternator field; but when the booster is excited half the mains voltage is, in effect, absorbed by the motor portion of the booster set which drives a 220-V dynamo and returns energy to the main d.c. system.

The machinery plan is unorthodox in that the main propelling unit is offset from the centre line of the ship and staggered with the main boiler, which is accommodated in the same compartment, thus minimizing the length of the machinery space.

The performance of the first two ships, which have been in service for nine and six months respectively, is stated to have been wholly favourable, though the capital outlay was high.

Electron Jubilee Celebrations

THE fiftieth anniversary of the discovery of the electron by Sir Joseph Thomson, O.M., will occur next year. To mark this jubilee and to demonstrate the tremendous influence such an advance in pure physics may have on the life of the community, the Institute of Physics and the Physical Society are jointly arranging a series of meetings and other functions to take place on September 25th and 26th, 1947, in London. A special exhibition which will be open to the public for several weeks, will be held at the Science Museum, South Kensington; it will show the development of the vast range of modern industrial equipment from its earliest experimental origins.

* The first of these ships, the *s.s. Beaverdell* was described in the *Electrical Review* of April 12th last.

Industry and the House

Electrical Topics to the Fore

THERE was scarcely a day, during the last month of the present Parliament's first year, when some aspect or problem of the electrical industries was not raised in the House of Commons. At question time particularly inquiries ranging from capital installations to the supply of small components were aimed at Ministers from both sides of the House. If I were asked to describe electricity in Parliament this month in one word, I would choose "shortages." There seems to have been a shortage of everything except questions!

Over all references has hovered the shadow of possible failures of existing generating capacity to meet the demand. Mr. Shinwell has given the maximum capacity of C.E.B. generating plant as 10,689,000 kW. In view, however, of plant unavailable due to breakdowns and overhaul, it was estimated that not more than 8,738,000 kW could be relied upon for the winter.

In severe weather the maximum simultaneous demand would be about 10,000,000 kW. The Minister said that plant shortage was responsible for the cutting-off of supplies, but evaded a challenge to say that new plant was being given priority.

In a written reply the same day Mr. Shinwell said that the C.E.B. had arranged new generating capacity of 3,209,000 kW and said he was not aware of any case in which the work was being delayed by shortage of material. Turning from the grid to the supply undertakings a few days later, Mr. Shinwell was less reassuring. He was unable to say in how many cases the provision of new supply schemes was being held up through lack of materials. The information could only be obtained by asking 570 electricity undertakings to submit returns, and he did not feel justified in imposing this burden, doubting the value of the information if it were obtained.

It was in the results of this shortage of generating capacity that members have shown the keenest concern, particularly in the cutting-off of electricity and the danger this represents to factories and hospitals.

By F. J. Erroll,
M.A., A.M.I.E.E., M.P.

In his second article Mr. Erroll, Conservative member for Altrincham and Sale, who is reviewing Parliamentary events exclusively for the Electrical Review, deals with the concluding stages of the present Parliament's first year.

Mr. Shinwell thought all possible steps were taken to issue warnings. Undertakings had been instructed

to avoid where possible the cutting of supplies without telephone warnings to hospitals, factories engaged in continuous process work, and other establishments where current interruptions would be dangerous. A general warning could only be given if there were a pre-arranged plan, but it might prove when the time came that this could have been avoided. To a number of penetrating supplementary questions the Minister gave answers that were not entirely satisfactory. Members are watching the situation very closely, and in the event of further interruptions without adequate warn-

ing it is certain that the matter will be ventilated in the House again.

Another shortage which may lead to industrial disorganization is the slow delivery of electric motors.

Mr. Woodburn has informed the House that

substantial expansions of factory capacity for their production is taking place. He pointed out, however, that production was limited by other factors, such as raw materials, a situation that would not be helped by Sir Ernest Graham Little's suggestion that a mass-production factory should be set up. I anticipate that this matter also will be pressed again early in the new Session.

On rural supplies the Minister was only vaguely reassuring. Early in October, when questioned on his inspection of Scottish hydro-electric undertakings, he reaffirmed the Government's policy to promote rural electrification throughout Britain. He was glad that the hydro-electric schemes would assist that policy. Subsequently, when asked if it were intended to extend the supply to cottages and farms in Suffolk without capital cost to the users, Mr. Shinwell said he had no authority to vary the statutory powers of undertakers in this connection. He prophesied that "this and cognate matters" would be dealt with by nationalization.

On a number of occasions the subject of electricity poles was raised. On the first occasion Mr. Shinwell acknowledged the

general shortage for electricity and other purposes and said that available supplies were allocated to meet the most urgent needs. He thought there were sufficient concrete poles now being produced to meet current demand and sufficient capacity to meet expected demands for a year. He hoped at least 80,000 wooden poles would be available for electricity undertakers in 1947. Dealing with post-war imports of poles, a Board of Trade spokesman stated that the first consignment was only just becoming ripe for preservation. Pressed again some days later Sir Stafford Cripps gave the present stock of telephone, telegraph and electric line poles held by Government Departments as 140,000. The majority were unsuitable for electrical use. It seems likely that the last has not yet been heard of this topic in the House.

Housing Shortages

Electrical shortages in connection with the housing drive were mentioned frequently. The Minister of Supply estimated that production of electrical accessories for house wiring was 65 and 80 per cent of pre-war output for the first six months of 1945 and 1946 respectively. Recognizing a shortage of components for new houses, Mr. Wilmot declared that effective steps were being taken to give priority to these requirements. The Parliamentary Secretary to the Minister of Works later said he believed that present production was adequate to meet the demand, but it is doubtful whether the industry will share this view. To take only one example from the records of the House itself, there were repeated complaints in the Scottish housing debate that lack of electrical supplies constituted one of the chief bottlenecks. Mr. J. H. Hoy (Leith) cited one case where there was a delay of 104 weeks in delivery of a certain type of electric cable.

"There are many types of electrical supplies which are scarce," he went on. "Housing is waiting on electric tubes, switches and mains boxes. I know of one firm in Edinburgh which cannot carry on with its schemes for approximately 1,000 houses, because of the lack of electrical supplies." Yet three weeks later Mr. Tomlinson (Minister of Works) affirmed that production was in general adequate for all new housing and other essential work. He admitted an estimate that 17 per cent of electric lighting appliances, accessories and fittings, and 11 per cent of electric cooking and heating apparatus were being exported, but said that

these were items not in short supply. Mr. Wilmot has given the production rate of cookers as 13,000 to 14,000 a month.

There were two occasions, in addition to that already mentioned, when oblique references to the nationalization issue were made in the House. Mr. Shinwell was asked what arrangements had been or were being made in regard to capital expenditure of undertakings on development of supplies prior to legislation affecting the industry, and whether such arrangements had been communicated to the companies. The only reply elicited was that after a meeting last May between the Committee representing the supply industry and the Ministry a formula had been communicated to the Committee, but that the Committee had not yet indicated its reactions. The Minister's answer suggests there has at least been some co-operation from the supply industry, and on another occasion the Minister showed he was not prepared to rule out further prospects of assistance. He told the House the Incorporated Municipal Electrical Association, the Conference of Joint Electricity Authorities and Joint Boards, the Electrical Trades Union and the Electrical Power Engineers' Association had indicated willingness to co-operate in carrying out the policy of nationalization. Urged by Mr. Palmer to say that the electricity companies alone had refused co-operation, the Minister said it was not quite clear that they had refused. "They had said something about it," he added, "but it had to be analysed." It would seem a relevant comment that the analysis is taking an unduly long time!

"Anti-Nationalization" Circulars

The third reference concerned anti-nationalization circulars. Sir Stafford Cripps rejected a suggestion that company law should be amended "to prevent statutory monopoly firms from circularizing political propaganda to their customers."

So much for the industry at home. Statements made from time to time by various Ministers served as a review of developments overseas of concern to electrical interests in Britain. The Assistant Postmaster General, for example, gave an account of his visit to America to study the telecommunications system of that country. It was the impression of Mr. Burke and his technical advisors that progress in the United States had been roughly parallel to that in Britain and Canada. Although the visitors were shown some interesting experiments, no major

changes in the British system were likely to result from the visit. The statement will be disappointing, not to say surprising, to those in this country familiar with American advances. Indeed, when pressed by Viscount Hinchingbrooke, Mr. Burke admitted that an automatic trunk telephone system similar to the American system was likely to be installed over here.

In view of the fact that cheap Japanese electric lamps and fittings were being sold widely before the war, frequently undercutting, by the employment of cheap labour, the goods of British manufacturers, great interest has been taken in the statement by Sir Stafford Cripps on the future of Japanese industries. The President of the Board of Trade recognized the damaging effects which low-priced Japanese competition had had on our export trade, and made it clear that the employment of cheap labour would be deterred by every means available to the Control Commission. There would be restrictions on all industries concerned with Japan's ability to wage war, with reductions in other industries so as to leave Japan with a balanced

economy. Japan was to be allowed, however, to retain those export industries which had no direct war potential. Although the statement was general rather than specific in character, it may be taken that the heavy electrical industries, without which modern war could not be waged, will be among those to be substantially contracted.

Turning to the other major ex-enemy country, Lt.-Col. Sharp asked what was the capacity of the electric power generating plant in the British zone of Germany. Mr. J. Hynd gave the present capacity as 2,034,000 kW, and supplied details of the power available for the week ended on October 16th. On another occasion the House was interested to learn that the report of the 1945 Commission on hydro-electric possibilities in East Africa was shortly to be made available, and that the East African Government had water-power very much in mind.

M.P.'s of all parties continue to take a lively interest in electrical matters, and the new session should provide full opportunity for discussion on manufacture and electricity supply.

Parliamentary News

By Our Special Reporter

DURING the debate on the Address in the House of Commons last week Mr. Peake pointed out (on November 15th) that there was a curious distinction between the transport and electricity services. The former was to be brought under "national ownership and control"; the latter on the other hand was apparently only to "pass into national ownership." Control was already, of course, in the case of both these groups of industries, 100 per cent. It was perfectly clear, therefore, that the effective step which the Government intended to take was the transfer of ownership.

What benefit did the Government expect to obtain for the ordinary common man or woman from these measures? So far as electricity was concerned he could see no benefits accruing to ordinary people, while the problem of assessing values for compensation would be highly complex because they had both private and municipal enterprise. It was a pity that the best brains in the industry should for the next two or three years be employed on these problems which would do nothing to advance the efficiency or the development of these enterprises.

Transport Nationalization

In advance of the introduction of the Bill for the nationalization of transport, Mr. Alfred Barnes, Minister of Transport, made a statement

in the House of Commons on Monday last "in order to put an end to uncertainty in regard to this matter." He said that the measure would cover the activities of all the railway companies, the canal undertakings and the London Passenger Transport Board.

Compensation would be based on the average of the mean daily Stock Exchange quotations of the securities for November 1st, 4th, 5th, 6th, 7th and 8th, 1946; if, however, the pre-election prices (from February to July, 1945) were higher then these would form the basis of compensation.

Holders of railway and canal stock would receive Government-guaranteed stock equal, "in the opinion of the Treasury," in value at the date of issue to the stock acquired by the Government. The new stock would be freely negotiable.

Vesting of Coal Industry

The Minister of Fuel and Power (Mr. E. Shinwell) stated in the House of Commons on Monday that he had decided that the transference of the coal mines to national ownership should take place on January 1st next and he proposed to make the necessary Order to give effect to this decision. In many ways the National Coal Board would have to make temporary and provisional arrangements until its organization was fully staffed.

Glasgow Technical Exhibition

Wide Range of Engineering Products

THE Technical Exhibition opened by LORD PROVOST SIR HECTOR MCNEILL in the Kelvin Hall, Glasgow, last Friday has an appeal to a wider community than the word "Technical" suggests. Many of the 150 exhibits are of considerable interest to the man in the street. Sir Hector said he believed that as we travelled further into the push-button and pull-lever world, and made further calls on mechanical slaves, we would take a big step towards solving the problems facing us to-day.

MR. E. R. BOYD, M.B.E., president of the Chamber of Commerce, who presided, welcomed to the exhibition firms whose headquarters were established in other parts of the United Kingdom and who were now exhibiting in Glasgow. It was, indeed, satisfactory to know that Scottish firms were well to the fore. Mr. Boyd revealed that inquiries had already reached the promoters as to whether a similar exhibition could be staged in certain important foreign countries. He was glad to be assured that this was not an exhibition of goods which were only available for export at present. Some of the products on show were already available, and others would be obtainable in the very near future.

The exhibition, which is open daily until November 27th, covers a wide range of engineering products, mechanical and electrical, in their application to works, factories and the home. Among the exhibits of Scottish manufacture are radio sets, vacuum cleaners, heating and ventilating plant, industrial thermometers, measuring instruments, etc. A new light weight calculating machine is another attraction.

New Scottish Industries

Hoover, Ltd., which has now a factory at Cambuslang, makes a strong feature of its fractional-H.P. motors. The company is providing the power unit for many types of industrial equipment and domestic, agricultural, and commercial appliances.

Both vacuum cleaners and polishers appear on the stand of Vactric, Ltd., which is now in full production at its factory at Chapelhall.

The British Vacuum Cleaner & Engineering Co., Ltd., and its subsidiary, the Magneta Time Co., Ltd., show clocks identical to those operating in Shell-Mex offices and in the Bank of England, and a cleaner similar to that in use on the *Queen Elizabeth*.

Glasgow and the West of Scotland have a special interest in Allander Industries, Ltd., manufacturers of "Allander" domestic radio sets. One of Scotland's new industries, the company began production near Glasgow and five months ago took over 65,000 sq ft of factory space at Bridgeton, one of the city's busiest industrial areas, where it is producing 4,500 sets

every month. Several models are shown, together with a prototype aluminium cabinet model for future release.

The British Trane Co., Ltd., gives prominence to "Vectair" convectors, and a special display features extended surface air heating and cooling batteries. A new type room cooling unit is exhibited for the first time.

Among "Erto" convectors shown by Erroll Engineering Co., Ltd., is a model incorporating a coal fire effect.

Bryterlite Electrical Co. (Glasgow) demonstrates heat circulation tests on its "Aerofier."

Model Power Station

A model of a power house is attracting attention to the stand of the Thompson Engineering Co., Ltd. Measuring Instruments (Pullin), Ltd. has a comprehensive range of its products and high and low powered electronic stroboscopes are demonstrated by Scophony, Ltd. Time switches for street lighting control and industrial purposes are featured by the Horstmann Gear Co., Ltd.

Sunvic Controls, Ltd., shows its proportioning head for toluene regulators and engineers can see how fineness of regulation is improved about ten times, giving a stability of the order of 5 milli-degrees. Also on view are adjustable thermostats, energy regulators, hot wire vacuum switch tubes, and the "Simmerstat" continuously variable, hot-plate control.

Marconi Instruments' exhibit is arranged under three heads—communications, industrial, and medical. A. Reyrolle & Co., Ltd., exhibit one of their type "S22A" 1,200-A medium-voltage air-insulated horizontal-draw-out metal-enclosed switchgear panels with air-break circuit-breaker. Fully automatic arc welding shown by Fusarc, Ltd., for shipbuilding, heavy and light engineering includes the latest continuous electrode.

Land, Speight & Co., Ltd., Glasgow, have a display of Ericsson telephones, including a private automatic exchange on which facilities exist for automatic telephone intercommunication and also for the incorporation of conference and loudspeaker telephones, preference lines, round call, and tie lines to other remote exchanges. An instrument for measuring moisture in timber, etc., is also shown.

Lewis Berger (Scotland), Ltd., exhibit "Kemplastite," the new decorative and protective coating for all metal and plastic surfaces, as well as "Hy-Meg," a complete range of high performance synthetic products which very largely improve the technique of insulation. There is an ingenious demonstration at the stall relating to insulating varnish. Applications of "Morganite" carbon are demonstrated by the Morgan Crucible Co., Ltd.

Coal Handling

Use of Bulldozers at Generating Stations

By **M. P. Henzell,**

A.M.Inst.F.

AT many generating stations facilities are lacking to pick up coal from the stock ground at a rate sufficient to meet requirements. Bulldozers are able to move coal for distances of 100 to 200 ft more cheaply and quickly than any other form of machine and, operating in conjunction with a stockyard grab-crane, can almost double the handling speed of a grab-crane operating alone. The grab-crane can remain stationary whilst the dozer pushes within its reach coal which could otherwise be recovered only by moving or laying rail track for the crane. Where rapid handling equipment is installed, a bulldozer can still be of great value in cleaning up the stock ground after coal has been lifted by the main handling equipment.

Bulldozers of the "D4" type are the most useful for this class of work, being powerful but not too cumbersome. They are fully tracked machines, driven by four-



"D4" type bulldozer clearing residue of coal pile

level to a height of 28 in. Although machines of this type are not at present manufactured in this country, limited numbers are now being released by the Ministry of Supply under a priority allocation scheme.

A British-built miniature bulldozer, named "Calfdozer," will, however, perform a prodigious amount of work for its 8-H.P. single-cylinder petrol engine. It is fully tracked with power operated dozing blade. It is easily maintained, economical to operate and therefore very suitable for smaller power stations. Bulldozers will satisfactorily sweep coal laid on virgin ground, but better conditions are obtained when the stock coal is put down upon a concrete bed as is the practice in some stations.

Ash spreading and consolidation by bulldozers will effect a big saving in cost compared with hand labour, as well as a reduction in maintenance work on ash tipping lorries, which are otherwise called upon to tip close to the ash-tip edge in soft and dangerous ground. To assist in preserving the amenities in the neighbourhood of power stations, ash tipping should be planned with a view to levelling uneven ground and raising the level of low lying ground. In all cases the ash tip should be made as inconspicuous as possible. Investigations are now being made into the possibilities of promoting plant growth on



Smaller type of machine ("Calfdozer") at work

cylinder Diesel engines, and the dozer, which is 9½ ft wide, is hydraulically operated and may be held in any position from ground

completed tips by providing a covering of soil. The initial turf and soil stripping before ashes are laid can be quickly and efficiently carried out by bulldozing.

These are but a few of the uses of such machines, and where adopted on generating

station sites, it will be found that they can be put to almost continuous use.

Acknowledgments are due to the Yorkshire Electric Power Co. for permission to publish the photographs accompanying this article.

Safety in Factories

Electrical Protective Equipment

THE use of protective gear for the electrical control of dangerous machinery and factory processes to prevent accidents is dealt with in a paper read before the Installation Section of the Institution of Electrical Engineers by Mr. W. FORDHAM COOPER, Factory Department, Ministry of Labour and National Service.

The author, whose suggestions do not necessarily represent the considered policy of his Department, first classifies the main risks and then states general guiding principles for their avoidance. The large number of problems he presents are necessarily somewhat heterogeneous, but an endeavour is made to discuss them in a systematic manner.

Typical instances are interlocking of danger areas, design and adjustment of limit switches, safety equipment on cranes and lifts, push button circuits and the prevention of inadvertent starting of dangerous machines. The most important of the guiding principles is "failure for safety," meaning that whenever danger arises the machine or process should automatically be stopped, or special safety measures should become effective.

Mechanical Interlocking

Warning lights and alarm signal systems should not be relied upon entirely; whenever possible the author prefers mechanical interlocking, which has been "brought to a fine art" by manufacturers of electrical switches and control gear. Some of these methods, such as key interlocking, are easily adaptable to other industrial processes. Excessive backlash in, and false position of, switches is another very important aspect and many examples are quoted of the need for critical examination of the design of control gear and emergency circuits.

The author advocates the segregation of circuits and earth-leakage protection, which he considers should be applied to electronic control equipment even in face of strong opposition from radio enthusiasts. How much can go wrong with such apparatus is

indicated by the servicing chart of an existing electronic safety device; it lists twenty-five items, under eight main headings, which may fail and render the device inoperative or cause it to operate incorrectly.

Discussion

MR. R. H. RAWLL (Shoreditch) said that there must be a sense of proportion in this matter. Safety devices should not be merely added to existing plant-protective apparatus; indeed, they should be of a higher order of excellence, almost, than the plant itself.

MR. L. N. DUGUID, representing the Institution of Mechanical Engineers, referred to crane accidents that had occurred through lack of standardization of controls. With regard to conveyors, it was essential, he said, to arrange a proper sequence of starting and stopping, a safety precaution which could be performed electrically. Insufficient credit had been given to electrical engineers for their good work. Certainly accidents on lifts had been reduced by electrical safety devices; they were now only about one-third of what they were in 1937. Actually, fatal accidents had dropped from a regular 25 per annum to only two in 1944.

MR. J. J. CHASE (Harris Lebus, furniture makers), said that, while a great deal had been said against group control, it had proved satisfactory for woodworking machinery. Another problem in woodworking was the control of saws. When switched off they took quite a time to stop and something better than the ordinary interlock switch was required to ensure that the saw had really stopped before access could be obtained to it.

MR. H. BRIGHT (Richards & Bright) spoke of lack of maintenance of control gear which often led to accidents. He said it was frequently not appreciated that a machine running light took longer to come to rest than one running on load, so rendering emergency safeguards of little value. Means should be provided of turning machines backward in case of accident so that an operator who might be caught up could be released as quickly as possible.

MR. G. T. SHEARS said that switchboard interlocks should be as few as possible, especially from the point of view of carrying out emergency operations. Otherwise the key exchange system became cumbersome.

MR. R. W. J. COCKRAM thought that to prevent backlash in switches a stronger spring would fail sooner so a better approach might be to re-design the toggle mechanism. He did not think it fair to compare railway with industrial engineers, as the author had done, because the industrial engineer had to design his gear for operation by all and sundry, whereas the railway engineer designed his gear for operation by a specially trained staff. Machine tools and control gear should be designed as one unit; that was already being done by some manufacturers. If more research information was made available as to the forces to be met in the interruption of electric circuits, it would enable engineers to improve reliability.

MR. F. C. FUKU said that evidence that springs could be made which did not become weak was afforded by the exhaust valve spring of the ordinary motor car engine. He had never had one fail yet.

MR. A. N. IRENS spoke of difficulties with magnetic chucks on machine tools. The general practice of machine tool makers was to connect a small rectifier to the "dead" side of the isolating switch so that if the supply failed the chance of having half a ton of

material flung across the shop was prevented.

MR. F. JERVIS SMITH emphasized the danger of undischarged condensers used for smoothing in some ancillary part of the equipment on which maintenance men might attempt to carry out some legitimate operation without expecting to find serious voltage anywhere.

MR. G. D. LEWIS said that as a designer he did not think he would have done his job unless he had endeavoured to prevent, so far as was possible, deliberate interference with interlocking guards and switches.

MR. F. W. ROBERTS said that a method of avoiding the majority of circuit leakage troubles was to connect the apparatus to the earth wire or, in some cases, to a common return wire, while all the controlling devices, switches, interlocks, etc., should be put on the feed.

The Chairman (MR. J. F. SHIPLEY) suggested that there should be only one safety key for any particular piece of apparatus.

THE AUTHOR, in reply, said the whole point of his paper was that if underlying principles were understood, or a more correct mental attitude adopted, protective devices could be made safe and fairly simple, provided one started early enough in the design.

Transformers for Protective Gear

CURRENT and voltage transformers were considered at this month's discussion meeting of the Measurements Section of the Institution of Electrical Engineers.

The subject was introduced by MESSRS. J. G. WELLINGS and F. J. LANE who first stated protective relay requirements and then commented on technical aspects. Most of the eight subsequent speakers deprecated attempts to make the same specifications cover both instrument and relay transformers and called for a separate standard for relay current transformers, in which there should be insistence on the maintenance of waveform, ratio and phase angle up to much higher currents. Time delay curves should be correlated with primary current.

While it was desirable that manufacturers should provide as much data as possible on each transformer in order that its possible suitability for other applications could be seen at a glance, it was not entirely satisfactory to divorce the transformer from the protective system as a whole. The performance of the transformer-relay combination under transient conditions could be found only by site tests, or works tests simulating site conditions. It was thought that reproducible works tests were essential for collecting data and that random faults on the system, or primary or secondary injection tests, should be regarded only as checks on correct connections.

Methods of dealing with transient unbalance were discussed at some length. Certain speakers

were willing to accept a small time delay as a safeguard against false tripping, but others thought that the effort to maintain instantaneous relay action was worth while to prevent spread of the fault, which could be achieved with proper design of the current transformers and selection of suitable "stabilizing" resistors. Linear couplers (coreless toroidal transformers) had been used in the United States, but when the problem was understood there was no reason why iron cores should not be employed.

Current transformers were often blamed when the fault lay rather with the method of installation. A case of faulty ratio was mentioned in which the symptoms of a short-circuited turn were traced to the addition of a metal casing, another in which gland flash-over was the trouble in a slip-on transformer. Balancing of secondary burdens was also important and attention should be given to the length of leads to control panels.

Speakers agreed that the statement of burden in volt-amperes was incomplete. Some favoured a rating in terms of the voltage available to operate the relay while others thought that a statement of impedance in ohms would be preferable, provided that it could be standardized for meter transformers as well.

To obtain optimum performance it was desirable to use separate transformers for each function, but where space in the switchgear, or economy of expenditure dictated duplication of function, a compromise with attainable performance would generally have to be accepted.

High-Voltage Measurement

TWO papers were presented at last week's meeting of the Measurements Section of the Institution of Electrical Engineers. Both are by Dr. F. M. BRUCE (English Electric Co., Ltd.), formerly with the Electrical Research Association.

The first paper discusses the several factors that influence the design dimensions of an ellipsoid voltmeter to be used for the precision measurement of a specified range of high alternating voltages. The theoretical treatment is illustrated by reference to a particular form of instrument (Thornton-Thomson) which measures the voltage gradient in a uniform electrostatic field in terms of the periodic time of oscillation of a conducting ellipsoid freely suspended in that field, the latter being created between the parallel plane electrodes of a condenser connected to a source of 50 c/s voltage.

The data in the paper are the subject of E.R.A. Technical Report L.T. 155, but sources of errors arising from approximations made in the theory have been investigated in detail and simple correction graphs developed to assist evaluation of their relative effects, thereby establishing a basis for future design with an accuracy of ± 0.01 per cent. Improved pole-plate assembly and timing would enable an instrument of this kind to be considered an absolute standard for the measurement of high alternating voltages.

The second paper describes the calibration of three spark gaps of uniform field for the measurement of high voltage at 50 c/s, the data being the subject of E.R.A. Technical Report L.T. 152. The author makes nine recommendations and indicates that further data, now being analysed, will reveal the potentialities of the uniform field spark gap for the measurement of impulse voltage.

Students' "Brains Trust"

A GATHERING of some 100 members of the I.E.E. London Students' Section and their friends attended a "Brains Trust" meeting on November 5th, when five prominent members of the Institution replied to questions.

For instance an inquirer wishing to know whether the necessity for consulting engineers would decrease was told that specialist advice tended to keep up a given standard and there was an important psychological effect to be considered in so doing. The respective merits of a general background compared with a physics background in the training of a telecommunications engineer were thought to depend on the type and qualities of the individual concerned, but a preference was indicated for a knowledge of science as a general background. As to whether widespread main-line electrification of railways in this country would come soon, if at all, brought forward the suggestion that it had been deferred too long as the gas turbo-electric means of propulsion

seemed to be the next step in this direction. In the past the economic aspect had always taken precedence over comfort.

District heating would absorb a by-product of generating stations in the form of exhaust steam and so was not likely to become a competitor of electricity.

It was felt that considerable development in fittings design would be necessary before fluorescent lighting would be popular in the home and there was still a final colour to be produced, which depended on finding a suitable fluorescent powder producing radiation within the required range of wave-lengths.

About 400 members and friends had an enjoyable time at an informal dance held by the Section on November 2nd, at the Royal Hotel, Woburn Place, W.C.1, when the guests included Mr. L. Austin Wright, secretary of the Engineering Institute of Canada.

L.N.E.R. Train Control

THE L.N.E.R. has recently modernized the telephone system by means of which control is exercised by the district superintendent's office in Edinburgh over the movement of all trains in the area between the Forth Bridge in the north and Berwick and Carlisle in the south. The new system replaces one which has been in operation since 1916.

The essence of train control is direct and immediate communication between the control office and all signal boxes, yards and locomotive depots, but it is not economical to have individual telephone lines from the control office to groups of signal boxes and depots are connected to the same circuit. Under the old system any individual signal box was called by a code of rings and the distracting effect of listening for one's own code signals and hearing signals to all other points can be realized. Further, the majority of the circuits had to be connected through a manually operated exchange. Now a controller dials the appropriate number and a bell rings only at the place required. Each place on any of the nineteen circuits wishing to call the control office does so by lifting the telephone hand-set and, if silence indicates that the circuit is disengaged, pressure of a push-button makes immediate contact with the control office where the illumination of a lamp on the control panel indicates the circuit on which attention is required.

The system also provides an inter-communication circuit which enables the controllers supervising separate sections of the line to consult each other without talking across the room. Circuit telephone communication is provided with the neighbouring district control offices at Burntisland, Glasgow and Newcastle and with the central control office for the Scottish area. During the alterations the opportunity has been taken of installing fluorescent lighting and modern office furniture in the control office.

COMMERCE and INDUSTRY

Dearer Zinc and Copper. Additional Token Imports.

IN order to bring the selling prices of copper and zinc in the United Kingdom more closely into line with current purchase costs, the Ministry of Supply has made the Control of Non-Ferrous Metals (No. 25) Order (S.R. & O. 1946 No. 1821, Stationery Office, 2d.). Under the new Order, which took effect on November 13th, the maximum prices for copper, zinc and zinc products are increased as follows:—Copper by £14 per ton; zinc by £5 per ton; zinc sheets by £5 per ton; and zinc oxide by £4 5s. per ton.

Holders of valid licences to purchase copper and zinc metals (as sold by the Directorate of Non-Ferrous Metals), granted on or before November 12, may, on application to the Directorate at 20, Albert Street, Rugby, cover themselves by purchases, where they have not already done so, against such licences up to and including November 30th, at the maximum prices ruling on November 12th.

Concurrently the Ministry of Supply announces increases in the prices for copper, zinc and brass scrap.

Token Imports

More varieties of goods are to be allowed into the United Kingdom under the token imports scheme. The Board of Trade announces that arrangements have now been made for the inclusion of additional items, including the following electrical goods:—Electric fans, complete with motors, for domestic use; domestic electrically operated washing machines; electric light bulbs; electric switches; lamp globes and lamp glasses. Until the end of 1946 the individual overseas manufacturer will be able to ship to this country the goods in the list to the extent of one-half of the quota of 20 per cent for the calendar year, i.e., 10 per cent by value of his average annual pre-war trade in these goods with the United Kingdom.

Road Haulage Charges

Having regard to changed conditions since the Road Haulage and Hire (Charges) Order was made in 1942, the Minister of Transport has made an amending Order. The Orders now provide that the charge made by any person for the carriage of goods on roads by motor goods vehicles or trailers, or for the hire of these vehicles, shall not exceed that which would have been fair and reasonable in July, 1939, with the addition of a percentage reflecting increases in costs since that month; and that, in any decision by the Minister, a Regional Transport Commissioner, or other person acting on the Minister's behalf, upon an application for the revision of a charge, the appropriate percentage to be added shall, in the

absence of proof to the contrary, be 55 per cent.

It is explained that there is no question of a fixed percentage being added to pre-war charges in all cases. If a charge is not more than 55 per cent above what was a fair and reasonable charge in July, 1939, any person wishing to challenge it has to prove that it is too high. If it is above that figure the onus of proof lies on the person making the charge.

Southport Exhibition

Southport Corporation has recently staged a Local Government Exhibition at which the Electricity Department's exhibit consisted of a full-size model of an E.D.A. kitchen lent by



E.L.M.A. display at the Southport Exhibition

the St. Helens Corporation. There was also the E.L.M.A. exhibit, "Lighting Through the Ages," which showed various types of lighting from the early Stone Age to the latest fluorescent tubing. Models of street lighting standards, with different methods of control, various classes of cable and a number of photographs illustrating the work of the Department, chiefly in its effort to assist the Ministry of Food, all proved of interest. Members of electricity authorities from other towns visited the exhibition and it was such a success that it was decided to keep it open for another week. The exhibition was open from October 12th to November 2nd, and 55,661 people visited it.

American Price Increases

The American General Electric Company has advised dealers and distributors that prices for home appliances are to be increased. The largest rise will be for flat plate-type home ironers, which are advanced to \$229.75 from \$143, while the smallest advance will be on electric clocks, about 10 per cent. Other increases include 11 to 17 per cent on electric dishwashers, 30 to 35 per cent on two washing machine models and 12.3 to 12.9 per cent on domestic refrigerators. New prices for ranges

and water heaters are expected shortly, as all quotations on these items have been withdrawn.

The Westinghouse Company announces that prices of motors, switchgear and transformers are to be increased immediately by from 8 to 25 per cent.—*Reuter* (New York).

Steel Works Lighting

A comprehensive scheme for re-lighting the Park Gate iron and steel works at Rotherham was recently completed by Lilleker Bros., Ltd., of Rotherham, who worked to plans prepared by lighting engineers of the British Thomson-Houston Co., Ltd. A detailed scheme was prepared for each department to increase the service intensity considerably and relate the spacing and mounting height of the lamps to the nature of the work normally carried out. Wherever it was found necessary to mount reflectors high above the floor level a 5-A M.K. fuse plug has been wired in circuit so that each individual lamp can be switched off for cleaning and maintenance without affecting the remainder of the installation.

In the foundry there are sixteen 400-W "Mercra" (mercury vapour) lamps in "Mazdalux" dispersive reflectors mounted at a height of 23 ft above floor level and their spacing staggered at intervals of 26 ft by 20 ft. Visors are fitted to the reflectors to protect the lamps from soot and dust and the result is lighting of an average intensity of 12 ft-candles. In the cogging mill shop there are fifty-one 500-W "Mazda" lamps in dispersive reflectors

ing reflectors with clear visors, are mounted at a height of 26 ft. Thirty 500-W lamps in dispersive reflectors with visors have been installed in the colliery arches and pit props department, and twenty 300-W lamps in dispersive reflectors in the pattern shop. Three rows of lamps in concentrating reflectors are provided in the boiler shop and in the test house, overall illumination of a high service intensity of 15 ft-candles is given by seventeen 300-W lamps in dispersive reflectors mounted at a height of 12 ft. Adjustable arm reflectors, each accommodating a 60-W lamp, are mounted on the drilling machines to give local lighting.

In the analysts' laboratory eleven 80-W 5-ft fluorescent lamps in trough reflectors are mounted in continuous lines 5 ft above bench level. The lamps give a service intensity of 12/15 ft-candles under the reflectors which have open tops to permit a certain amount of upward light.

F.B.I. Mission to Austria

A trade mission under the direction of Mr. C. F. I. Ramsden, overseas director of the Federation of British Industries, has spent about a week in Austria investigating the possibilities of co-operation between British and Austrian industry and the speeding up of the economic recovery of Austria.

The Bolton Appointment

Bolton Town Council Labour group and the local M.P.s have had unofficial discussions with officials of the Electrical Power Engineers' Association and Associated Municipal Electrical Engineers on the salary of the chief electrical engineer—a post the Associations boycotted because it was advertised at £1,600 a year. The Associations consider they are justified, by the national agreement, in seeking a starting salary of £1,917 rising to £2,255. Mr. J. F. Wallace, secretary of the E.P.E.A., said that over 60 per cent of local authorities were honouring the agreement on electrical engineers' salaries. Mr. R. H. Harral, vice-chairman of the Associated Municipal Electrical Engineers, said that in cases like Bolton the Central Electricity Board made payments well in excess of an engineer's salary for management charges. No charge fell on the ratepayers for the salary or out of the revenue expenses. He would not be surprised if Bolton got from the Electricity Board about £10,000 a year for management charges alone, for work which chief engineers were carrying out successfully. They were



Pit arch department at Park Gate works lighted by "Mazda" lamps

fitted with visors. In the 24-in. mill the lighting scheme has been divided into two parts. Thirty-eight 500-W "Mazda" lamps in concentrating reflectors with clear visors, mounted at a height of 26 ft give a service intensity of 8/12 ft-candles over the working area. Over the stocking area, a further sixty-one 200-W lamps, in concentrat-

equally concerned with the loss of chief engineers who were leaving municipal services for private companies. Several members of the Labour group were not satisfied with the basis of the agreement or the principle underlying it and said that as public representatives they must have some regard to the salaries paid.

District Heating at Manchester

The *Manchester Guardian* reports that the Manchester Housing Committee on November 11th had before it a letter from the Ministry of Health approving the technical feasibility of Manchester's plan for the district heating of Wythenshawe but refusing any immediate financial help to the Corporation. The Committee decided to raise the financial question once more, and to review the plan with a view to meeting any further questions that might be raised by the Ministry. The original estimate of the cost of the plan was £2,500,000.

German Patent Specifications

Over 70,000 German civil patent specifications, covering wartime developments in German industry and research, have been brought to Britain from the Berlin Patent Office and are open to inspection at the Patent Office Library, 25, Southampton Buildings, Chancery Lane, London, W.C.2. The specifications are in German. Name and subject indexes are available up to the end of 1942 and quarterly name indexes up to September, 1943. Subject searching after 1942, however, may be facilitated by reference to copies of the weekly classification list, *Patentblatt*. Photographic copies of any specification and drawing may be obtained at the rate of 6d. per page.

Lighting Research Fund

Research into the problems of display window lighting is to be encouraged by the establishment of a research fund at the University of Liverpool. Sponsored by Lewis's, Ltd., departmental stores, the value of the fund is £200 a year for seven years. The primary object of the research is to eliminate glare and reflection. The work will be carried out in the Department of Electrical Engineering, Electrotechnics, in conjunction with the chief engineer of Lewis's, Ltd.

New Zealand Import Licensing

Among amendments made by the New Zealand Government in the import licensing schedule for 1947 is one providing that applications from regular importers of electric irons for licences to import these will be considered upon production of evidence that supplies are available for early delivery.

Paint Company's Plans

The group of companies under the control of Lewis Berger & Sons, paint manufacturers, has extensive plans for the erection of new factories.

The Homerton factory is in a "planned" area, and it is therefore intended to move the production headquarters to Chadwell Heath, where it already has a factory. The first stage of the group's development programme is the erection of an extension to the Chadwell Heath factory and coupled with this is the erection of pilot factories elsewhere, some in distressed areas. The scheme will call for expenditure of approximately £350,000. Approval to commence this work has been recommended and it is hoped to complete it within the next fifteen months.

Crompton Parkinson's Doncaster Works

The Doncaster factory of Crompton Parkinson, Ltd., which during the war made small arms ammunition and now employs 500 work-people on the manufacture of car batteries, incandescent and fluorescent lamps, and electric motor components, is to be extended to employ 1,000 additional hands next year, a building licence having been obtained. A ten-year plan provides for four new factories employing 2,500 workers, 60 per cent of them women.

Machine Tool Sale

About 350 machine tools will be offered at an "on site" sale which the Ministry of Supply will hold from December 11th to 17th at A. V. Roe, Ltd., Harrogate Road, Yeadon, nr. Leeds. Included among the machine tools will be autos, capstan and turret lathes, drilling, grinding and milling machines, and various miscellaneous types. The sale will be held daily (Saturday and Sunday excepted) from 10 a.m.

"Export Quiz" Display Unit

To meet the increasing requests from factories and shops for the electrical "export quiz" display, the Board of Trade has decided to build twenty more units. Applications for the loan of one of these for one week should be sent to Public Relations Dept., Board of Trade, Millbank, London, S.W.1. Leaflets and posters for this campaign are also available.

Westinghouse Domestic Appliances

The Westinghouse Brake & Signal Co., Ltd., ask us to state that they are not the manufacturers of "Westinghouse" refrigerators, electric irons and other domestic electrical appliances. The official agents handling spare parts and service for these devices are Electrical & Refrigeration Services, Ltd., 40, Upper Richmond Road, London, S.W.15.

House-Building Industries' Conference

A conference organized by the House-Building Industries' Standing Committee, will be held at the Seymour Hall, London, on November 28th, and will bring together not only the leading house-builders but members of all the big industries allied with housing. It is this Committee which recently organized a national

competition for the design of the smaller type of post-war permanent house, and from selected plans demonstration pairs of houses have been built in twenty-four different areas. The conference has been called to receive reports on the work completed, and to give an opportunity for the housebuilders and members of allied industries to discuss common problems and to consider solutions. Among the speakers will be Alderman A. W. Curton, J.P., chairman of the Standing Committee, and representatives of the Royal Institute of British Architects, the Council of Industrial Design, Mr. R. King, President of the Federation of Registered House-Builders, and Mr. L. D. Gammans, M.P. for Hornsey. The conference will be welcomed by Sir Wavell Wakefield, M.P. for St. Marylebone.

Rural Electrification

The British Electrical Development Association has invited the Central Landowners' Association, the National Farmers' Union and Chamber of Agriculture for Scotland, the Highland and Agricultural Society of Scotland, the National Union of Agricultural Workers and the National Federation of Women's Institutes to nominate a representative to serve on the Association's Rural Electrification Advisory Committee. Mr. E. E. Hoadley, borough electrical engineer and manager, Maidstone, has been appointed chairman of the Committee and Principal H. G. Robinson, of the Midland Agricultural College, Sutton Bonington, as vice-chairman. The present Committee consists of representatives of electricity supply undertakings, the Central Electricity Board, the Ministry of Agriculture and Fisheries, the Royal Agricultural Society of England, the National Farmers' Union, the British Dairy Farmers' Association, the Milk Marketing Board, the National Poultry Farmers' Association, the Institution of British Agricultural Engineers, and the Electrical Contractors' Association.

Eire's Electrical Imports

An omission occurred in the table of Eire's electrical imports given on page 795 of our issue of November 15th. An entry for "other electrical goods and apparatus" should have been included, the half year's totals for which were: 1945, £59,032 and 1946, £168,176. Consequently, the country's gross electrical imports for the six months ending June 1st amounted to £979,208 as against only £245,156 in the corresponding period a year ago.

Installations in New Houses

So that members of local authorities, architects and builders could form an idea of what sort of electrical appliances would be available for the homes of the future a display of equipment was recently arranged by the Electricity Department of Norwich Corporation recently. The

Lord Mayor (Mr. S. A. Bailey), who opened the display, referred to unsightly festoons of wires so often seen, which would be obscured when electrical fittings were incorporated in the buildings. Mr. J. A. Sumner, the city electrical engineer, remarked that there was a tendency among architects to reduce the number of electrical points to save money on new houses. It was much more expensive to add these things after the house was finished and the plastering done, and he urged people to plan fully for electrical needs before the house was built.

Radar Equipment Orders

Siemens Brothers & Co., Ltd., who are co-operating with Metropolitan-Vickers Electrical Co., Ltd., in the supply and service of marine radar equipment, have in hand installations on the following ships:—*Highland Chieftain*, for Royal Mail Lines, Ltd., *Sacramento*, for Ellerman Wilson Line, *Marie Louise Mackay*, cable ship for the Commercial Cable Co., and *Clan MacLachlan*, now under construction for the Clan Line Steamers Ltd. In addition orders have been received for merchant ships under construction for the French and Belgian Governments. Installations have already been completed by the Metropolitan-Vickers Electrical Co. on the *Kronprins Frederik*, *Crane* and *Manchester Shipper*.

Hungarian Electrical Industry

Before the war the Hungarian electrical industry was well developed and produced a wide range of electrical equipment, electric lamps, radio sets and valves, and large quantities of these were exported. In an article contributed to the *Board of Trade Journal* H.M. Secretary (Commercial) at Budapest says that in spite of shortage of man-power and materials and transport difficulties, the industry is making rapid recovery. In addition to the large amount of apparatus which is being produced for Russia, considerable numbers of radio sets and parts, radio valves and electric lamps are to be exported to Norway, Sweden and Denmark under trade agreements signed recently with these countries.

International Trade Agreements

Mr. W. Clayton, the American Under-Secretary of State for Economic Affairs, announced recently that negotiations for trade agreements with a number of countries (including Great Britain and the Dominions) would probably begin in April next year. Mr. Clayton was of the opinion that the recent political change in the United States would not result in the reversal of its reciprocal trade programme.

Mercury Imports

The *Board of Trade Journal* states that following on the recent reduction in price of Government-owned stocks of mercury (from £30 to £25 per 76-lb bottle) it has been decided that the

import of mercury should revert to private trade as from November 7th. Supplies of mercury may still be obtained from the Government store until users are able to make their own buying arrangements, which it is hoped will be made before the end of the year. Intending importers should apply for the necessary licences to the Import Licensing Department, Board of Trade, 189, Regent Street, W.1.

Trade Publications

Bruce Peebles & Co., Ltd., Edinburgh.—Illustrated brochure (5 M.341.MC), entitled "Outward Bound", on a.c. and d.c. motors and generators, motor-generators, rotary converters, synchronous condensers and transformers, including mining types, with a list of Empire users.

G.M. Engineering (Acton), Ltd., Standard Road, North Acton, London, N.W.10.—Illustrated catalogue (B.B.T.101) on the overhead trunking (bus-bar-tee) system of distributing power to machine tools in factories.

Standard Telephones & Cables, Ltd., Connaught House, Aldwych, London, W.C.2.—Illustrated brochure on the d.c. bias system of remotely controlling street lighting.

Kirolite (Sales) Ltd., 15, Bury Street, London, E.C.3.—Illustrated catalogue, with price list, of lighting fittings, including candle type wood pendants, wall brackets and table models, rustic lanterns and wrought iron pendants.

Aerialite, Ltd., Castle Works, Stalybridge, Cheshire.—Booklet illustrating factory machinery and processing.

[Applicants for copies of these publications should write on their firms' business notepaper.]

Hoover Manchester Showroom

The first showroom in Manchester of Hoover, Ltd., was opened at 40, Deansgate, on November 7th by Mr. F. H. Bunn, director and general sales manager of the company. The guests were Hoover dealers in Manchester. The manager of the showroom is Mr. H. Potts.

Trade Announcements

The Airedale Electrical & Manufacturing Co., Ltd., has moved its Bradford office and works to Harrogate Road, Apperley Bridge, Bradford, (telephone: Idle 686; telegrams, "Switch, Idle"). A five-day week has been introduced and the offices and works will be closed from Friday evening until Monday. Owing to further increases in costs of production, the increase in catalogue prices has been advanced from 70 to 80 per cent as from November 18th.

The Western Trading Co. has opened an additional warehouse at 6, Richmond Street, Manchester, 1.

Change of Name

The business of Hartley & Co., electrical and mechanical engineers, 17, St. John's Hill, Shrewsbury, owned by Mr. A. W. M. Hartley, has been transferred by him to Hartley Electro-

motives, Ltd., of which Mr. Hartley is managing director. All debts of Hartley & Co., have been taken over by Hartley Electromotives, Ltd.

Change of Address

Steatite Insulations, Ltd., has removed to 27, Farquhar Road, Edgbaston, Birmingham, 15 (telephone: Edgbaston 3990). The stockrooms are at 29, Upper Hagley Road, Bearwood, Birmingham, 17 (telephone: Bearwood 1736).

TRADE MARKS

APPPLICATIONS have been made for the registration of the following trade marks. Objections may be made within one month of the dates stated:—

November 6th

WINCHARGER (design). No. 630590. Class 7. Windmills and impellers thereof, wind-driven motors, electric generators with or without wind-driven or internal combustion driving units, electric motors (not for land vehicles) and dynamotors.—Wincharger Corporation, Sioux City, Iowa, U.S.A. Address for service: c/o Lloyd Wise & Co., 10, New Court, Lincoln's Inn, London, W.C.2.

SYNCHROMO. No. 638821. Class 7. Electric and hydraulic mechanisms for operating aircraft controls, ships' steering gear, and for operating similar installations requiring remote or correspondence control.—B. & P. Swift, Ltd., Swift Works, North Circular Road, N.W.10.

SONITOLA (design). No. 638197. Class 9. Apparatus for reproducing sound and motion picture films. Also **MINITOLA** (design). No. 638198. Class 9. Apparatus for reproducing motion picture films and sound simultaneously.—Photographic Electrical Co., Ltd., 71, Dean Street, London, W.1.

November 13th

AMSON. No. B642395, Class 9. Electrical apparatus and instruments included in Class 9; scientific, photographic, cinematographic and optical apparatus and instruments, etc.—A. Mosley and L. Mosley, trading as A. Mosley & Son, proprietors of Amson Radio Co., 95, Princess Street, Manchester.

LECTRONA. No. 643283, Class 9. Loudspeakers and diaphragms for loudspeakers.—Acoustic Products, Ltd., 50-58, Britannia Walk, City Road, London, N.1.

HORSTMANN PLASLITE (design). No. B635307, Class 9. Electric inspection lamps.—F. G. Horstmann, "Bonners," Vann Lane, Hambleton, Godalming.

WEATHERCRAFT. No. B639652, Class 11. Air-conditioning and ventilating installations.—Carrier Engineering Co., Ltd., Carrier House, Catherine Place, London, S.W.1.

MASOLON. No. 642858, Class 11. Baths, electric heating apparatus and electric lamps.—Quick Supply, Ltd., 45 Kilburn High Road, London, N.W.6.

Gas-Cushion Cables

Discussion on Mr. Harrison's Paper

THE discussion which followed Mr. T. R. P. Harrison's I.E.E. Transmission Section paper on "The Development of the Gas-Cushion Cable for the Highest Voltages" (see our last issue, p. 782) was opened by Mr. D. T. HOLLINGSWORTH (British Insulated Callender's), who said that in addition to type tests he would like to know more about the accessories needed to make the cable gas-tight. With the present lead shortage there were special reasons why the pressure cable should be considered for 33 kV. For the transmission of a given amount of power the diameter of the pressure cable was very much less than that of the solid cable so that a considerably greater length of pressure cable could be manufactured for a given amount of lead. The cable with which he was associated was protected against corrosion by a special serving of alternate layers of rubber and bitumen tape. Pneumatic pressure tests of the lead sheath, if considered necessary, should be done with the cable on site before jointing.

Mr. R. DAVIS (National Physical Laboratory) called for really systematic tests on cables. In the case of surge tests, for example, it had to be decided what the duty of the cable should be and in what respect the cable was capable of carrying out that duty.

Service Experience Necessary

Mr. W. C. BARRY (Henley's) said that the paper described tests on which the cable maker had based decisions, but it was much too early for those type tests to be included as acceptance tests. It was necessary to accumulate experience under service conditions.

Mr. D. P. SAYERS (Birmingham) thought that for all practical purposes the gas-cushion cable seemed to be of conventional type with reduced dielectric thickness and extra reinforcement over the lead sheath to contain the gas pressure. The paper presented a simple picture of present fashions in high-voltage cable technique, but users would want to be satisfied on numerous points which were very inadequately dealt with. Type tests for the 132-kV cable at present being installed in Birmingham called for ten positive and ten negative impulse test shots each of 640 kV peak value.

Mr. W. H. LYTGOE (Henley's) said that two types were being developed by the author's company, one with a double and one with a single lead sheath, which was important because the cable industry was very much concerned with the minimization of demands for lead.

Mr. J. E. BRIGG (British Insulated Callender's) said there seemed to be considerable misunderstanding of the differences, if any, between the different types of pressure cables available.

Mr. J. CONNING (British Insulated Callender's)

said oil polymer compounds had excellent electrical characteristics when properly treated; he suggested that the extra care necessary when using those compounds in the manufacture of the gas-cushion cable might be justified.

Mr. P. M. HOLLINGSWORTH asked about the effect of drainage, since the author seemed to be rather more concerned with where the free compound was going than where it came from.

Mr. T. R. SCOTT (Standard Telephones & Cables) said that the author did not mention that there was in existence an oil-filled cable worked at a pressure comparable with that of gas cables, nor that in the types using gas there were differences between those which had gas in contact with the dielectric and those which had the gas carefully kept from the dielectric.

Mr. HARRISON, replying, denied saying that a second lead sheath was vital, but he had stated that the protection of the reinforcement was vital. A second lead sheath was a handy way of ensuring that and it was more useful for gas leak location, but he agreed about the need to economize in lead. The gas pressure test was applied to the cable before the reinforcement was applied and the pressure was low. Some joints that had been tested had properties comparable with those of the cable itself. The gas cushion design described by Dr. P. Dunsheath in Paris had for its object making the cable self-sealing, but it was extremely difficult to ensure that a pressure of 200 lb. per sq in. would be maintained after jointing.

I.E.E. Homes

ADDRESSING an audience of members of the Institution of Electrical Engineers recently, Mr. Ernest Leete, deputy chairman of the I.E.E. Benevolent Fund, announced that a private estate near London had been given to the Fund, and that members had already subscribed, or promised, to the "Homes Fund" about £10,000 towards the cost of building suitable small houses on the site.

The estate, "The Chesters," at New Malden, Surrey, consists of some eight acres of land and a house. It has been given to the Institution by Mr. C. W. Speirs, J.P., who is himself a member of nearly fifty years' standing, and it will form the Institution's War Memorial. Plans for a number of houses have been submitted by Mr. Louis de Soissons, A.R.A., F.R.I.B.A., and it is hoped that building may soon begin. These first houses at "The Chesters" will provide shelter for beneficiaries young and old; but, as Mr. Leete remarked, "The Chesters" estate is only the beginning. As the "Homes Fund" grows, and as land becomes available, the Memorial will be developed on a truly national scale.

Compression Cables

Development of 264-kV Type

PRODUCTS of Enfield Cables, Ltd., displayed at the Savoy Hotel, London, on November 14th, included sections of cable of the compression type for very high voltages. Technical particulars of this development were given by us on October 25th, 1944, and May 25th, 1945, in connection with the 500 yd

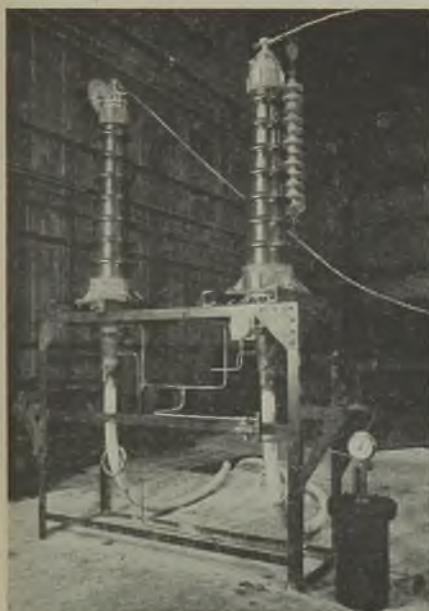
exerts a continual pressure of 200 lb per sq in. on the latter, thus compensating for expansion and contraction of the dielectric during temperature variations with load.

Lord Verulam, who was joint founder thirty-two years ago of the Enfield group of works, said that these now covered 35 acres and employed 3,500 people, which he expected would be increased to 5,000 by 1950, when projects in hand for Brimsdown and South Wales (including new rubber manufacturing plant) had been completed. He had entire confidence in the future of the compression cable, under the technical direction of Mr. F. W. Main. Siemens and Standard Telephones & Cables were in co-operation with them.

Sir Johnstone Wright (general manager, C.E.B.), who was guest of honour at the function, expressed his satisfaction with the reliability of the first compression cable (2½ miles run of three-core) which was laid between Hackney and Walthamstow in 1932; its carrying capacity was 31,500 kVA at 66 kV. When examined last August it was found to be in excellent condition; earlier troubles experienced were due entirely to electrolysis of the outer steel pipes caused by stray currents from the tramways. In 1941

another 66-kV compression cable, but of the self-contained type, had been laid between the same points. Porcelain with a stabilizing glaze, as used for overhead lines, had been successfully employed for the first time for terminations at Osbaldwick, where the associated 132-kV cable had given no trouble.

The first 132-kV compression cable, Lord Forrester (managing director) stated, was made for testing in 1927. Although the lead membrane added to the cost it gave twice the factor of safety obtainable without it. An Enfield three-core 66-kV compression cable had this year withstood at the N.P.L. what was believed to be the highest impulse breakdown stress applied to any cable, namely 1,270 kV per cm.



Terminal arrangements of 264-kV experimental installation at the Brimsdown works of Enfield Cables

(route length) of 132-kV 0.4 sq in. (90-MVA) cable, laid up in three single cores, which was inserted in the grid at Osbaldwick, Yorkshire. Up to the end of last year approximately 11,000 yd of 66-kV compression cable had been installed by Enfield Cables, Ltd., in addition to the 132-kV cable at Osbaldwick and a 150-kV length at Arnhem in Holland. Recent installations have been self-contained, as distinct from the steel pipe-line design originally adopted. The latest technical advance has been the manufacture of a similar type for 264 kV as here illustrated.

The principal feature that distinguishes compression cable from others in which gas under pressure is employed is that the gas does not come into contact with the dielectric (impregnated paper). Nitrogen contained between an outer circular lead sheath and an inner, slightly oval, reinforced thin lead membrane



Single-core straight through joint

Referring to his recent visits abroad with Mr. Booth (sales manager), he had been much impressed by the scope of the very high-voltage cable overseas, sometimes under narrow waters. He advocated bold experiments at home in the interests of export policy; for that reason he believed the Severn Barrage scheme would be justified.

Some part of the responsibility for the predominant position of British cable makers

house, and one of the Corporation's housing estates is to be solely of this type. The present demand is for 1,000 kVA, and a new substation has been built to cope with an anticipated increase.

The Corporation Quay on the riverside is being enlarged and extensions to the electrical equipment are being planned. New cranes are on order to deal with the increased shipping traffic. Housing has been regarded as a vital link in the development programme and several schemes of temporary and permanent houses have been completed, or are in hand.

It became apparent that considerable extensions to the distribution system would be necessary, and the Electricity Committee decided to introduce a ring-main system round the borough. The system adopted is almost identical to that introduced by the borough electrical engineer (Mr. N. Hunter) when he was at Morley (Yorks) in 1936; it consists of 11 kV, 0.25 sq in. ring-mains and pilots, and interconnected distributors. The brick-built substations have brick barriers between switches and transformers, an pebble-filled cable trenches and transformer beds.

The Portrack Trading Estate is being negotiated by the North-Eastern Trading Estates, Ltd.; it will be similar to the Team Valley Estate at Gateshead. The scheme covers an extensive area, and a number of firms have agreed to take over factory sites, particularly for light engineering. When the scheme is fully developed the load will be from 10,000 to 12,000 kVA, and this will involve a 66-kV supply. An initial supply of 1,000 kVA is scheduled for 1947, increasing to 5,000 kVA in 1948. Sanction and consent from the Electricity Commission for over £100,000 has already been obtained to cover part of these schemes.

The developments were too large to be undertaken by the Electricity Department, and in consequence tenders were invited for the supply, delivery, and installation of cables, switchgear, transformers, and associated equipment. The successful contractors were Edison Swan Cables, Ltd., A. Reyrolle & Co., Ltd., W. Lucy & Co., Ltd., and C. A. Parsons & Co., Ltd.; the whole of the work has been supervised by the Electricity Department staff.

Development at Stockton

STOCKTON-ON-TEES, like many other towns, has suffered in the past through having "all its eggs in one basket." It depended mainly on shipbuilding and heavy industry, and between the wars, had many thousands of unemployed owing to the general industrial depression. With a view of avoiding this in future, an Industrial Development Committee was formed to persuade manufacturers to establish factories on Tees-side. Now, with the support of the Board of Trade, success is beginning to be realized. New factories making a wide variety of products are being erected; others are being extended; and already a nucleus has been formed for future development.

One of the companies attracted by the development scheme is Le Tourneau (Great Britain), Ltd., an American syndicate which has built a large factory on the Bowesfield industrial site for the manufacture of agricultural machinery; the initial load is 750 kVA, but this will rise to 1,500 kVA. F. Hills & Sons, plywood manufacturers, are extending their factory. This firm has introduced the "Lamella" permanent



Cross section of cable

in the world was assigned by Mr. V. Z. de Ferranti (President, I.E.E.) to climatic conditions here. He suggested that designs needed to be worked out in the expectation of the prevalence of wet weather; hence the products could stand up to the worst that Nature could do.

Economic Engineering

THE Institute of Economic Engineering and the Production Control Research Group have amalgamated. The new body will be known as the Institute of Economic Engineering (incorporating the Production Control Research Group) and its office will still be at 28, Victoria Street, London, S.W.1. Lord Marley will continue to be associated with the new body, the scope of which will be enlarged adequately to cover research and education in production control as well as motion study and time study. Mr. E. Barrell is succeeded as honorary general secretary, by Mr. W. J. Worsdale.

marshes beneath the water-logged land around the River Lea and its tributaries. On one of the tributaries of the River Lea a raft was used. A special soil solidifying liquid was pumped down into the river bed which turned the marshy land beneath into a hard substance which would bear 400 lb per sq in. pressure. Simultaneously men bored beneath the river bed in a narrow pilot tunnel and pumped similar liquid into the ground from beneath the river. A safe and stone-like canopy of solidified soil was thus formed.

At the Mile End station excavations were carried out beneath the Mile End Road without disturbing the flow of traffic above.

The new line is the first in London, apart from experimental stretches, which has been planned and fitted throughout to eliminate noise. The tunnel is lined on both sides at wheel level with slabs of sound-absorbing composition which absorb 80 per cent of the sound. These slabs have a "chocolate" outer shell of asbestos pierced with holes, and the "biscuit" inside is an asbestos and magnesium composition. The tracks are not in the usual 60-ft lengths but in 300-ft lengths, eliminating the usual click of the wheels on the rail joints. The extra expansion is very small. The signalling on the lines incorporates all the latest London Transport improvements.

Forthcoming Events

Monday, November 25th.—BRISTOL.—The University, 5 p.m. I.E.E. Western Centre (Installations Group). "Engineering Principles applied to the Design of Water Heating Installations of the Solid Fuel/Electric Type," by R. Grierson and Forbes Jackson.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North Eastern Centre. "Rural Electrification: The Use of the Single-Phase System of Supply," by J. S. Pickles and W. H. Wills.

BIRMINGHAM. — The University, Edmund Street, 6 p.m. I.E.E. South Midland Centre. Lecture summarizing all the papers and lectures given at the Radiolocation Convention, 1946, by R. A. Smith. (Joint meeting with the Radio Group.)

Tuesday, November 26th.—LONDON.—At the Dorchester Hotel, Park Lane, W.1, 1 p.m. Federation of Associations of Specialists and Sub-Contractors. Annual luncheon.

Institution of Electrical Engineers, 5.30 p.m. Radio Section. Discussion on "The Economics and Subjective Requirements of Television Picture Sizes," opened by D. C. Birkinshaw.

MANCHESTER. — Engineers' Club, Albert Square, 6 p.m. I.E.E. North-Western Centre. "The Electrical Engineering Industry in the Post-War Economy," by G. L. E. Metz and R. L. Davies.

Wednesday, November 27th.—EDINBURGH.—Heriot-Watt College, 6 p.m. I.E.E. Scottish Centre. "Theory of Servo Systems with particular reference to Stabilization," by A. L. Whiteley.

LONDON.—At the Institution of Civil Engineers, Great George Street, S.W.1, 6 p.m. Institute of Welding. "The Inspector's Approach to Radiographs of M.S. Butt Welds," by E. Fuchs, L. Mullins and S. H. Smith.

Grosvenor House, Park Lane, W.1, 7 p.m. Association of Electrical Machinery Traders. Annual dinner-dance.

Central Hall, Westminster. Federation of British Industries. Export Conference. (Also following day.)

Thursday, November 28th.—LONDON.—Connaught Rooms, Great Queen Street, W.C.2, 12.55 p.m. Batti-Wallahs' Society. Luncheon. "Electricity in the Service of the 21st Army Group," by Lt. Col. N. Elliott.

Friday, November 29th.—STAFFORD.—County Technical College, 7 p.m. I.E.E. South Midland Students' Section. "Electric Resistance Furnaces," by F. Crook.

Saturday, November 30th.—LONDON.—I.E.E. London Students' Section. 2 p.m. and 4 p.m. Visit to the Post Office (London) Railway, Mount Pleasant, E.C.2.

LEICESTER.—I.E.E. East Midland Students' Section, 9.30 a.m. Visit to the works of Taylor, Taylor & Hobson.

MANCHESTER.—Manchester Limited, Cross Street, 7 p.m. I.E.E. North-Western Students' Section. Autumn dance.

Monday, December 2nd.—BRADFORD.—Technical College, 7.15 p.m. Bradford Engineering Society. Film, "Steam."

BIRMINGHAM.—James Watt Institute, 6 p.m. I.E.E. South Midland Centre. "The Extinction of Arcs in Air-Blast Circuit Breakers," by A. Allan and D. F. Ames, and "The Influence of Resistance Switching on the Design of High Voltage Oil Circuit Breakers," by H. E. Cox and T. W. Wilcox.

Tuesday, December 3rd.—LONDON.—At E.L.M.A. Lighting Bureau, 2, Savoy Hill, W.C.2, 7 p.m. Electrical Power Engineers' Association (London Local Group). "Experiences with Power Supply in Western Europe after 'D' Day," by Lt. Col. N. Elliott and Major L. W. Neville.

Oddfellows' Hall, 186, Hammersmith Road, 7 p.m. Association of Supervising Electrical Engineers (West London Branch). "Some Notes on the Safe Installation of Electrical Equipment," by H. F. Buxton.

LEEDS.—Corporation Electricity Department, Whitehall Road, 6 p.m. I.E.E. North Midland Centre. "Power Supply for Generating Station Auxiliary Services," by W. Szwander.

ELECTRICITY SUPPLY

Bury Undertaking's Jubilee. Warwickshire Assessment Revision.

Blackpool.—TRANSMISSION SCHEME.—The Electricity Committee has approved details for the extension of the 33-kV transmission system and is seeking sanction to borrow £143,767 for the work.

Blyth.—LIGHTING PLANS.—The Town Council has decided not to renew the agreement with the Blyth Gas Co. for gas lighting after it expires in 1951 and the borough engineer is to consider and report on the question of public lighting by electricity.

Burton-on-Trent.—ESTATE SUPPLY.—A supply of electricity is to be provided to the Netherseal estate at a cost of £4,880.

Bury.—UNDERTAKING'S JUBILEE.—The Corporation electricity undertaking celebrated its Jubilee on November 5th, electricity supply to the borough having been commenced from a power station at Whitehead Bridge, off Rochdale Road, on that date in 1896. During the fifty years' history the undertaking has had only two "chiefs," Mr. S. J. Watson, now living at Torquay, and Mr. J. G. Potts, who took over in 1923 and will retire in the New Year. The present chairman of the Electricity Committee, Alderman T. Evans, has almost completed twenty-one years in that position.

Hadley.—PUMPING STATION CONVERSION.—The Metropolitan Water Board is to remodel the Hadley Road pumping station and install electrical plant at a cost of £26,700, it being anticipated that there will be a saving of £1,000 in running costs and a saving of 350 tons of coal per annum.

Islington.—RENTAL WIRING INSTALLATIONS.—The Electricity Committee has reported on rental wiring systems and recommends certain concessions to consumers purchasing the installations to take full account of the amount already paid for them. It also suggests that the slot meter charge for installations should be reduced from 2d. to 1d. per kWh.

SUSPENSION OF MINIMUM CHARGE.—The Committee recommends the suspension of the minimum charge of 10s. per annum for the supply of electricity because the administration cost incurred in its collection does not justify continuance.

Lichfield.—SUPPLY TO FACTORY.—The Electricity Committee has agreed to provide a supply to the factory of Dolphin & Co. on the Trent Valley estate, subject to a guarantee of a minimum revenue of £100 per annum.

Liverpool.—COAL STOCKS.—Mr. J. Eccles, city electrical engineer, stated at a local meeting of industrialists last week that the Electric Supply Department had about five days' stock of fuel on rail all the time, but under the worst conditions anticipated it would have only two days'

stock in the station precincts. It would be impossible to keep industry going or maintain domestic comfort on one week's stock.

Lowestoft.—SUPPLY TO ESTATES.—At a cost of £5,314 the Electricity Committee is to provide a supply to housing estates being developed by the Lotingland R.D.C. at Carlton Colville and Kessingland.

Menai Bridge.—CHEAPER ELECTRICITY PROSPECTS.—Mr. P. Jones stated at a meeting of the U.D.C. that there were proposals to reduce the price of electricity and when the new two-part tariff was introduced next April electricity would average about 1d. per kWh. Reasons why the price could not be reduced at once were lack of transformers to take the extra load and the Government's exhortations to use less electricity.

Paisley.—LOAN.—The Electricity Committee is to apply for consent to borrow £20,000 for cookers and £10,000 for wash-boilers, water heaters and immersion heaters.

Scotland.—LOCH SHIN SURVEY.—The North of Scotland Hydro-Electric Board has engaged Sir Murdoch Macdonald & Partners to carry out a preliminary survey of the Loch Shin catchment area in Sutherland. This is the first step towards the development by the Board of the water-power resources of the county. The catchment area of Loch Shin has been estimated to have a potential annual output of approximately 140 million kWh.

DAIRY FARMERS PRESS FOR ELECTRICITY.—The Executive of the Association of Certified and T.T. Milk Producers has decided to take all possible steps in conjunction with the N.F.U. to press for an acceleration of the rate at which electricity is being installed on dairy farms in Scotland.

Southport.—ELECTRICITY FOR FARMS.—The Electricity Committee is seeking a Fringe Order to supply farms at Halsall and Woodvale.

Warwickshire.—ASSESSMENT OF UNDERTAKINGS.—The Valuation Committee of the County Council has had under consideration the general question of the adjustment of the assessments of various electricity undertakings in the county in those areas where appreciable extensions of the undertakings have taken place since the last cumulo valuation and apportionment and the officers have been instructed to examine the position with a view to increasing the assessments. In the case of the Avon power station at Warwick the company has agreed to an increased assessment of £3,223.

Wick.—TRANSFER OF UNDERTAKING.—The Electricity Commissioners have approved the transfer of the Town Council's electricity undertaking to the Hydro-Electric Board subject to conditions of agreement between the parties

being fulfilled. One of these conditions is that the Town Council wipes off the current deficit on the undertaking which is expected to reach £5,000 by the date of transfer, May, 1947. The Council's proposals for clearing the deficit include increased electricity tariffs, direct payment from the rates, and borrowing.

Overseas

Australia.—**HUME RESERVOIR SCHEME.**—Two 21,000-kW turbo-generators are to be installed at the Hume Reservoir, the output of the plant to be shared equally between New South Wales and Victoria.

GENERATING PLANT FOR PYRMONT STATION.—In 1940 the Sydney County Council approved the construction of the Pyrmont power station to accommodate four 50,000-kW turbo-alternators. The first set is scheduled for commissioning in 1948 and the second in 1949. In view of the expected increase in demand after 1950 it is now considered necessary to arrange for the installation of the remaining sets which the general manager (Mr. G. S. Boyd) recommends should be of 60,000 kW.

Belgium.—**FIVE-YEAR SCHEME.**—At the recent annual meeting in Brussels of the financing undertaking known as "Brufina," the chairman surveyed the present condition of the principal branches of the industry. Commenting on the position of the electricity supply, he stated that although the aggregate capacity of the generating plant had increased since 1939 from about 775,000 kW to 900,000 kW, the supply available for industrial purposes was still 10 per cent below the demand. To some extent this shortage had been met by imports of electric power from Germany but since the end of June last these had been cut down by the occupation authorities. Recently a five-year plan had been adopted for an extensive re-equipment both of power stations and transmission lines, at a cost of about £15 million. It was not expected, however, that much of the new material would be ready for operation before the end of 1947.

Italy.—**CURTAILED SUPPLIES.**—Drastic restrictions of the supply of electric power in Northern Italy were announced recently. Supply is to be stopped for ten consecutive hours on two days a week and for five hours on Sundays.—*Reuter.*

Northern Rhodesia.—**PROPOSED HYDRO-ELECTRIC SCHEME.**—The Northern Rhodesian Government has decided to investigate the possibility of establishing a hydro-electric scheme on the Kafus Gorge, some 30 miles from Lusaka. The intention is to supply power within a 300-mile radius of the station. This would cover Salisbury, Bulawayo among other places in Southern Rhodesia, the whole of the copper belt in Northern Rhodesia, and the Belgian Congo and Nyasaland if the need arose. Within easy reach of a line drawn through the area, and extending 250 miles north and south of the site, are large gold mines

and some of the largest copper mines in the world, as well as deposits of iron ore, zinc, lead, vanadium, mica and other minerals. It has also been decided to erect a cement factory at Lusaka with a capacity of between 20,000 and 30,000 tons a year.

Spain.—**MOBILE POWER PLANTS.**—A movable power station bought in Great Britain by the Instituto Nacional de Industria has been put into operation at Cartagena. *Reuter's Trade Service* (Madrid) states that similar plants are already in operation at Seville, La Folguera, Barcelona, Palma de Mallorca and El Forrol del Caudillo.

TRANSPORT

London.—**BUSES TO REPLACE TRAMS.**—The London Passenger Transport Board has finally decided to abolish the tramways, nearly all south of the River Thames. About 730 tramcars now in service are to be replaced by fuel-oil buses as and when these become available during the next two years.

Sunderland.—**GENERAL MANAGER'S REPORT.**—Statistics included in the 1945-46 annual report of the general manager and engineer of the Corporation Transport Department (Mr. C. A. Hopkins) show that the trams ran 2,248,000 miles and carried the record number of 50.5 million passengers. A total of 5,325,000 kWh was used, equivalent to 2.37 kWh per vehicle-mile, the average price paid per kWh being 1.01d. Passengers carried per vehicle-mile averaged 22.47 and the fare per mile worked out at 0.65d.

Colonial Telecommunications

COLONIAL telecommunication systems and plant are the subjects of two papers presented at yesterday's ordinary meeting in London of the Institution of Electrical Engineers. Both are by Messrs. C. LAWTON and V. H. WINSON (Preece, Cardew and Rider), who review the growth of systems during the last thirty years in colonial, protected and mandated territories—not the Dominions.

The first paper is concerned with development and general requirements in respect of overhead lines as well as both aerial and underground cable systems, and with the design fittings, components and apparatus with particular reference to service needs in damp tropical climates. The latter are classified with the aid of humidity graphs; various methods of drying air and ventilating are commented on and a comfort chart is included to indicate human sensitiveness to heat and humidity.

The second and shorter paper discusses general planning and outlines organization with observations on the performance of work for other Government services, staff selection and training, methods of purchasing materials, the control of expenditure by the costing of work and the desirability of keeping cost accounts.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Modern Hot-plate

A RECTANGULAR hot-plate of pleasing appearance and rather larger than usual is being made by O'CONNOR ELECTRICAL INDUSTRIES, LTD., 79, Petty France, London, S.W.1. Its dimensions are 19½ by 12 by 2¾ in. and the easily cleaned surface is nickel plated. Heat-proof



Hot-plate with pilot lamp indicator

moulded plastic handles are combined with the base. The loading is 250 W; a pilot lamp indicator is provided.

Lamp Starting Switch

A starter switch for tubular fluorescent lamps is being made by ZODIAC ELECTRICAL PRODUCTS, Springfield Road, Guiseley, Leeds. It is of the thermal type and is claimed to initiate the lamp glow without flicker within four seconds. Variation of ambient temperature has been allowed for and provision is made for adjustment of the re-setting period. The switch assembly is built up within a moulded bakelite case, so obviating the need for glass enclosure. It is of the plug-in form suitable for standard holders and is available in three ratings for 80, 40 and 30 W lamps. Distribution to the trade is from 40, Sunbridge Road, Bradford, Yorks.

Phase-failure Relay and Timer

A relay for tripping motors in the event of a phase failure is announced by BRITISH ELECTRONIC PRODUCTS, LTD., Moxley Road, Bilston, Staffs. It is connected to the contactor coil of the starter and can be additionally arranged to energize a pilot lamp, or other alarm device, being suitable for any three-phase circuit at from 380 to 460 V independently of frequency variation. The relay will function within 0.1 sec with 40 V out of phase down to 0.025 sec with 80-V phase difference, and it automatically resets itself. Special designs can be undertaken for longer operating times. The metal case measures 6½ by 4½ by 3½ in., arranged for 1 in. conduit entry at one end.

Another product of the same makers is a sequence timer for spot and seam welders, with a range of from 0.01 to 3 sec in twelve steps. Any time cycle between 0.01 and 15 sec is obtainable. The device weighs 24 lb and its case dimensions are 12 by 8½ by 6½ in.

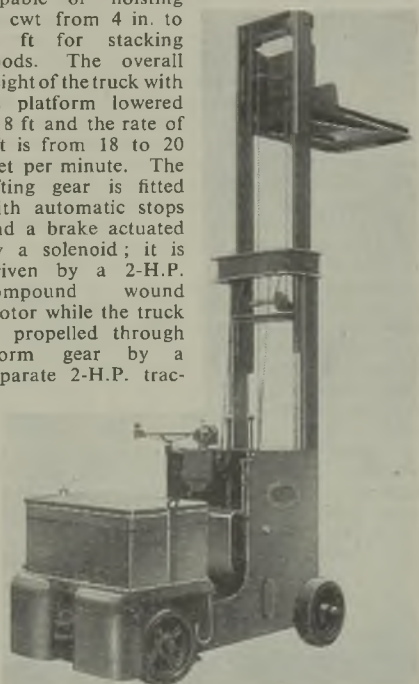
Bell Transformer

A step-down transformer designed for bell-ringing purposes is being introduced by MORPHY-RICHARDS, LTD., 121, Victoria Street, London, S.W.1. It is of high-grade construction and fully fused for primary connection to ordinary a.c. mains, the secondary winding being tapped for 12-, 8- or 4-V output.

Tiering Truck

A battery-energized "Greenbat" truck for handling materials has an elevating platform

capable of hoisting 10 cwt from 4 in. to 12 ft for stacking goods. The overall height of the truck with its platform lowered is 8 ft and the rate of lift is from 18 to 20 feet per minute. The lifting gear is fitted with automatic stops and a brake actuated by a solenoid; it is driven by a 2-H.P. compound wound motor while the truck is propelled through worm gear by a separate 2-H.P. trac-



Goods stacking truck with exceptional lift

tion type motor at a speed of 4.5 m.p.h., which is a fast walking pace. Both motors are energized by a battery of 14 "Exide-Ironclad" cells. The truck is built by Greenwood & Batley, Ltd., Armley Road, Leeds.

NEW BOOKS

High Voltage Supply. Crane Travel Motors.

Industrial High Voltage Distribution and Public Supply. By E. J. Barrows, A.M.I.E.E. Pp. 126; figs 40; index. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, London, W.C.2. Price 15s.

In his preface, the author notes the unfavourable comments passed from time to time by electrical factory inspectors upon the competence of some works engineers, particularly with regard to their inability to assess short-circuit current values from available system data. From the inclusion in the title of the term "industrial," one is led to expect considerable emphasis on such networks, particularly at the voltages with which works engineers are concerned. Instead, a considerable proportion of the book is devoted to examples which concern the supply engineer, starting in some cases at the 132-kV grid supply.

While appreciating that the factors to be taken into account in any full-scale short-circuit investigation must include the sources of supply, much of the material given may tend to frighten the works engineer rather than encourage him to go on to the bitter end. The book is, in fact, written more for the engineer of large industrial plants where one expects to find employed engineers whose competence can rarely call for criticism on the part of inspectors. If education in these matters is required, it is surely at the other end of the scale where the engineer of a small works has not only to be an electrical engineer, but also civil and mechanical as well. This is the chief weakness of the book. Otherwise it is excellent, setting forth as it does the manner and means whereby fault calculations are carried out from beginning to end. With other books and papers on the same subject, some of which are noted in a short bibliography, there is no reason why anyone who can add and multiply should not be able to conduct a calculation of short-circuit values. The presentation is simple and clear and Mr. Barrows has included a number of useful tables, some of which, while being based on similar information in B.S.116 and B.S.936, are presented in an alternative form which makes them of more direct value.

A part of the 27 pages devoted to reactors, which appear unnecessary for the purpose intended by the author, could, with advantage, have been given over to treatment of problems at 400 V, relating, for example, to the effect of resistance and reactance of conductors, more particularly the former. This might have been dealt with in the chapter on "Fuse-Protected Switchgear," but this is concerned more with high-voltage problems than low.

On page 58, the author states that the largest switchgear in use to-day has a "rupturing

capacity" of 1,500 MVA but that 2,500 MVA is envisaged. Actually the latter rating is already in service; incidentally, the use of the term "rupturing capacity" has long been deprecated, the accepted term being "breaking capacity." This book is of value to all electrical engineers who face short-circuit calculations from time to time. Supply engineers should not be deterred by the prominence given to "industrial" in the title.—R.T.L.

Electric Traction for Cranes. By Richard A. West. Pp. 86; figs; index. Sir Isaac Pitman & Sons, Ltd. Price 15s.

When installing electric motors difficulties often arise in determining the exact size of motor required for a particular machine owing to the fact that exact mechanical data are not available. This is particularly the case with loads which require a variable driving torque, and similar problems occur with crane driving motors which are operated for short periods.

In this book the author gives the results of his investigations into the problem of electrical driving of the travel motion of cranes, with particular reference to the long travel motion of the steel-mill crane bridge. In many cases the main factor which determines the power necessary is the rate of acceleration required, this being of greater importance than the maximum running speed on account of the relatively short travel. Detailed consideration is given to the factors affecting the total load, e.g., speed, acceleration, frequency of operation, friction and windage.

Axle friction with different types of bearings is discussed, together with flange friction, arrangements of wheel drives, and wheel slip. The mechanics of long travel motion is given a thorough practical treatment, simple formulae and data being quoted to enable power requirements to be calculated and performance predicted. Several pages are devoted to heating effects with different types of motor enclosure and different time ratings. The requirements of motor control gear for long travel motors, choice of resistance steps for best results, and braking are also included. Whilst the book deals mainly with d.c. motors, a.c. machines are not neglected, and ample comparisons of the performance obtained are given.

A feature of this work is the large number of curves which clearly show the characteristic performance of the machines and illustrate, in a condensed form, the results of calculations, which are thus readily available for practical application. The information given should be of considerable assistance to both electrical and mechanical engineers concerned with crane design and operation.—J.L.W.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Falk, Stadelmann & Co., Ltd.—Mr. Gustav Falk (chairman and joint managing director) presided at the annual meeting held last week and in his statement, which was taken as read, he drew attention to the fact that it was the sixtieth annual general meeting of the company. The business was founded by the late Mr. S. Falk in 1882, formed into a private company in 1887 and converted to a public company in 1928. During the year under review all their works had been employed to the fullest extent of the labour and material available, the shortage of which, particularly the latter, had a restrictive effect on output. The position regarding raw materials and components required for some of their products had become increasingly difficult of late, and it was hoped that with the assistance of the Government Departments concerned this shortage would soon be remedied.

Owing to the destruction by enemy action of a number of the company's London warehouses there was a great lack of space for both storage and service, but he was glad to report that the repair of one of the major buildings was on the point of completion, although even this would not provide sufficient space for their ever-increasing range of goods. Export trade was making satisfactory progress; while every effort was being made to foster this, home requirements could not be neglected, especially those articles specified for Government housing schemes which absorbed a large proportion of the company's output.

Aberdare Cables of South Africa, Ltd.—At the statutory meeting held in Johannesburg last month, the acting chairman (Mr. W. J. Cotterell) said that the company, which was incorporated on August 13th last, intended to manufacture other products besides cables, including those developed in Great Britain by associated companies. In addition to marketing its manufactures in Africa, the company proposed at a later date to export certain of them, and it had therefore purchased a factory site of roughly 25 acres at Port Elizabeth. Until the production phase was reached the company would act as agents for Aberdare Cables, Ltd. A message was read from Sir George Usher, chairman of the company and of the Aberdare group, who said that arrangements had been completed for sending machinery out as soon as the buildings were completed.

Cape Electric Tramways, Ltd., reports a net profit for the year ended June 30th of £91,758, as compared with £55,208 for the preceding year. Replacement reserve receives £20,000 and the dividend for the year is maintained at

6 per cent. The directors propose to capitalize £98,245 out of undistributed profits by the issue to shareholders of 98,245 bonus shares of £1 at par in the proportion of one share for every five shares held.

Strand Electric Holdings, Ltd.—The accounts of this company for the year ended July 11th were briefly reviewed in our last issue. In his statement issued with the report and accounts, Mr. J. D. H. Sheridan (chairman and joint managing director), says that the company has moved into its Gunnersbury works, which were requisitioned during the war, and the Ealing works have been let on satisfactory terms. The theatre lighting section of the Sales Department is very busy and the only limiting factor at the present time is that production is still short of demand.

The general section of the Sales Department, which looks after all sales of equipment (other than those to theatres) and all export business, is receiving an encouraging number of inquiries, particularly from overseas. The fuel shortage has prevented the Sign Department from resuming full peace-time activity, but a steady business is being carried on. The Contracting Department has been actively engaged upon the installation of Strand Electric apparatus right through the war and since the war ended. Shortage of supplies of contracting material is tending to restrict turnover. The Manchester and Dublin branches of the company are very active.

Radio & Television Trust, Ltd.—The accounts of the company (formerly the Philco Radio & Television Corporation of Great Britain, Ltd.) for the year ended March 31st last show a net trading profit of £236,843, compared with £115,701 for the preceding year, and the net profit before taxation is increased from £47,550 to £161,020. Taxation provision amounts to £107,500, (last year £31,741, after crediting £15,000 from taxation reserve). The accounts of subsidiaries have been charged with amounts to form comprehensive tax reserves on their profits, and £23,000 has been set aside for the service of the sinking fund certificates and preference capital, representing one year's obligations. It is proposed to pay an ordinary dividend of 25 per cent together with a bonus of 15 per cent; this compares with a 10 per cent distribution last year. All qualifications by the auditors last year regarding the valuation of subsidiary companies' shares and of stocks in hand and work in progress have now been eliminated. The balance carried forward is £15,950 (£12,930).

The Delhi Electric Supply & Traction Co., Ltd., is again paying an interim ordinary dividend of 4 per cent.

New Companies

Cambridge Electrical Components, Ltd.—Registered November 7th. Capital, £2,000. Manufacturers of, and wholesale and retail dealers in, resistors, electrical components, apparatus and appliances, etc. Directors: H. P. Board, E. Bowers and Dr. Gerhard Liebman. Regd. office: Lloyds Bank Chambers, Hobson Street, Cambridge.

Safax, Ltd.—Registered November 6th. Capital, £1,000. Manufacturers of, and dealers in, electric lamps, neon signs, and domestic appliances, etc. Directors: S. Osocroft, C. Walsh, F. F. Tott and H. Burley. Regd. office: 8, Dover Street, Burnley.

British Rollux, Ltd.—Registered November 7th. Capital, £500. Manufacturers of, and dealers in, lamps, lamp reflectors, standards and shades, electrical accessories, etc. Directors: J. E. Turnbull and C. J. Charles. Secretary: F. R. Clarke, 39, Chapel Farm Road, S.E.9.

R. N. Eaton & Co., Ltd.—Registered in Dublin November 4th. Capital, £10,000. Electrical, mechanical and civil engineers, contractors, etc. Directors: R. N. Eaton, R. B. Eaton and J. A. McKeown.

Trembath & Co., Ltd.—Registered November 5th. Capital, £5,000. Refrigeration and electrical engineers, etc. Directors: N. L. Trembath and Barbara M. Trembath. Regd. office: 16, Park View, Hatch End, Middlesex.

Auto Electrics (Morecambe), Ltd.—Registered November 5th. Capital, £1,000. Electricians, electrical, mechanical and general engineers, etc. Directors: R. Yates, F. Chapman and W. E. Bamber. Regd. office: Bare Lane, Morecambe.

Coolfridge, Ltd.—Registered November 5th. Capital, £100. Manufacturers of, and dealers in, refrigerators and cold storage equipment, etc. Solicitors: Stone & Stone, Moorgate, E.C.2.

Reid & Barrow, Ltd.—Registered November 6th. Capital, £1,500. To acquire the business carried on by P. T. W. Reid and F. Barrow as "Reid & Barrow," electrical engineers and contractors and radio specialists. Directors: T. W. Reid and F. Barrow. Regd. office: 139, Masons Hill, Bromley, Kent.

Gelco, Ltd.—Registered November 1st. Capital, £200. Manufacturers of, and dealers in, radio, television and electrical apparatus, etc. Directors: M. S. Gee and M. Levitt. Secretary: E. C. Silver. Regd. office: Napier House, 24/27, High Holborn, W.C.1.

S. G. Huband & Sons, Ltd.—Registered November 1st. Capital, £3,000. Constructors and maintainers of, and dealers in, wireless and electrical apparatus, etc. Directors: S. G. Huband, R. L. Huband, and G. K. Huband. Regd. office: 52, High Street, Cricklade, Wilts.

Speed Development Co., Ltd.—Registered November 8th. Capital, £100. Designers, consultants, engineers, manufacturers of all electrical, mechanical and electro-mechanical

equipment, etc. Directors: R. C. Fuller, W. H. Ruffle, and C. W. Edwards. Regd. office: 25, Newman Street, W.1.

Guy Morrison & Co., Ltd.—Registered November 6th. Capital, £1,000. Manufacturers, importers and exporters of, and wholesale and retail dealers in, electrical and mechanical appliances, electrical engineers, etc. Secretary: Sarah A. Dawson. Regd. office: 22, Upper Grosvenor Street, W.1.

Radio Television (Edware), Ltd.—Registered November 9th. Capital, £750. Directors: F. G. Merkl and A. H. Auterac. Regd. office: 13, North Parade, Mollison Way, Edware.

Roberts Electrical Co., Ltd.—Registered November 7th. Capital, £100. Electrical and mechanical engineers, etc. Directors: H. C. P. Roberts and A. C. Lusty. Solicitors: Joynson Hicks & Co., W.C.2.

T. W. F. Day, Ltd.—Registered October 30th. Capital, £2,000. Electrical engineers and contractors, builders, etc. Directors: T. W. F. Day, Clara Day and J. R. Day. Regd. office: 10, Union Street, Dewsbury.

Abbey Electrical (Midlands), Ltd.—Registered October 29th. Capital, £1,000. Electrical engineers, general electrical installation contractors, etc. Directors: G. R. Dawes, A. Collins, F. S. Smith and J. B. G. Southall. Regd. office: Burton Road, Sedgley, Staffs.

Increases of Capital

Funditor, Ltd.—Increased by £35,000 beyond the registered capital of £15,000.

Alloy Wire Co., Ltd.—Increased by £11,000 beyond the registered capital of £1,000.

Liquidations

Claytelec, Ltd., 6, Highbury Grove, London. N.5, electrical contractors.—The first meetings of creditors and shareholders under the compulsory liquidation were held on November 12th. The Official Receiver reported that the liabilities amounted to £2,642 and the assets were estimated at £1,150. The company was registered in May, 1944, with a nominal capital of £1,000 to carry on the business of an electrical contractor formerly carried on by B. Clayton at 26, Aberdeen Park, Highbury. Resolutions were passed for the appointment of Mr. B. Manning, 3, Great Winchester Street, London, E.C.2, as liquidator. A committee of inspection was also appointed.

Bankruptcies

R. T. H. Brimfield, lately carrying on business under the style of Richfield Electrical Components at 73 and 78, High Holborn, London, W.C.1, electrical contractor.—Second dividend of 11d. in the £, payable November 26th at Bankruptcy Buildings, Carey Street, London, W.C.2.

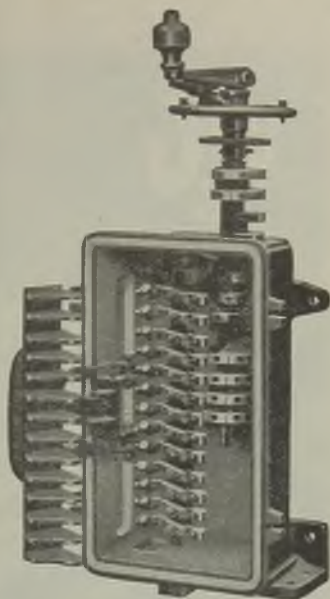
CONTROL

OF IMPORTANCE TO YOU

In order that we may give you the best service under the present difficult conditions we appeal to you to utilise standard equipment; avoid "frills" whenever possible.

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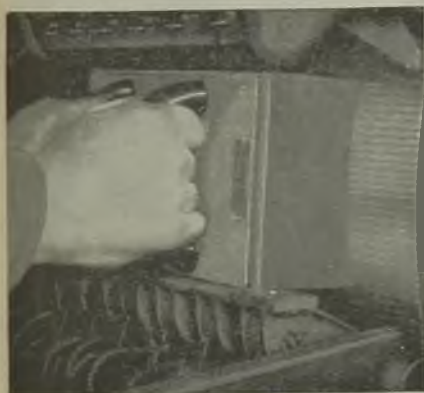


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STOCKS AND SHARES

PRICES in the Stock Exchange markets are moving with an irregularity which precludes any attempt to cover the trend with a general description. British Government securities, and most of the gilt-edged stocks which follow in their train, continue their upward course. Home Railway stocks have fallen heavily. An evening newspaper stated bluntly that when the terms of compensation were published stockholders would probably receive a nasty shock. This caused a severe shrinkage in the previous demand. Fixed-charge stocks gave way in common with the junior issues. Southern Railway 5 per cent preference shed 5 points, receding to 119½, and the preferred, 79 two or three weeks ago, fell to 74. London Passenger Transport stocks remained steady. Amongst other transport issues, Thomas Tilling eased off to 56s. 6d. British Electric Traction deferred held its price of 1240.

Electricity Supply Shares

Something of a halt has been called to the rush for the ordinary shares of the Home electricity supply companies. County of London ordinary, to quote one example, were run up to 50s., before reverting to 47s. 6d. The buying had been of a rather indiscriminate order; share prices had to be advanced because the supplies necessary to satisfy the purchasers, came in but slowly. When the demand slackened, sellers appeared in greater number, with the result that certain of the supply companies' ordinary shares are slightly easier. The King's Speech demonstrated the intention of the Government to proceed with nationalization of electricity, but strenuous opposition continues to be offered.

Market Movements

Among the equipment manufacturers, the telephone group shows better prices for Automatic Telephones at 72s. 3d. and Ericssons at 53s. 9d. Half-a-crown has been gained by Hopkinsons, at 5½. In the radio section, E.M.I. at 28s., E. K. Cole at 29s. and Radio Television at 10s. are easier. Babcock & Wilcox at 68s. are 2s. 6d. to the good and Vickers rose to 30s. Crompton Parkinson have moved up to 33s. 6d., Laurence Scott to 14s. 6d. In other markets, Cable & Wireless preference put on 1½ to 123, and Anglo-American Telephone preference 2, to 142½.

Company Results

Tube Investments shares reacted 5s. to 6½ after the declaration of a final dividend, making 22½ per cent for the year. Last year's distribution, at the same rate, was accompanied by a 10 per cent cash payment which shareholders were warned to regard as a special distribution from contingencies reserves no longer required. The recent announcement of the closing of one of the works because of the steel shortage had restrained optimism about the dividend. Never-

theless, the absence of any increase came as something of a disappointment in the market. Due appreciation is given, however, to the accompanying profits which show the distribution to be a decidedly conservative one. The shares pay £3 13s. 6d. per cent on the money. Ward & Goldstone indicate a further improvement on their sound dividend record by raising this year's interim payment from 15 to 20 per cent. A final of 20 per cent was paid last year, making 35 per cent. The company's 5s. shares have risen to 51s. 6d. A conservative dividend policy has built up a strong balance sheet.

Decca Dividend

For some time the quotation of Decca 1s. ordinary shares on a yield basis of about 2 per cent has indicated high expectations from the results of the company's expansion. Last week's declaration of a dividend again making 112½ per cent for the year, and the preliminary profits statement, were followed by a decline of half a crown, to 2½, in the price of the shares. Anticipations, however, were not seriously disappointed since the results relate to the year ended as long ago as last March. Expansion of production would have been considerably hindered over that period by reconversion problems. In January the company raised fresh capital in the shape of 600,000 preference shares for the development of the Decca Navigator system, as well as for general business purposes.

Cable Shares

With the prospect of a large and sustained demand for electric cable in the course of the expansion of the electricity supply, railway, building and constructional industries, the shares of the leading cable makers retain their place in the front rank of industrial investments. Johnson & Phillips, now 80s., have been a firm feature of the industrial market since the shares were quoted ex-rights to the new shares, which are now worth 15s. premium over the issue price of 65s. The yield of 3½ per cent still looks reasonably generous by present standards. Henley's 5s. ordinary pay £3 11s. 6d. per cent on the money.

Enfield Cables at 53s. remain under the influence of the cut in the interim dividend due to supply shortages. British Insulated Callender's final dividend is not expected before the new year, the accounting period having been extended to cover the eighteen months to December 31st next. An interim of 4 per cent was paid in July. A yield of 4 per cent on Siemens, at 37s. 3d., reflects the effect of the decline shown in last year's trading profit. On Telegraph Constructions at 56s. and London Electric Wire at 42s. 6d. the return is a little better than 3½ per cent, and on General Cables at 23s. 9d. it is three guineas per cent. Modest gains have occurred in Veritys, 8s., Allen Wests, 9s. 6d., and Ferranti preference, 36s. 3d. Metal Industries "B" are better at 58s. 9d.

Swiss Electrical Trade

Imports and Exports in 1945

THE accompanying statements show Switzerland's electrical imports and exports in 1945, by countries, with increases or decreases compared with 1944. They are extracted from the Swiss official trade returns which, however, give more detail than it is possible to include here. On the import side there was a decline in all the important items with the exception of wire and cable, and telegraph and telephone apparatus, except radio. There will be no surprise at the much reduced part played by Germany in the electrical trade. Her place was taken partly by France and Holland and, to a less extent, by Belgium. Exports increased generally, those of power plant by about 75 per cent, while the advance in meters, radio goods and unspecified apparatus was also noteworthy. Some smaller items only showed declines. The statistics show a wide range of

customer countries and a renewal of business with France. The exchange rate is 17.35 Swiss francs to the pound sterling.

Employment in Switzerland has this year continued at a high level, and some bottlenecks have developed by reason of difficulties in obtaining deliveries from the foundries and from factories producing parts. Export trade generally is still below the pre-war level of 60 per cent of total output. Trouble is still caused by the shortage of coal, particularly in the metal-goods industries. In Switzerland's foreign trade generally, the United States has been taking the major part this year, followed by France and Sweden. Compared with pre-war years an important change has occurred inasmuch as relations with countries overseas have expanded, while those with European nations have suffered contraction.

Class of Goods	1945 Fr. (000)	Inc. or dec. on 1944 Fr. (000)	Class of Goods	1945 Fr. (000)	Inc. or dec. on 1944 Fr. (000)
Imports			Electric incandescent lamps—		
<i>Accumulators—</i>	278	— 325	From Germany	24	— 458
From Germany	48	— 175	Holland	1,409	+ 720
France	2	— 15	<i>Telegraph and telephone apparatus</i>	2,572	+ 1,157
Sweden	227	— 133	From Germany	355	— 311
<i>Insulators—</i>	130	— 145	Belgium	2,184	+ 472
From Germany	6	— 85	Exports		
Denmark	100	— 67	<i>Accumulators—</i>	362	— 236
France	24	+ 8	To Argentina	130	+ 35
<i>Meters and measuring instruments</i>	312	— 408	Portugal	28	+ 28
From Germany	142	— 362	Spain	150	+ 141
Holland	96	+ 4	France	11	+ 11
France	43	+ 4	<i>Insulators—</i>	101	— 141
<i>Radio apparatus—</i>	3,961	— 1,960	To France	63	+ 3
From Germany	835	— 2,228	Spain	7	+ 2
Holland	1,108	+ 20	Holland	2	— 96
Sweden	367	— 245	Peru	5	+ 5
France	876	+ 740	Portugal	9	+ 8
United States	114	+ 102	<i>Telegraph and telephone apparatus</i>	208	— 521
<i>Glass rectifiers, with or without mercury—</i>	117	— 118	To France	10	+ 10
From Germany	26	— 129	Spain	47	— 177
Holland	85	+ 11	Sweden	16	+ 11
<i>Unspecified electrical apparatus,</i>			Brazil	18	+ 18
50 to 500 kg—	64	— 125	Argentina	90	+ 90
From Germany	37	— 141	<i>Radio apparatus—</i>	3,586	+ 862
Holland	15	+ 15	To Spain	604	+ 448
<i>Ditto, 3 to 50 kg—</i>	30	— 92	Brazil	333	+ 155
From Germany	6	— 83	Portugal	802	+ 587
Sweden	6	— 25	Sweden	158	— 102
Holland	8	+ 8	Turkey	203	— 435
<i>Ditto, under 3 kg—</i>	536	— 442	S. Africa	558	+ 558
From Germany	173	— 604	<i>Dynamo-electric machines—</i>	31,924	— 13,647
Holland	102	+ 22	To France	1,999	+ 1,907
Belgium	227	+ 64	Spain	15,765	+ 10,186
<i>Dynamo-electric machines—</i>	485	— 995	Portugal	3,127	+ 1,756
From Germany	182	— 1,018	Denmark	395	— 16
Sweden	23	— 40	Czechoslovakia	183	— 443
France	87	+ 76	Argentina	1,785	+ 1,422
Holland	52	+ 2	Brazil	3,140	+ 2,425
<i>Lighting and starting equipment for vehicles—</i>	260	— 192	Holland	525	+ 482
From Germany	200	— 200	India	456	+ 456
United States	24	+ 24	Peru	862	+ 744
<i>Insulated wire and cable—</i>	163	+ 79	Morocco	335	+ 335
From Germany	28	— 14	S. Africa	306	+ 271
Belgium	56	+ 34	<i>Insulated wire and cable—</i>	35	— 141
Czechoslovakia	68	+ 53	To Spain	19	— 76
			Sweden	5	— 27

Swiss Electrical Trade (Continued)—

Class of Goods	1945 Fr. (000)	Inc. or dec. on 1944 (000)	Class of Goods	1945 Fr. (000)	Inc. or dec. on 1944 Fr. (000)
<i>Meters and measuring instruments</i>	10,589	+ 3,289	<i>Ditto, 50 to 500 kg—</i>	3,952	+ 825
To France	740	+ 709	To France	382	+ 281
„ Spain	1,884	+ 1,007	„ Spain	1,633	+ 728
„ Sweden	841	+ 290	„ Portugal	423	+ 313
„ Turkey	392	+ 150	„ Peru	128	+ 13
„ Cuba	446	+ 153	„ Sweden	291	—
„ Brazil	814	+ 345	„ Brazil	488	+ 432
„ Argentina	2,345	+ 1,953	„ Argentina	286	+ 132
<i>Electric incandescent lamps—</i>	628	— 65	<i>Ditto, 3 to 50 kg—</i>	4,566	+ 944
To Germany	50	— 57	To France	758	+ 722
„ Italy	192	+ 192	„ Turkey	211	+ 156
„ Turkey	337	+ 336	„ Sweden	121	— 94
<i>Lighting and starting equipment for vehicles—</i>	1,978	— 3,894	„ Spain	1,472	+ 679
To United States	240	+ 240	„ Brazil	529	+ 322
„ Sweden	260	+ 1,537	„ Argentina	263	+ 98
„ Spain	24	+ 163	„ Peru	114	+ 99
„ Portugal	270	+ 211	<i>Ditto, under 3 kg—</i>	2,542	+ 690
<i>Unspecified electrical apparatus over 500 kg—</i>	3,908	+ 1,528	To France	624	+ 549
To France	204	+ 204	„ Spain	322	+ 209
„ Spain	2,713	+ 1,583	„ Portugal	184	+ 150
„ Portugal	213	+ 35	„ Sweden	316	— 7
„ Egypt	207	+ 207	„ Brazil	204	+ 170
			„ Argentina	203	+ 154
			<i>Electric trucks</i>	11	— 311

NEW PATENTS

Electrical Specifications Recently Published

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

A. K. T. Ges Brown, Boveri & Cie.—"Windings for alternating current commutator machines." 20853/43. December 11th, 1942. (Addition to 570/328.) (582002.)

R. W. Bailey and Metropolitan-Vickers Electrical Co., Ltd.—"Combustion product generators." 25945. September 5th, 1938. (581960.)

A. F. Berry.—"Means for indicating the use of electrical energy in consuming devices." 13237. July 11th, 1944. (582038.)

A. D. Blumlein and E. L. C. White.—"Methods and apparatus for determining the direction or position of sources or reflectors of radiant energy." Cognate applications 21108/39 and 2928/39. July 20th, 1939. (581920.)

British Celanese, Ltd. (Celanese Corporation of America).—"Production of insulating materials." 3452. February 24th, 1944. (582006.)

British Non-Ferrous Metals Research Association, G. L. Bailey and A. P. C. Hallows.—"Production of copper alloys." 8130. May 21st, 1943. (581903.)

British Thomson-Houston Co., Ltd.—"Super-regenerative receiver circuits." 1681/44. February 3rd, 1943. (581913.) "Ignition systems for the periodic production of spark discharges." 4337/44. March 12th, 1943. (581916.)

British Thomson-Houston Co., Ltd., and

F. W. Carter.—"Gun laying equipment." 15055. October 9th, 1940. (581966.)

British Thomson-Houston Co., Ltd., and E. R. Edinborough.—"Means for detachably securing a device to a support." 9981. April 20th, 1945. (581959.)

J. D. Cockcroft and A. J. H. Oxford.—"Radio location systems." 15329. September 17th, 1943. (581989.)

J. D. Cockcroft and D. R. Chick, W. S. Eastwood and A. J. H. Oxford.—"Searchlight control installations." 17680. December 11th, 1942. (581980.) "Pulse radar installations." 31422/45. December 11th, 1942. (Divided out of 581980.) (581999.) "Radio apparatus for receiving pulsed signals." 15190/44. December 11th, 1942. (Divided out of 581980.) (581996.) "Radio aerial systems." 31421/45. December 11th, 1942. (Divided out of 581980.) (581998.)

W. W. Constantine (General Motors Corporation).—"Controllers for electric motors." 11928. June 23rd, 1944. (582031.)

E. C. Cork, M. Bowman-Manifold, F. H. Gale and R. Blythen.—"Circuit arrangements for mixing oscillations." 12351. September 1st, 1942. (581976.)

A. C. Cossor, Ltd., and L. Jofeh.—"Thermionic valve circuits." 9054. May 12th, 1944. (582018.)

A. C. Cossor, Ltd., and F. R. W. Trafford.—"Electrical apparatus for the measurement of distances by the reflection of electromagnetic waves." 18557. December 13th, 1942. (581982.)

Dorman & Smith, Ltd., T. Atherton and J.

Lund.—“Electric plug pin sockets and contact blocks.” 514. January 11th, 1944. (582003.)

General Electric Co., Ltd., and H. J. Foxon.—“Manufacture of diamond dies.” 4957. April 16th, 1941. (581969.)

General Electric Co., Ltd., and E. Friedlander.—“Electric motors of the squirrel-cage type.” 13318. July 12th, 1944. (582063.)

J. Hardwick.—“Amplifier gain control systems.” 27565. October 10th, 1939. (581921.)

Hazeltine Corporation.—“Ultra-high-frequency signal translating apparatus.” 13306/42. October 29th, 1941. (581892.)

W. T. Henley's Telegraph Works, Sir E. M. Hughman and P. Dunsheath.—“Method and means for exploding submarine mines.” Cognate applications 4870/41, 5598/41 and 5838/41. April 11th, 1941. (581922.)

O. K. Kolb (Electrical Fono-Films Co., Aktieselskab).—“Circuit arrangements for obtaining a control or measuring voltage.” 10474. August 18th, 1941. (581887.)

T. M. Lewish, E. G. Rounce and A. E. Hills.—“Combined pump and electric motor unit.” 13032. July 7th, 1944. (582036.)

Marconi's Wireless Telegraph Co., Ltd.—“Phase correction circuit.” 10251/44. May 29th, 1945. (581919.)

Okonite-Callender Cable Co., Inc.—“Method of improving the physical properties of lead.” 4713/44. March 16th, 1943. (582009.)

A. J. H. Oxford.—“Apparatus for measuring the time displacement between electric signals.” 6087. April 15th, 1943. (581986.)

A. F. Pearce.—“Electron-discharge devices employing hollow resonators.” 680/43. December 16th, 1941. (Divided out of 577530.) (581895.)

Philco Corporation.—“Vacuum tube circuits.” 19831/43. November 25th, 1942. (581910.)

H. Pittet.—“Electric devices for distant indication.” 2954/41. February 14th, 1940. (582000.)

C. Ryder and Metropolitan-Vickers Electrical Co., Ltd.—“Control systems.” 18159. December 21st, 1942. (581925.)

S. Smith & Sons (England), Ltd., and F. W. Meredith.—“Three-phase dynamo electric machines.” 5514. March 5th, 1945. (582039.)

S. Smith & Sons (England), Ltd., F. W. Meredith, E. B. Moss and H. E. Whitley.—“Balanced rotors.” 17206. October 19th, 1943. (581991.)

Soc. Genevoise d'Instruments de Physique.—“Circuit arrangement for transforming an electric impulse.” 20855/43. January 14th, 1943. (581930.)

Sperry Gyroscope Co., Inc.—“Concentric line impedance transformers.” 6502/42. May 17th, 1941. (581972.) “Hollow resonators for high frequency electron discharge tubes.” 279/43. May 17th, 1941. (Divided out of 581972.) (581983.) “Concentric line impedance transformer for matching any two impedances.” 280/43. May 17th, 1941. (Divided

out of 581972.) (581984.) “Reflection eliminating transmission line joints.” 17389/43. May 17th, 1941. (Divided out of 581972.) (581992.)

Standard Telephones & Cables, Ltd., and C. H. Foulkes.—“Mounting of helical conducting filaments in electrical devices.” 10896. June 6th, 1944. (582025.)

Standard Telephones & Cables, Ltd., and M. L. Gayford.—“Anti-vibration mountings for electrical apparatus such as electron discharge tubes.” 9377. May 16th, 1944. (582020.)

Standard Telephones & Cables, Ltd., and F. D. Goodchild.—“Electron-discharge apparatus incorporating high-frequency resonators of the coaxial conductor type.” 10704. June 21st, 1940. (581883.)

Standard Telephones & Cables, Ltd., and H. R. Stocks.—“Magnetic means for the hardness testing of metals.” 7800. April 30th, 1940. (581964.)

Standard Telephones & Cables, Ltd., and S. G. Tomlin.—“Electron-discharge apparatus of the velocity modulated type.” 11000. June 28th, 1940. (581884.)

“Electron-discharge apparatus employing electron velocity modulation.” 18101. December 24th, 1940. (Addition to 581884.) (581885.)

Standard Telephones & Cables, Ltd., M. M. Levy and L. E. Weaver.—“Generation of electrical impulses.” 4506. April 4th, 1941. (581986.)

Sylvania Electric Products, Inc.—“Fluorescent lamps.” 8582/44. March 24th, 1943. (581951.)

Sylvania Industrial Corporation.—“Process of coating fibrous materials and the products produced.” 12772/43. August 7th, 1942. (581928.)

Western Electric Co., Inc.—“Electron discharge devices.” 8746/44. May 11th, 1943. (581952.) “Process and apparatus for producing a coating of discrete metallic particles particularly the mosaic surface of the target of an electron camera tube.” 4773/44. April 29th, 1943. (581935.)

Westinghouse Brake & Signal Co., Ltd., and L. H. Peter.—“Signalling systems of the track circuit type for railways and the like.” 11284. June 13th, 1944. (581957.)

Westinghouse Brake & Signal Co., Ltd., and A. H. B. Walker.—“Apparatus for frequency multiplication of alternating electric currents.” 13249. June 11th, 1944. (582061.)

Westinghouse Electric International Co.—“Gas turbines.” 6401/44. January 30th, 1943. (582049.)

Paris Trade Fair

The Paris International Trade Fair will be held from May 10th to 26th next year. Application forms and further particulars can be obtained from Miss E. Lambert, London representative of the Foire de Paris, 11-13, Rugby Chambers, 2, Rugby Street, W.C.1.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

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

Australia.—The following contracts are announced in *Tenders* (Melbourne):—**NEW SOUTH WALES.**—December 5th. Sydney County Council Electricity Department. 33-kV and pilot cable (Spec. 862).

December 12th. 33-kV switchgear (Spec. 851) and automatic voltage regulating equipment for generators (Spec. 866) at Pyrmont "B" station. Comptroller of Stores.

December 23rd. Public Works Department. Steam raising plant and 12,500-kW turbo-alternator and auxiliary equipment for Port Kembla power station, extension "E."—N.S.W. Government Offices, London.

VICTORIA.—January 15th. Victorian Railways. 1,500-kW automatically controlled rectifier units.

December 11th. State Electricity Commission. 35,000-kVA transformers and spares.

February 11th. (Extended date.) Six water-tube boilers complete with auxiliary and accessory plant for Yallourn (Spec. 46-47/1). Agent-General for Victoria, London.

QUEENSLAND.—December 16th. Department of Irrigation and Water Supply. Oil-engine driven generating plants.

December 13th. Department of Transport. Brisbane City Council. L.v. switchgear for New Farm power house.

Bristol.—Education Committee. Electric lighting, power and heating installations at new Junior Mixed and Infants' School, Begbrook. Contractors wishing to tender should send their names and addresses to the city architect by November 30th. (See this issue.)

Bury.—December 9th. One 1,250-kVA and two 625-kVA 6,500/400/230-V three-phase transformers. (See this issue.)

Cleethorpes.—December 20th. Electricity Department. Four 500-kVA transformers. (See this issue.)

Epsom and Ewell.—December 16th. Electricity Department. One 500-kVA three-phase transformer and one ten-panel 11-kV 150-MVA truck type switchboard. (November 8th.)

Heston and Isleworth.—December 15th. Borough Council. One 10,000-kVA transformer. (See this issue.)

Kingston-upon-Thames.—December 9th. Corporation. Paper-insulated cables. (November 15th.)

Litherland.—November 30th. Urban District Council. Electric wiring in twenty-four bungalows, Field Lane. Surveyor, Town Hall.

Manchester.—December 6th. Electricity Department. Air-cooling pipework for Nos. 67 and 68 boilers. (November 15th.)

December 13th. Soot-blowers for Nos. 65 and 66 boilers. (November 15th.)

New Zealand.—January 21st. Hydro-Electric Department. 11-kV control and relay boards for Oamaru and Ashburton substations.

North Scotland.—Hydro-Electric Board. Supply and erection of 132-kV transmission lines. (See this issue.)

Plymouth St. Mary.—December 6th. R.D.C. Electricity Department. 6,600/415/240-V, three-phase transformers. (November 8th.)

Warwick.—December 2nd. County Council. Contracts for heating and electrical engineers. (November 15th.)

Orders Placed

Birkenhead.—Town Council. Accepted. Six boiler units for new power station (£2,545,780).—Babcock & Wilcox.

Eccles.—Electricity Committee. Accepted. Two 6,000-kVA transformers (£5,688 each).—Ferranti. 33-kV switchgear (£25,258) and 6-kV switchgear (£10,838).—Metropolitan-Vickers.

Glasgow.—Transport Committee. Accepted. Two rectifier sub-stations for trolley-bus service.—G.E.C. (£11,395), English Electric Co. (£11,586).

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.

Alnwick.—Houses (40), Barresdale site; U.D.C. surveyor.

Blaby.—Houses (135), for R.D.C.; surveyor, Rural Council Offices, Narborough, Leics.

Blackley.—Houses (55), Victoria Avenue East; Greenwoods Building Industries, Ltd., Salem Works, Lees Road, Oldham.

Boldon.—Steel-framed building for Insulating Products, Ltd.; R. Frazer & Sons, builders, Hebburn-on-Tyne.

Houses (210), Whitburn; N. Hindmarsh, U.D.C. surveyor, Council Offices, East Boldon.

Bournemouth.—Transport control offices for T.C.; Jackson & Greenen, architects, Hinton Buildings, Hinton Road.

Brighton.—Printing works, Regent Street; Brighton & Hove Herald, Ltd.

Castle Ward (Northumberland).—Houses (50), Dinnington, for R.D.C.; J. W. Urpeth, builder, Bedlington.

Cramlington (Northumberland).—Houses (80) for Seaton Valley U.D.C.; J. E. Gardiner, Ltd., Shiremoor, Northumberland.

Crook (Co. Durham).—Dress making factory for Ramar, Ltd.; North-Eastern Trading Estates, Ltd., Low Fell.

Cudworth.—Conversion of old school in Pond Street into factory; A. Martin & Co., Ltd., Lenton, Nottingham.

Darlington.—High school for E.C.; borough surveyor, Town Hall, Darlington.

Doncaster.—"Airey" houses (200), for R.D.C.; J. A. Williams, surveyor, Nether Hall.

Droitwich.—Houses (32), for T.C.; borough engineer, Friar Street.

Droylsden.—Houses (86), for U.D.C.; Chappell & Sons, Ltd., builders, Chappell Road, Droylsden.

Dudley.—Houses (25), Holly Lodge Estate, for T.C. (£32,237); Mark Round & Sons, builders, New Street, Dudley.

Eastbourne.—Extensions, Princess Alice Hospital (£7,000); Governors.

East Sussex.—School (270 places), Portslade, for E.C.; E. A. Verger, county architect, County Hall, Lewes.

Ellesmere Port.—Factory, Thornton; Shell Petroleum Co., Ltd., Stanlow.

Filey.—Houses (56), Newthorpe Estate, for T.C.; Tarran Industries, Ltd., Clough Road, Hull.

Gateshead.—New warehouse for Tyne-Tees Steam Shipping Co., Ltd.; architects: Hetherington & Wilson, County Chambers, Newcastle. Factory on Trading Estate for Durham Steel Co.; Stanley Miller, 17, North Street, Newcastle.

Glasgow.—Cleansing depot, Greenholme Street, Cathcart (£29,000); city engineer.

Halesowen.—Shops (12), Norton Estate; A. & J. Mucklow, builders, Haden Cross, Haden Hill.

Hastings.—Houses (67), Rocks Lane estate (£87,437); Ringmer Building Works, Ltd.

Hulme.—Extensions, Clarence Mills; J. Carr & Co., Ltd., Clarence Street.

Ince-in-Makerfield.—Houses (100), Chemical Fields site; surveyor, Council Offices, Ince Green Lane, Wigan.

Jarrow-on-Tyne.—Factory, Bede Estate, for Beck & Cohen, Ltd., London; C. S. Errington, architect, 46, Grainger Street, Newcastle-on-Tyne.

Leek.—Houses (120), Endon, Brown Edge and Baddeley Green; surveyor, Urban Council Offices.

Lichfield.—Factory, Trent Valley estate; Wilsons of Wolverhampton, Ltd.

Factory, Trent Valley estate; Soya Milk Products, Ltd.

Linslade.—Houses (30), Southcott, for U.D.C.; H. A. Rolis, architect, 15, Bridge Street, Leighton Buzzard.

Newcastle (Staffs).—Primary school, Bradwell Estate, for E.C.; C. B. Parkes, architect, Bournville Estate Office, Birmingham, 30.

Newcastle-on-Tyne.—Rebuilding workshops for Christie Malcolm & Co., printers; Marshall & Tweedy, architects, Grainger House, Blackett Street.

Newmarket.—Permanent houses (48), on several sites for R.D.C.; L. J. Cockerham, architect, Council Offices, Park Lane.

Rainford.—Houses (28), Southern's Lane, for U.D.C.; Clough & Gaskell, Ltd., Billinge Road Saw Mills, Wigan.

Ramsgate.—Additional houses (76); borough engineer.

Rochdale.—Extensions, Crawford Spring Works; F. S. Ratcliffe (Rochdale), Ltd., Allen Street.

Rubery.—Junior & infants' primary school, for Worcestershire E.C.; L. C. Lomas, county architect, 60, The Tything, Worcester.

Runcorn.—Houses (80), Chester Road, Helsby, for R.D.C.; A. J. King, surveyor, Castle Park, Frodsham, via Warrington.

Sale.—Houses (88), Carrington Lane, for T.C.; J. E. Dean & Son, builders.

Sedgley (Dudley).—Houses (52), Lower Gornal, for U.D.C.; W. Whittingham, Ltd., contractors, Wolverhampton.

Sherburn (Co. Durham).—Four factories for North-Eastern Trading Estates; G. Gray & Kinghorn, Camden Street, North Shields.

Shildon (Co. Durham).—Houses (50), Dale Road, for the U.D.C.; C. Yeoman, builder, Ryhope, Sunderland.

Southend-on-Sea.—Staff houses at Runwell Hospital (£30,000); borough engineer.

Skelmersdale.—Dwellings (206) for U.D.C.; surveyor, U.D.C. Offices.

South Shields.—Factory, Bede Estate, for Denton & Co., asbestos makers, Hilda Buildings, Churchway.

Sowerby Bridge.—Houses (50) for U.D.C.; Walsh, Wilkinson & Coutts, surveyors, 10, Harrison Road, Halifax.

Staveley.—Houses (448), Inkersall Green, for U.D.C.; H. W. Gilman, surveyor, Council Offices.

Stockton-on-Tees.—Houses (216), at Newham Grange, for the T.C.; L. Brown & Son, builders, Boathouse Lane.

Tillicoultry (Clackmannan).—Houses (86); burgh surveyor, High Street.

Upton.—Extensions, mental colony (£14,500); Cheshire county architect.

Urmston.—Houses (50), Winchester Road, Davyhulme, for U.D.C.; Gilbert Ash, Ltd., builders, 1, Stanhope Gate, London, S.W.1.

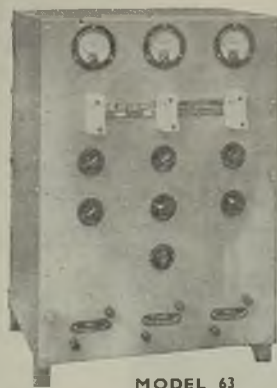
Whitley Bay.—Holiday camp; P. Dodds & Son, solicitors for promoters, 72, Howard Street, North Shields.

HEAYBERD

RECTIFIERS

*Designed for
Lasting Service!*

F. C. HEAYBERD & CO., LTD.
28, RUSSELL SQUARE, LONDON, W.C.1.



MODEL 63

A three-circuit Battery Charger suitable for a Charging Station handling radio cells and car batteries.

Circuit 1. Charges 1 to 12 2v. cells at 1 ampere

Circuit 2. Charges 1 to 12 2v. cells at 2 amperes

Circuit 3. Charges 1 to 12 2v. cells at 5 amperes

Send for Lit No. 1042 giving full details of over thirty models

THE METAL OF UNIQUE QUALITY

Mallory 73 Beryllium Copper is a non-ferrous alloy having high tensile and fatigue strength, great hardness, good electrical conductivity, and resistance to wear and corrosion. These properties have led to the wide use of Mallory 73 in electrical and precision engineering and in the instrument and radio industries. Complete informative literature has been collated by Mallory metallurgists and this is available by request.

MALLORY **73**
BERYLLIUM COPPER



Contact Blades. Helical Springs.
Diaphragms and capsules.
Instrument hairsprings. Fuse
clips. Circuit breaker springs.
Bourdon pressure tubes.
Snap action switch blades.

JOHNSON, MATTHEY & CO. LIMITED

CONTROLLING

MALLORY METALLURGICAL PRODUCTS LIMITED
73/83 HATTON GARDEN, LONDON, E.C.1

G.E.C.

STEEL

CABLE TRUNKING SYSTEM



CB351
Right angle Type A



CB355 Tee piece



CB352
Right Angle Type B

The use of G.E.C. steel cable trunking in connection with heavy cable has many advantages and enables a considerable economy to be made when substituted for multiple conduit runs.

Another big advantage of cable trunking is that when extra circuits are needed after completion of a contract, they are simply and easily provided by removing covers and inserting the extra cables.

Important features include :

- Maximum accessibility with neatness and simplicity.
- Exceptional strength and rigidity.
- Perfectly smooth interior with no projecting screws to damage the cable.
- All cover plates are flush fitting.
- Sleeves are an integral part of each unit, making the use of separate couplers unnecessary.

CB530
Steel Trunking



CB354
45° Bends



CB356
Stop Ends

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS for insertion in the following Friday's issue are accepted up to **First Post on Monday**, and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

THE CHARGE for advertisements in this section is 2/- per line (approx. 7 words) per insertion; **ONLY OFFICIAL AND GOVERNMENT ANNOUNCEMENTS CAN NOW BE DISPLAYED**—30/- per inch. Where the advertisement includes a Box Number this counts as six words and there is an additional charge of 6d. for postage of replies.

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

Original testimonials should not be sent with applications for employment.

Please address
your envelope..

**CLASSIFIED
ADVERTISEMENT DEPT.**

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF HESTON AND ISLEWORTH

Tender for 10,000-kVA Transformer

TENDERS are invited by the above Council for the supply, delivery, erection and setting to work of one 10,000-kVA Transformer, 21,000/11,000 volts, with on-load tap change equipment suitable for remote control.

The specification, form of tender and general conditions governing the contract may be obtained from the Borough Electrical Engineer and Manager, 11, Staines Road, Hounslow. One copy will be supplied free, but for additional copies a charge of 10s. 6d. each copy will be made.

Tenders, enclosed in plain sealed envelope endorsed "Tender for 10,000-kVA Transformer," must be delivered to the undersigned not later than 12 noon on the 13th December, 1946.

HAROLD SWANN,

Council House, Town Clerk.
Treaty Road, Hounslow. 3600

**COUNTY BOROUGH OF BURY ELECTRICITY
DEPARTMENT**

THE Corporation invite tenders for the supply and delivery of:—

1 1,250-kVA, 6,500/400/230-volt, 3-phase Transformer.
2 625-kVA, 6,500/400/230-volt, 3-phase Transformers.

Forms of specification, etc., may be obtained from the Engineer and Manager, Electricity Department, Market Street, Bury.

Tenders, endorsed "Transformers," are to be delivered to me not later than Monday, 9th December, 1946.

EDWARD S. SMITH,

Municipal Offices, Town Clerk.
Bank Street, Bury.
15th November, 1946. 3614

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

TENDERS are invited for the supply, delivery and erection of 132,000-volt Transmission Lines.

Copies of the tender documents may be obtained from the Consulting Engineers, Messrs. Merz & McLellan, 39, Northumberland Street, Edinburgh, 3, on or after 25th November, 1946, on sending to them cheque for £1 1s., which will be refunded on receipt of a bona fide tender.

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

T. LAWRIE,
Secretary.

16, Rothesay Terrace,
Edinburgh, 3.
15th November, 1946. 3626

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.

BOROUGH OF CLEETHORPES ELECTRICITY DEPT.

TENDERS are invited for 4 500-kVA Transformers. Specification may be obtained upon application to the Borough Electrical Engineer and Manager, Showrooms and Offices, Grimsby Road, Cleethorpes, Lincs.

No tender will be received except in a plain envelope marked "Tender, Transformers." The Corporation do not bind themselves to accept the lowest tender.

Tenders to be addressed to G. Sutcliffe Esq., Town Clerk, Council House, Cambridge Street, Cleethorpes, and delivered not later than December 20th, 1946.

G. SUTCLIFFE, Town Clerk.
3544

SITUATIONS VACANT

**LONDON AND HOME COUNTIES JOINT
ELECTRICITY AUTHORITY**

APPPLICATIONS are invited for the following appointments. The persons appointed will be required satisfactorily to pass an examination by the Authority's medical adviser, and to become subject to the Authority's Superannuation Scheme, which applies generally the provisions of the Local Government Superannuation Act, 1937, including the provisions of that statute relating to transfer values.

The following conditions of service, salaries, wages, etc., apply to the appointments:—

METER ENGINEER (Dorking): N.J.B. Schedule, Class F, Grade 8b (first year), at present £386 per annum. Duties include supervision of meter work, consumers' inquiries, correspondence, and two-part tariff contracts. Candidates must have had experience in a meter department of an authorised undertaker, and have passed the examination for associate membership of the Institution of Electrical Engineers, or an equivalent examination.

CONSUMERS' ASSISTANT (Dorking): N.J.B. Schedule, Class F, Grade 9 (first year), at present £358 per annum. Duties include dealing with consumers' inquiries regarding electrical apparatus and installations. Candidates must have passed the examination for associate membership of the Institution of Electrical Engineers, or equivalent examination.

SHOWROOM ASSISTANT (Dorking): Local Authorities' Administrative, etc., Services, National Scale, Miscellaneous Division, Grade II. Commencing salary £315 per annum, plus cost-of-living bonus, which is now £59 10s. per annum at age of 21 and over. Duties: To take charge of showroom and attend to consumers' inquiries. Candidates must have been educated to matriculation standard, and have had experience in authorised undertaker's showroom. Knowledge of electrical domestic apparatus is essential.

WIRING FOREMAN (Twickenham): District Council (No. 10) London Area, Electricity Supply Industry. Present wage 2s. 14d. per hour, plus a temporary addition of 9d. per hour. Candidates must have had extensive experience in electrical wiring work in domestic and small industrial premises, and be capable of controlling staff.

Applications, stating age, qualifications and experience, accompanied by copies of not more than three recent testimonials, must be sent to the District Manager of the Authority at 56, South Street, Dorking, or at 42, York Street, Twickenham, as the case may be, by not later than Friday, the 6th December, 1946. Canvassing, directly or indirectly, will be a disqualification.

A. L. BURNELL,
Clerk to the Authority.

5-6, Lancaster Place,
Strand, W.C.2.
15th November, 1946. 3621

LEYTON BOROUGH COUNCIL ELECTRICITY DEPT.

SENIOR SALES ASSISTANTS. Applications are invited for the appointment of Two Senior Sales Assistants (Male). Salary in accordance with the National Joint Board Schedule, Grade 9, Class F (at present £375 18s. per annum rising to £391 13s.). Note: The classification is likely to rise to G next year.

Applicants, who must be not more than 40 years of age at the time of the appointment, must hold the Electricity Development Association Domestic Electricity Salesmanship Certificate, and should have had experience in an Electricity Supply Authority's showroom, sale and hire of all types of domestic electrical apparatus. Sound knowledge of the principles of electric cooking, water heating, refrigeration and illumination required, and experience of practical installation work an advantage.

SHOWROOM ASSISTANTS. Applications are invited from young persons over 18 years of age for the appointment of Four Showroom Assistants at a salary commencing at £200 per annum, rising by annual increments of £15 to £250, plus bonus of £48 5s. per annum for females, or £60 per annum for males.

Applicants must have had a good general education, have a knowledge of salesmanship, and be capable of dealing promptly and efficiently with enquiries in the showroom. Accuracy with figures, clear handwriting, tactful and courteous personality essential.

The above appointments will be subject to the Council's conditions of service applicable to such appointments, and to the provisions of the Local Government Superannuation Act, 1937, and the successful candidates will be required to satisfy the Council's Medical Officer of Health as to their medical fitness. It will be a condition of employment that the successful candidates must be members of a trade union.

Applications, in the candidates' own handwriting, stating age, qualifications, experience, particulars as to membership of a trade union, and when able to take up duties, accompanied by copies of not more than three recent testimonials, to be sent to the Borough Electrical Engineer and Manager, Electricity Offices, Cathall Road, Leytonstone, E.11, not later than first post Monday, 22 December, 1946. Canvassing in any form will be a disqualification.

D. J. OSBORNE,

Town Hall, Leyton, E.10.
8th November, 1946.

Town Clerk.
3460

COUNTY BOROUGH OF BLACKPOOL
ELECTRICITY DEPARTMENT

Appointment of Lady Demonstrator

APPLICATIONS are invited for the above appointment at a salary of £300 per annum rising by annual increments to £336, inclusive of war bonus. Candidates must have had a good general education and hold a recognised diploma in domestic science and/or the E.A.W. Electrical Housecraft Diploma. They must be competent to take lectures and demonstrations and to advise consumers on the selection and use of electrical appliances of all types. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications, stating age, qualifications and full details of experience, accompanied by copies of not more than two recent testimonials, should be addressed to the Borough Electrical Engineer, Shannon Street, Blackpool, not later than 11th December, 1946.

TREVOR T. JONES, Town Clerk.

3579

BATTERSEA BOROUGH COUNCIL
ELECTRICITY DEPARTMENT

APPLICATIONS are invited for the position of Senior Meter Tester, salary Class G, Grade 9a, of the National Joint Board Schedule, at present starting at £360 3s. per annum.

Applicants must have passed the Ordinary National Certificate and be competent to test all types of D.C. polyphase and prepayment meters, both in the Class A testing station and *in situ*. They will be required to assist with the calibration of sub-standard instruments.

Applications, with copies of recent testimonials, should reach the General Manager and Engineer, Electric House, 204, Lavender Hill, S.W.11, not later than Friday, 6th December, 1946.

R. G. BERRY,

Town Hall,
Battersea, S.W.11.

Town Clerk.
3580

KENT COUNTY COUNCIL

APPLICATIONS are invited for the following appointments on the permanent staff of the Buildings Department:—

- Principal Engineering Assistant at a basic salary of £750 x £25 to £900 a year.
- Heating Engineering Assistant at a basic salary within the range £460-£510 a year.
- Electrical Engineering Assistant at a basic salary within the range £460-£510 a year.

The basic salaries are subject to a war addition at present £59 16s. a year. The posts are superannuable, and the successful candidates will be required to pass a medical examination.

Candidates for post (a) should possess a University degree in engineering and the Diploma of Membership of the Institution of Civil Engineers, and be able to prepare schemes for and advise upon all matters relating to heating, hot water, electrical, ventilation and laundry installations in county establishments.

Candidates for post (b) should be members either of the Institution of Civil or Mechanical Engineers (by examination), and have had experience in the mechanical equipment of buildings as regards heating, hot and cold water supplies, laundry plant, kitchen layouts and ancillary services.

Candidates for post (c) should be members of the Institution of Electrical Engineers (by examination), and must have had a sound practical training and experience in electrical engineering generally, particularly in electrical installation and contracting work, and be capable of designing electrical installations, preparing specifications, and supervising and testing the work in schools, hospitals, institutions and county buildings generally.

Application forms, obtainable from the County Architect, Springfield, Maidstone, must be delivered to him, duly completed, not later than the 7th December, 1946.

W. L. PLATTS,

Clerk of the County Council.

County Hall,

Maidstone.

13th November, 1946.

3610

CITY OF SALFORD ELECTRICITY DEPARTMENT

APPLICATIONS are invited for the following posts:—
(1) ASSISTANT MAINS ENGINEER. Candidates should have had technical training up to H.N.C. standard, and experience in the planning, operation and maintenance of 33-kV, 6.6-kV and 400-volt cable systems.

(2) ASSISTANT ELECTRICAL ENGINEER in the Substation Department. Candidates should have had technical training up to H.N.C. standard, and experience in the manufacture, installation, operation and maintenance of power station and substation switchgear, transformers and protective systems.

The salary offered for each post is in accordance with Grade 8a, Class H, of the N.J.B. Schedule, the present value being £455 per annum rising to £476 in four years.

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

All applications should be addressed to the City Electrical Engineer, Electricity Department, Frederick Road, Salford, 6, and must be received by Monday, the 2nd December, 1946.

H. H. TOMSON, Town Clerk.

3608

MID-SOUTHERN UTILITY COMPANY

Appointment of (a) Junior Assistant and (b) Tracer

APPLICATIONS are invited for the position of Junior Assistant to District Engineer, with salary and conditions in accordance with Grade 9a, Class G, N.J.B. Schedule. A Junior Tracer is also required.

Junior Assistant's experience must include H.T. and L.T. overhead and underground distribution systems; he should possess theoretical qualifications equivalent to the Higher National Certificate in Electrical Engineering and have some experience with an electricity supply authority.

The Tracer must have drawing office training and a good outside knowledge of mains records; salary will be based on age and experience.

The persons appointed will be required to pass a medical examination and duly qualify for the Company's Superannuation Scheme.

Replies, stating age, training and experience, mentioning whether married or single, should be forwarded to the Company at Victoria Road, Aldershot, Hampshire, within 14 days of the date of this advertisement.

3569

BOROUGH OF BEXLEY**Appointment of Two Junior Mains Assistants**

APPPLICATIONS are invited for the above positions from candidates with sound technical training and practical experience in an electricity undertaking.

The salary will be in accordance with N.J.B. Schedule, Class F, Grade 10. The appointment will be subject to the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications, endorsed "Junior Mains Assistants," giving age, details of education, training, positions held, present position and salary, together with copies of testimonials, should be sent to reach the Borough Electrical Engineer, 269, Broadway, Bexleyheath, not later than the first post Saturday, 14th December, 1946. Applicants should disclose whether to their knowledge they are related to any member of, or the holder of any senior office under, the Council. Failure to do so, or canvassing in any way, will disqualify.

ARTHUR GOLDFINCH, Deputy Town Clerk.
3635

BOROUGH OF WIMBLEDON ELECTRICITY SUPPLY DEPARTMENT**Appointment of Shift Charge Engineer**

APPPLICATIONS are invited for the position of Shift Charge Engineer for a non-selected generating station operating in parallel with the C.E.B. Grid. Applicants must have had experience with water tube boilers, turbines and usual auxiliaries.

Salary in accordance with N.J.B. Schedule, Grade 8, Class G, London area, at present £490 per annum. The position is subject to the Local Government Superannuation Act, 1937, and the selected candidate will be required to pass a medical examination.

Applications, giving details of training, experience, date of birth and particulars of any previous local government service, to be sent with copies of testimonials to the Chief Engineer and Manager, Electricity House, Durnsford Road, Wimbledon, S.W.19.

EDWIN M. NEAVE, Town Clerk.
3636

Town Hall,
Wimbledon, S.W.19.

BOROUGH OF RADCLIFFE ELECTRICITY DEPT.**Cable Joiner (Plumber)**

APPPLICATIONS are invited for the position of Cable Joiner in the above department. Wages and working conditions in accordance with the Schedule of the District Council No. 3, North-Western Area, Electricity Supply Industry, Zone A. Present rate 28.45d. per hour for a 47-hour week.

Applicants must have experience in high and low tension mains jointing, feeder pillar, network boxes and substation H.T. and L.T. boards. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and to a satisfactory medical examination.

Applications, stating age and experience and accompanied by copies of not more than three recent testimonials, endorsed "Joiner," should reach the undersigned not later than Tuesday, 3rd December, 1946.

H. A. FOX, Town Clerk.
3604

Town Hall, Radcliffe, Manchester.
November, 1946.

PAISLEY CORPORATION ELECTRICITY DEPT.**Meter Tester**

APPPLICATIONS are invited for the position of Meter Tester in a Class A Polyphase Testing Station. Applicants must be conversant with the testing and calibration of all A.C. single-phase and polyphase meters.

Wages and conditions of employment will be in accordance with the District Joint Industrial Council (No. 13) Area Schedule, present rate of wage, including war bonus, 47-hour week, is £5 7s. 8d.

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

Applications, giving age, details of training and experience, and accompanied by testimonials, must reach the undersigned, enclosed in an envelope, endorsed "Meter Tester," not later than 9th December, 1946.

DANIEL ROSS, A.M.I.E.E., F.I.E.S.,
Electrical Engineer and Manager.
3591

27, Blackhall St.,
Paisley.

BOROUGH OF BARKING ELECTRICITY DEPT.**Appointment of Substation Engineer**

APPPLICATIONS are invited for the position of Substation Engineer at a salary in accordance with the N.J.B. Schedule, Class F, Grade 6, commencing at £534 per annum.

Candidates must be Corporate Members of the Institution of Electrical Engineers or hold an equivalent qualification, and must have had technical and practical experience of all work connected with rotary, rectifier and static substations. The selected candidate will be responsible to the Borough Electrical Engineer for the design of substations, design of all equipment, protective and supervisory systems, preparation of estimates and forms of tender, responsible for equipping and maintaining all substations, responsible for substation fitting staff, together with any other work which may arise.

It is anticipated that a house owned by the Corporation will be available for the successful applicant. The appointment is subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications must be submitted on the appropriate form, which may be obtained from the undersigned, and should be returned, together with copies of three recent testimonials, by Thursday, 28th November, 1946, endorsed "Substation Engineer." Canvassing in any manner will be deemed a disqualification.

E. R. FARR, Town Clerk.
3470

Town Hall, Barking,
2nd November, 1946.

GET YOUR TRAINING FREE IN THE PROFESSION OF ENGINEERING

THE War Office is inviting applications for Engineering Cadships leading to 4 years' technical commissions in the Army. Free technical training in civil, mechanical, electrical or telecommunications engineering will be provided at technical colleges, together with the award of an adequate maintenance grant, the duration of courses varying from 9 months to 24 months.

Candidates must be medically fit; between the ages of 17½ and 20 years; be British subjects, the sons of British subjects and of pure European descent; and possess one of the following initial educational standards:—

Higher School Certificate, with Mathematics and Physics (or approved equivalent standard).
University Intermediate Examination in Science or Engineering.

Ordinary National Certificate in Mechanical or Electrical Engineering.
General School Certificate with Credits in Mathematics and either Physics or General Science.

Have completed first year Senior Engineering Course at a Technical College.

Have attended a Junior Technical School up to the age of 16 years.

Preference will be given to applicants who have had practical experience in workshops.

Application forms, together with full particulars of the scheme, may be obtained from the Under-Secretary of State for War, War Office (Dept. R.), A.G.22, London, S.W.1. Envelopes should be endorsed "Engineering Cadships."

3535

NORTHAMPTON COUNTY BOROUGH EDUCATION COMMITTEE**College of Technology**

APPPLICATIONS are invited for the post of Head of the Engineering Department at the Northampton College of Technology, which is recognised as a Grade I Department. Salary scale £800 x £25 x £750.

Applicants should hold an engineering degree and have had industrial and teaching experience; they should be competent to organise the electrical and mechanical work in the College.

Full particulars and forms of application may be obtained from the undersigned, to whom completed applications should be returned by the 30th November, 1946.

H. C. PERRIN, Chief Education Officer.
Education Office, Springfield, Cliftonville, Northampton.
3628

A genuine all-round Electrician required for permanent position with Central London contractor. Must be used to small and medium-sized jobs, and some knowledge of fluorescent lighting. Substantial bonus to really capable man.—Box 3581, c/o The Electrical Review.

METROPOLITAN BOROUGH OF ISLINGTON ELECTRICITY DEPARTMENT

A PPLICATIONS are invited from persons of not less than 21 years of age for the position of Female General Clerk (two vacancies).

The salary for the position will be in accordance with the General Division of the National Joint Council Scheme of Conditions of Service (£144-£264 per annum, according to age), plus temporary cost-of-living bonus, at present amounting to £48 2s. per annum.

Preference will be given to candidates having a general knowledge of filing systems and of the preparation of records for electricity supply. The appointments will be subject to the National Joint Council Scheme of Conditions of Service and to the provisions of the Local Government Superannuation Act, 1937, and the successful candidates will be required to pass a medical examination.

Applications, stating age and experience, and accompanied by copies of not more than three recent testimonials, must be sent to the Engineer and General Manager, 341/3, Holloway Road, N.7, so as to reach him not later than the 30th November, 1946. Candidates are required to disclose in writing whether to their knowledge they are related to any member or holder of any senior office under the Council. Canvassing, either directly or indirectly, will be a disqualification.

W. ERIC ADAMS.

Town Hall, Upper St., N.1.
November, 1946.

Town Clerk.
3534

A British firm of telephone manufacturers in India has vacancies for Telephone Engineers with experience in installation and maintenance of automatic and manual telephone exchange equipment. Applicants should be capable of carrying out exchange installation work on their own initiative under the general supervision of the Senior Installer. The post offers good prospects to young single men. Good salary with kit and travelling allowances and usual leave. Apply, giving full details of experience and age, to—Box 148, Dorlands, 18/20, Regent Street, London, S.W.1. 3456

A large group of electricity supply companies requires a Publicity Assistant to undertake production of advertising matter and preparation of articles for the Press, and for public relations work generally. Candidates should have had an engineering training and be in possession of some qualification recognised in that profession, as well as having experience of journalism. Experience of the electricity supply industry, although desirable, is not essential. Ability to talk to meetings, in addition to being able to present information in writing, would be an advantage. Salary in accordance with qualifications. Candidates should apply, stating their age and giving particulars of their training and experience, to—Box 3605, c/o The Electrical Review.

A vacancy exists in London Statistical Office of well-known electrical manufacturing company. Applicants should have good educational background, be quick at figures, and willing to accept a minor post with prospects of advancement, depending entirely on ability. Knowledge of the trade an advantage. Commencing £250 per annum.—Box 3603, c/o The Electrical Review.

A N old-established engineering company in the London area, employing approximately 1,000, requires a Works Manager with experience of works and production organisation and control of personnel. The prospects are excellent and a salary commensurate with the experience and qualifications of the selected applicant will be paid. The appointment is permanent and pensionable.—Box 3598, c/o The Electrical Review.

A RMATURE Winder for Merseyside area. Must have knowledge of A.C. and D.C. machines. One capable of organising, with prospects of taking charge of, a new department. Write, giving details of training and experience, together with copies of references, to—James McKenzie Ltd., Oxtow Road, Birkenhead. 3444

A RMATURE Winders required, experienced in A.C. and D.C. for repairs and rewinds. Apply with full details of experience to—Box 3613, c/o The Electrical Review.

A RMATURE Winders and Improvers urgently required. Top rates and good conditions.—Box 113, c/o The Electrical Review.

A RMATURE Winders and Improvers urgently required. Top rates and good conditions.—Collins Electrical Ltd., 22, St. Alban's Place, London, N.1. 85

A SSISTANT Chemist required for laboratory of electrical engineering works in London area. Exempt from or completed national service, age 20-25 years. Salary £250-£350 according to age and experience.—Box 3023, c/o White's Ltd., 72, Fleet Street, E.C.4. 3477

C ABLE Plumber-Joiners required for work in the Midlands. Apply to—B. I. Callender's Cables Ltd., 1, Nile Street, Birmingham, 15. 3545

C ABLE Representatives required on behalf of well-established independent rubber-insulated cable company at Manchester, Leeds, Birmingham, Newcastle and Glasgow. Applicants should possess adequate knowledge of these products, be capable of negotiating business for all sizes and types, and preferably have a good connection with industrial, municipal and colliery undertakings. Replies, which will be treated in strict confidence, should state age, experience and salary required, to—Box 3578, c/o The Electrical Review.

C ABLE-Making Engineer, familiar with manufacturing processes and machines for paper, rubber or plastic cables, offered permanent position with considerable scope in an established London firm. Knowledge of costing or estimating desirable. Good general education essential. State salary required, age and details in full.—Box 3495, c/o The Electrical Review.

C HIEF Electrical Engineer (plant construction) required by Messrs. Dorman Long & Co. to be responsible for the design and installation of the electrical equipment in their major plant development schemes. First-class technical qualifications essential, and previous experience in similar work desirable. Salary will be in line with qualifications. State approximate figure required. Apply, giving full particulars of training and experience, to the Chief Engineer, Dorman Long & Co., Middlesbrough. 3637

C HIEF Engineer. Transformers, small power, audio service requirements, London. Prospects for all-round sound man. State experience and salary required.—Box 9933, c/o The Electrical Review.

C HIEF Inspector required for West London works manufacturing audio frequency amplifiers, electronic equipment and precision instruments. Applicants must have previous experience similar capacity, theoretical knowledge equivalent to Higher National Certificate standard radio and electrical sections, and be capable of controlling personnel. Apply, giving full details past experience and salary required, to—Box 3625, c/o The Electrical Review.

C INEMATOGRAF Engineer required to take charge of installation and service for important distributors of sound film apparatus, Middle East. Attractive salary on three year contract can be offered to really first-class man with good technical knowledge and thorough experience of sound film equipment. Write full details experience, qualifications, age and present salary to—Box 3533, c/o The Electrical Review.

C LERICAL Assistant required for stores office. Must have good knowledge of electrical material.—London Electrical Co., 92, Blackfriars Road, S.E.1. 104

D ESIGNER-Draftsman, experienced in development of light electro-mechanical equipment, required immediately for electric control gear manufacturers in London. Part-time services would be considered. Apply, stating age, experience and salary required, to—Box 3548, c/o The Electrical Review.

D ESPATCH Manager required by manufacturing electrical engineers employing 1,000 workpeople, situated 20 miles west London; capable of controlling finished stock, packing, invoicing, and all forms of inland and overseas forwarding. Write, stating age, experience and salary required.—Box 3583, c/o The Electrical Review.

D RAUGHTSMAN, having first-class experience on direct current motors up to 50 h.p. Give details of experience, salary expected and when available to Personnel Manager (Birmingham Area).—Box 3597, c/o The Electrical Review.

D RAUGHTSMEN. Applications are invited from Senior and Junior Switchgear Draftsmen with experience of general switchboard work, high and low voltage, control panels, diagrams, etc. Applicants should state age, experience and salary required to—Employment Officer, Messrs. Johnson & Phillips Ltd., Victoria Way, Charlton, S.E.7. 3443

D RAUGHTSMEN required in N.E. London area. Two Seniors, with sound mechanical knowledge and experience in E.H.T. outdoor switchgear of the oil minimum type. One Senior with experience of steelwork, cable ducting, overhead lines, etc., for outdoor switching stations. One Intermediate with experience of control boards, indoor cellular gear and kiosks, knowledge of diagrams an advantage. Good salary offered to suitable men. Apply, stating age and experience.—Box 3243, c/o The Electrical Review.

D RAUGHTSMEN, preferably with telecommunications experience, required by large firm in the Midlands. Maximum salary £350 plus cost of living bonus. Write, giving details of experience, age, and salary required.—Box 11, c/o The Electrical Review.

DRAUGHTSMAN-Designer with electrical and mechanical experience in the design and production of electric heavy duty cooking apparatus. State experience and salary required.—Box 3593, c/o The Electrical Review.

DRAUGHTSMEN required by switchgear engineers. Experienced in contract work, protective gear diagrams or design. Applications in writing, with full particulars, to—Ferguson, Painin Ltd., Manchester, 11. 86

DRAUGHTSMEN (Senior) required for large A.C. and D.C. machines, including turbo and waterwheel alternators, also for medium type A.C. and D.C. machines. Applications from men with suitable technical qualifications and good general mechanical drawing office experience will be considered. Salary dependent upon qualifications and experience. Apply, giving full details of qualifications, experience, age and salary, to Chief Draughtsman, Engineering Drawing Office, The General Electric Co. Ltd., Witton, Birmingham, 6. 3576

ELECTRICAL Engineer required by established British company in India. Age 22 to 28. Must hold good degree in technical science or electrical engineering with two years' practical experience with an approved British manufacturer. Preference given to man having experience with switchgear manufacture up to 11 kV and with switchgear estimating experience. Four years' agreement. Salary 800 rupees per month for first year, increasing 50 rupees per month yearly, plus allowance 150 rupees. First-class passages and six months' leave from India if re-engaged after termination of agreement.—Box 3536, c/o The Electrical Review.

ELECTRICAL Manufacturers require Electrical Engineer with wiring contracting, estimating and drawing office experience, with a view to becoming Illuminating Engineer covering Scotland. Age 25-30. Write, stating experience, age and salary required, to—Box 3618, c/o The Electrical Review.

ELECTRICAL Tester for fractional horse-power motors.—Box 3442, c/o The Electrical Review.

ELECTRICAL Wholesalers. Two Junior Storekeeper/Backers for general warehouse duties, age 16/19 years, or those exempt from military service. Some experience an advantage, but not necessary. Apply in writing to—Messrs. Young & Wildsmith Ltd., 35, Little Russell Street, London, W.C.1. 3567

ELECTRICIANS required for screwed conduit work in North of England and Scotland, also one Foreman Joiner. Only first-class men need apply.—Neale & Partners Ltd., Electrical Contractors, Exchange Buildings, Quayside, Newcastle-upon-Tyne, 1. 9950

ELECTRICIANS wanted for London Contractors, must have thorough knowledge of trade. Good prospects to live men. Telephone for appointment CUN. 2401. 3640

ELECTRONIC Engineer required for development work on industrial radio frequency apparatus in connection with machinery and processes for the shoe and allied trades. Candidates must have a good technical education, preferably to degree standard, and have had experience in the design of radio frequency circuits. Applications should be made to—The Manager, Experimental Dept., The British Union Shoe Machinery Company Limited, Belgrave Road, Leicester. 3572

ENGINEER experienced in erection of large alternators, transformers and switchgear required for India. Single man under 35 preferred. Permanent pensionable post with good salary and prospects for suitable man. Applications, with full details experience, to—Box 3574, c/o The Electrical Review.

ENGINEER required for overhead line section (traction) of chief electrical engineer's department of a main line railway. Age up to 35 years. Minimum qualification. Higher National Certificate and some works experience. Civil construction works experience desirable. Appointment for probationary period, during which training would be given in design, layout, etc., of 1,500-volt D.C. overhead contact line equipment, with prospect of permanent appointment if satisfactory.—Box 3531, c/o The Electrical Review.

ENGINEERS and Draughtsmen are invited to apply to a large electrical engineering firm in the Midlands which has vacancies in the switchgear department for Technical Sales, Contract, Costing and Design Engineers; also experienced Technical Engineers capable of handling large projects for generation, transmission and distribution. Vacancies also exist for Draughtsmen for circuit diagram and general work.—Box 69, c/o The Electrical Review.

ESTABLISHED firm of electrical machinery repairers require an Assistant to the General Manager. Candidates, age 33/35 years of age, are invited to submit applications, stating age, qualifications, technical, practical and executive industrial experience, with progressive details of previous positions. State salary required.—Box 3537, c/o The Electrical Review.

ESTIMATING and Supervisory Engineer required. Previous experience essential. Also able to prepare specifications and estimates, and carry contracts through to completion. Write, stating age, experience and salary required, to—Contracts Dept., Giles Electrical Engineers) Ltd., Victoria Colonnade, Southampton Row, W.C.1. 3619

EXPERIENCED Contract Engineers to prepare and produce estimates for electrical contracting installations in factories and other buildings in India. Good general electrical engineering background essential. Single men, preferably under 30 years of age. Write—Staff Manager, General Electric Co. Ltd., Magnet House, Kingsway, W.C.2. 3645

EXPERIENCED Practical Photographic Processor or Photo-printer required, female, age 25-35. Experience in Barco, Photostat and Blue printing processes an advantage. Opportunity to take charge of section. Permanent position. Write, stating age, experience and salary required, to—Staff Office, British Insulated Callender's Cables Ltd., Krith Works, Belvedere, Kent (Ref. SR/11). 3478

FIRST-class Electrician wanted, used to installation work. Permanent post for right man. Apply—R. J. Kemp & Co. Ltd., Coalville, nr. Leicester. 9926

FIRST-class man required to take charge sales of small group of companies, H.Q. London. Goods manufactured include thermostats, transformers, fluorescent, electronics, furniture, metal work, small tools. Expansion into other fields desired. State experience. Excellent prospects for right man.—Box 9934, c/o The Electrical Review.

FOREMAN wanted by leading firm of cable manufacturers for copper wire mill, including pickling plant and annealing ovens. Applicants should be between 30 and 40 years of age and must be conversant with all modern methods and fully capable of taking complete charge of plant, including die room for the refinishing of synthetic and diamond dies. The position, which is a staff appointment, is progressive, and superannuation benefits are available.—Box 3390, c/o The Electrical Review.

FULLY experienced Female Tracer required, age 25-30. Write, stating age, experience and salary required, to—Staff Office, British Insulated Callender's Cables Ltd., Erith Works, Belvedere, Kent (Ref. SR/12). 3476

JIG and Tool Draughtsman, preferably with experience of automatic screw machines cam design. State experience and salary required.—Box 3592, c/o The Electrical Review.

JUNIOR Draughtsman required by London manufacturers of light electro-mechanical equipment. State experience, age and salary required to—Box 3549, c/o The Electrical Review.

JUNIOR Engineer wanted for London electrical contractor's office. Estimating experience essential. Write, stating age, salary.—Box E.630, Scripps, South Molton Street, W.1. 3568

LADY Assistant required for clerical duties in electrical showroom. Write, stating age, previous experience and salary required, to—Sales Dept., Giles (Electrical Engineers) Ltd., 11, Victoria Colonnade, Southampton Row, W.C.1. 3620

LADY or gentleman required as Assistant to Export Manager by City firm. Must be good at figures. No Saturdays. Write—Box "Q.S." c/o 95, Bishopsgate, E.C.2. 3570

LARGE firm of electrical engineers and contractors require, for India, Engineer with wide experience design and layout high-voltage switchgear and transformer systems. Experience required in handling large plant contracts. Permanent pensionable post with excellent prospects and home leave. Applications, with full details experience, to—Box 3575, c/o The Electrical Review.

LONDON County Council. Electro-medical Technician required for X-ray department of Lambeth Hospital, Brook Drive, S.E.11. Candidates must be experienced in the construction of electro-medical or X-ray apparatus or scientific instruments. Rate of pay 70s. a week, rising by annual increments of 5s. a week to 100s. a week, plus a special allowance of 20s. a week and cost-of-living addition of, at present, 30s. a week. Preference given, other things being equal, to persons registered under the Disabled Persons (Employment) Act, 1944. Apply for form to—The Medical Officer of Health, Public Health Department (S.D.3), The County Hall, Westminster Bridge, S.E.1 (3021). 3577

MANAGER or Manageress of good appearance and personality required for high-class electrical and radio retail and art goods business, 30 miles from London. Must be thoroughly capable and able to take full control. Write with particulars, stating age, experience and salary required.—Box 115, c/o The Electrical Review.

METER Mechanic. Applications are invited for the position of Meter Mechanic from craftsmen having suitable experience in repairing and recalibrating all types of watt-hour meters, summation equipment and time switches. Conditions of employment and wages are in accordance with No. 9 Area, J.I.C., the present wage being £5 9s. 8d. per week of 47 hours, including war bonus. The appointment in the first instance will be temporary. Applications, with copies of three recent testimonials, should be addressed to the Borough Electrical Engineer, Town Hall, Tunbridge Wells, by 2nd December, 1946. 3639

OPPORTUNITY for Distribution Engineer. Well-known firm of electrical contractors desirous of extending their organisation to include large overhead line contracts have opening for young engineer, age preferably not over 35, but able to handle all design, and thereafter control construction in the field, all on a sound technical and commercial basis. Good opportunity, salary £600 to £800 per annum, depending on qualifications and experience. Apply, giving full details, with copy of testimonials and salary desired, all in strict confidence, to—Box 3595, c/o The Electrical Review.

REPRESENTATIVE required for Birmingham area by company with established connections in plastic sections, cables, wires and flexible cords, etc. Essential qualifications are selling ability, some electrical knowledge, and own car. Salary, expenses and commission, based on qualifications. Applications, with full details of past experience and education, should be made in the first instance to—Box 3606, c/o The Electrical Review.

REQUIRED for Barbados, an Engineer to supervise the installation of plant in small sugar factories. Must be able to act on his own initiative and to talk intelligently about quotations. Single man under 30 years of age.—Box 3646, c/o The Electrical Review.

REQUIRED, for extensive development programme. Electrical Draughtsmen with experience in steelworks H.T. and I.T. distribution schemes, substation design and layout, A.C. and D.C. heavy industrial control gear. Draughtsmen with similar experience in other industries would be considered. Apply by letter, stating age, experience and salary required, to—Chief Draughtsman, Dorman Long & Co. Ltd., Central Engineering Dept., Britannia Works, Middlesbrough. 41

SENIOR Design Draughtsman required with experience of automobile or aero electrical equipment. Salary according to qualifications. Apply—Personnel Dept., Simms Motor Units Ltd., Oak Lane, East Finchley, N.2. 3627

SUDAN Government Posts and Telegraphs require One Assistant Engineer (Aeradio) and Two Engineering Inspectors (Wireless) for service in the Sudan, age 28-35, to supervise installation and maintenance of radio transmitters up to 20-kW aerial power, receivers (including high and low-frequency direction finding apparatus), studio gear and Diesel-alternators, and to take part in the training of Sudanese. Applicants must have had wide practical experience of modern high and medium power radio transmitting and receiving apparatus, test equipment, studio gear, and modern aerial arrays. Knowledge of Diesel-generating sets and A.C. distribution advantageous. City and Guilds Certificates in radiocommunications desirable. Applicants for the post of Assistant Engineer (Aeradio) will also be required to have had wide practical experience of modern high-frequency direction finding equipment and radio aids to navigation (Radar, etc.). The pensionable salary scale applicable is £E.252-276-300-324-360-396-480-540-600 (all biennial increases), £E.660 (triennial increase). Efficiency bar at £E.480. If efficiency bar passed, scale extended by two biennial and one triennial increases of £E.60 to £E.780 maximum. Appointment will either be on probation for permanent pensionable service or on Provident Fund Contract (with security for 7 years after satisfactory completion of probationary period of 2 years) at a starting rate according to age, experience and qualifications. Starting salaries proposed: £E.396 for Engineering Inspectors (Wireless) and £E.432 for Assistant Engineer (Aeradio), but higher starting salaries might be offered to specially well qualified candidates. If appointment is on Provident Fund Contract, the above rates will be increased by about 17%. Outfit allowance of £E.40 is payable when contract is signed, provided appointment is at a salary not exceeding £E.600 per annum, or £E.700 on Provident Fund Contract. Cost-of-living allowance equal to 35% of salary, subject to a maximum of £E.15 per month, is now payable (£E.1 = £1 0s. 6d.). Strict medical examination. Free passage on appointment. At present there is no income tax in the Sudan. Fuller information: Papers containing fuller information for candidates are obtainable from the Sudan Agency in London, Wellington House, Buckingham Gate, S.W.1. Mark envelopes "Aeradio" or "Wireless." 3540

SENIOR Draughtsmen required in the Glasgow area to specialise on the design of modern electric cookers. Applications, stating qualifications, salary required, etc., to—Box 3588, c/o The Electrical Review.

SKILLED Armature Winder required for India. £45 per month plus ten per cent. of Bombay concern's profit. Fare paid out and home after four-year period. Must be single man with full winding tradesman apprenticeship.—Box 3191, c/o The Electrical Review.

STOREKEEPER, experienced. Used to handling electrical stores and accustomed to the control of staff. Apply in own handwriting stating age, experience and wages required.—Buckrose Light & Power Co. Ltd., Electricity Buildings, Driffield, Yorkshire. 3617

STOREKEEPER required (permanency) by old-established London wholesalers in Victoria district. Applications will be treated confidentially and should state age, experience and salary required to—Box 3573, c/o The Electrical Review.

SUPERVISORS. Two Supervisors required, used to dealing with enquiries, planning and estimating for all types of commercial installation. Applications are invited from suitable men to work on salary and profit-sharing basis. Apply in first instance by letter to—Neale & Partners Ltd., Exchange Buildings, Quayside, Newcastle-on-Tyne, 1. 9923

SWITCHGEAR Draughtsmen required. Knowledge of layouts and wiring diagrams. London area. Experience, details, etc., to—Box 3489, c/o The Electrical Review.

TECHNICAL Sales Engineer required by electric control gear manufacturers in London. Must have sound electrical knowledge, coupled with commercial experience. Reply, stating age, experience and salary required, to—Box 3547, c/o The Electrical Review.

TECHNICAL Sales Engineer required by London company to develop the sale of high-grade insulating material in this country. Applicants should have wide practical and selling experience and preferably possess a knowledge of French. Send full details training, qualifications and experience and remuneration required to—Box 3360, c/o The Electrical Review.

TEST Room Assistants required (North London) for wiring and testing of precision electrical instruments.—Box 3543, c/o The Electrical Review.

THE Electrical Fair Trading Council invites applications for the appointment of full-time Executive Official. Applicants should be not less than 30 years of age, and preferably possess a comprehensive knowledge and experience of the trading structure of the electrical industry. Apply in writing, giving full information as to age and experience, to—The Chairman, Electrical Fair Trading Council, Kern House, Kingsway, W.C.2. 3557

TRANSFORMER Design Engineer required, experienced in all types up to 500 kVA. Promising and highly paid position. Write, stating age and experience, to—Brentford Transformers Ltd., Windmill Road, Brentford, Middlesex. 3520

VACANCY for person to take charge of Electrical Assembly and Fine Coil Winding. Applications only considered from persons with previous experience. Able to control male and female labour. Progressive position, good salary and permanency to right man. Manchester district.—Box 3538, c/o The Electrical Review.

VACANCY for experienced Foreman for light electrical assembly and coil winding. Good prospects and salary to right person. Manchester district.—Box 3539, c/o The Electrical Review.

WANTED in London, Senior and Junior Mechanical Draughtsmen, preferably with power station layout experience. Progressive appointment and permanency if suitable. Write, stating age, experience and salary required, to—Box No. 7450, c/o A. W. Brown, 37, Titchell Street, S.W.1. 3594

WIDE Strip Mill. Electrical Engineer required for specification layout and installation of power distribution, substations, lighting, also electrics in plant, including tandem mills and electric furnaces. Permanent position for suitable man.—Northern Aluminium Co. Ltd., General Engineering Department, Banbury. 3452

WORKS Manager with experience radio and electrical instrument manufacture is offered permanent post with good salary and prospects.—Box 3429, c/o The Electrical Review.

WORKSHOP Assistant wanted for research laboratory of radio firm in S.W. London area, for construction of electronic apparatus. Good mechanical and electrical experience essential. Write, giving full details of past experience, to—Box 375, L.P.E. 110, St. Martin's Lane, W.C.2, quoting reference "M.1." 3550

YOUNG Engineers required for investigational and development work in connection with H.V. insulation in the research department of a North-West switchgear factory. Basic training in H.V. laboratory technique, preferably with Higher National or ordinary B.Sc. academic qualifications. Apply, stating age and salary required.—Box 3647, c/o The Electrical Review.

APPOINTMENTS FILLED

Disatisfaction 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

ABLE Electrical Engineer desires change. Experienced planning and installation plant and wiring, test and overhaul electrical equipment. Sound technical education, some sales experience. Good references.—Box 9892, c/o The Electrical Review.

ADVERTISER with many years of experience in design, manufacture and selling of H.T. and L.T. joint boxes, pillars, etc., desires change. At present holding important position. Live connection throughout G.B.—Box 9941, c/o The Electrical Review.

A.M.I.E.E. (32), seeks responsible position in or near London with a growing firm. Flair for compiling advertising literature, technical letters, and replying speedily to customers' correspondence.—Box 9864, c/o The Electrical Review.

AN Electrical Installation Engineer and Draughtsman wishes to open negotiations for a permanent executive appointment in London, Herts. or Beds. Preferably in surveyor's dept. of organisation controlling hotels, multiple stores, etc., or with insurance co., manufacturers or contractors. Sound technical and practical background, 25 years' experience in all branches of contracting and maintenance. Well versed in building and allied trades, and in general engineering. Minimum salary £800 p.a.—Box 9871, c/o The Electrical Review.

AUTOMATIC Telephone Equipment Installer, 20 yrs.' experience P.O. and priv. contracts with leading firm, install. and maint., desires post, age 47.—Box 9929, c/o The Electrical Review.

EDUCATION and Training. Young man, 24, college trained 43 years' Assistant Apprentice Supervisor at a Midland engineering works (400 apprentices, all grades), requires similar post to extend experience, preferably in South. Willing to initiate scheme if necessary.—Box 9856, c/o The Electrical Review.

ELECTRICAL and Mechanical Engineer, 26 years power station, 6 years' war service, warrant officer artificer, at present electrical maintenance factory, requires change.—Box 9874, c/o The Electrical Review.

ELECTRICAL Engineer, A.M.I.E.E., age 31, 8 years' experience in light electro-mechanical engineering, including design, development, production problems, etc., also acted for two years as technical representative. Previous experience in heavy engineering. Seeks position, for preference, in an administrative or executive capacity.—Box 9847, c/o The Electrical Review.

ELECTRICAL Engineer, Grad. I.E.E., works apprenticeship with large electrical concern, 3 years' design and estimating experience, seeks experience in operation, installation, layout of electrical equipment in large plant, Birmingham district.—Box 9893, c/o The Electrical Review.

ELECTRICAL Engineer (31), degree standard, specialising in the design and manufacture of all kinds of electrical instruments and allied equipment, offers his services, full-time or in an advisory capacity.—Box 9951, c/o The Electrical Review.

ELECTRICAL Fitter, maintenance repair, desires permanent post, good references, East London or South Essex areas.—Box 9898, c/o The Electrical Review.

ELECTRICAL Supervisor, fully qualified, desires progressive position, London, South Essex areas preferred. Full details from—Box 9905, c/o The Electrical Review.

ELECTRICIAN, disengaged, all systems wiring, power, maintenance.—H., 150 Windmill Rd., Brentford. 9922

ELECTRICIAN, general wiring, maintenance, house or factory.—J. Creedy, 182, Colney Hatch Lane, N.10. 9931

ELECTRICIAN wants job, 30 years' experience all systems, anywhere, charge or otherwise.—E., 13, South Vale, S.E.19. 9872

ELECTRICIAN-Fitter, 25 years' all-round electrical and mechanical experience A.C./D.C. power wiring, motors, erection mechanical-electrical apparatus and machines, good refs.—Box 9942, c/o The Electrical Review.

ELECTRICIAN, good education, 30 years' first-class experience installations, all systems, maintenance, industrial and domestic, especially lighting, capable giving intelligent supervision, estimating, etc. Small contractor, London area preferred.—Box 9944, c/o The Electrical Review.

ENGINEER, age 38, with 16 years' experience in administrative posts, desires situation as Works Manager. Wide experience in all classes of engineering, planning and rate fixing. Special study made of mass production methods jigs and tools. General electrical knowledge. London area preferred.—Box 9910, c/o The Electrical Review.

ENGINEER, A.M.I.E.E., Representative with 12 years' contacts in Birmingham and Midland Counties, desires change; details.—Box 9865, c/o The Electrical Review.

EXECUTIVE (39) seeks progressive permanency, preferably Southern Counties, South Coast or London area. Sound technical and commercial knowledge, works and D.O. training, extensive supervisory experience, fully conversant sales and purchasing of electrical equipment and raw materials. Specialised in production and inspection of rotating machines and cables. Moderate knowledge French and Spanish.—Box 9928, c/o The Electrical Review.

EXPERIENCED Electronic, Radio, Television, Research Development and Circuit Designer seeks post with prospects. Fully qualified engineer, first-class references.—Box 947, Aldridge, 1 Whitefries St., London, E.C.4. 3539

EXPERT Plumber-Joiner desires position, must be plenty of overtime.—John George Smith, 141, Edgware Road, The Hyde, Hendon, N.W.9. 9948

LONDON General Mains Foreman, age 40, desires change to post where initiative and organisation would be recognised. Good practical and technical training. Experienced in super-tension, H.T., L.T., A.C. and D.C. networks and substations, change-over and over-heads. Fault location. Used to handling large cable gangs, jointers and departmental transport. Present salary £390 p.a.—Box 9878, c/o The Electrical Review.

LONDON Sales Engineer wishes to represent manufacturer London and the south, full time; 20 years' experience selling A.C. and D.C. machines, control gear, rectifiers, car and telephone; A.M.I.E.E., public school and university training; excellent references.—Box 9904, c/o The Electrical Review.

POSITION required by ex-R.A.F. communications N.C.O., 24. H.S. cable and wireless operating, point-point, air ground, etc.; teleprinting; maintenance radio equipment; laboratory experience; holds Xmitting licence; ed. matric, contg. studies.—BM/HWMO, London, W.C.1. 9952

PRODUCTION Engineer, Grad. I.P.E., A.M.I.E.E., seeks appointment as Works Manager, Production Manager or similar post. Sound industrial training, experienced in production electric motors, domestic appliances, aero engine components. Keen, energetic, possessing initiative and administrative ability. Available immediately.—Box 9918, c/o The Electrical Review.

RADIO and Electrical Engineer (32), Higher National Certificate both radio and electrical engineering; 6 years' apprentice in electrical installation and maintenance; 2 years' small electric motor manufacture and repair; 1 year corporation electricity dept. as technical adviser in generating station; 8 years with old-established firm as manager of dept. manufacturing radio and electrical equipment for H.M. ships. Holder of P.O. transmitting licence. Keen radio experimenter.—Box 9851, c/o The Electrical Review.

RESEARCH Laboratory Mechanic, sound practical knowledge and able to make electronic devices from theoretical circuit diagrams, desires change of position, London area.—Box 9859, c/o The Electrical Review.

SALES Executive (38) desires responsible technical sales appointment with large progressive firm of electrical engineers in Midlands; manufacturers of motors, switchgear, transformers, etc., but other equipment considered. High qualifications, considerable experience, selling ability, organiser, publicity, etc. Position must be of managerial capacity with good salary in keeping with applicant's status.—Box 9921, c/o The Electrical Review.

SENIOR Buyer, large radio and light current electrical engineers, seeks change. Wide experience, engineer, organisation and control purchasing dept. Plastic materials specialist.—Box 9949, c/o The Electrical Review.

STOREKEEPER—Trade Counter Salesman requires position. Long experience electrical trade.—Box 9927, c/o The Electrical Review.

WORKS Manager desires change, accustomed complete charge extensive factory producing all classes paper cables, including 33 kV, wire-drawing experience, familiar manufacture V.I.R. cables.—Box 9930, c/o The Electrical Review.

WORKS Executive, A.M.I.A. (42), seeks responsible position. Experience of works management, organising, production planning and control, supervising, time study and personnel administration as applied to all types of precision electrical measuring instruments and radio. Good disciplinarian and used to handling labour to obtain co-operation for best results.—Box 9854, c/o The Electrical Review.

WORKS Manager, M.I.E.E., M.I.P.E.E., 25 years' experience production and administration, experience radio, television (and components), domestic appliances, seeks similar position, London area. Energetic and efficient organiser, good administrator. Excellent references.—Box 9911, c/o The Electrical Review.

WORKS Stores/Showroom. Applicant requires progressive post. Apprentice trained in installation work. Had thorough training in stores managing, keen, energetic, conscientious, capable, and smart appearance. Any county north of a line Bristol-London. Age 33. Refs.—Box 9943, c/o The Electrical Review.

YOUNG Electronic Engineer, B.Sc. (Eng.), Grad.I.E.E., 3 years in research establishment, requires post near London.—Box 9879, c/o The Electrical Review.

AUCTION NOTICES

UNDER Sheriff's Execution: Belton Lane Works, Grantham, Lincs. To be sold by auction by Messrs. Golding, by instructions from W. R. Bolton, Esq., Sheriff's Officer, on Wednesday, December 11th, 1946, and days following, if necessary, at 11 a.m. precisely on each day, upon the premises of Coverley-Kendall Ltd., Belton Lane Works, Grantham. Modern Machine Tools, Plant, General Works, Canteen and Office Equipment, Stock-in-trade, etc., used in the manufacture of Radio Frequency Heaters, etc. Particulars (when ready) from the Auctioneers' Offices and Estate Sale Rooms, 38, Westgate, Grantham (Phone 44).

FOR SALE

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

A considerable quantity of Copper Wire, enamel and enamel and cotton, paper, silk, etc., also double wound natural silk covered. Available in bulk. Send for price list.—Box 67, c/o The Electrical Review.

A Cooksley & Co. Ltd. offer large selection of used Electric Motors, A.C. and D.C. Write—21/25, Tabernacle Street, London, E.C.2 (Monarch 3357/58). 46 number of Dynamos from 10-80 kW. 110 v. and 220 v., for belt drive or coupling of various descriptions available.—The Electroplant Co., Wembley, Middx. 3643

A quantity of new 7/029, 7/020 V.I.R. Twin Cable.

A Offers to—Imperial Lighting Co., Pocock Street, London, S.E.1. 9917

A Superior Streamlined Toaster in one-piece die-cast aluminium, with attractive mirror finish. Price 39s. 6d. subject. Immediate delivery. Sample, 31s. Cash with order.—Metropolitan Distributors Ltd., Truro. 94

A ABOUT 25,000 yards unused 1036 paper-insulated, 4-core, lead covered (Henleys) Cable, in 50-yard coils. To be disposed of in one lot at 33s. 4d. per hundred yards, plus carriage.—J. & F. Stone Ltd., 53/65, Worship Street, London, E.C.2. 3492

A C. and D.C. House Service Meters, all sizes, quarterly and prepayment, reconditioned, guaranteed one year. Repairs and recalibrations.—The Victoria 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 2278-9). 102

A C./D.C. 5-valve Superheterodyne Sensitive 3-wave Band Receiver. Excellent tone. Attractive modern cabinets in "Plastele" or polished wood, £16 16s. Usual trade terms and facilities. Early delivery. Trade only.—Morgan, Osborne & Co. Ltd., Southview Road, Warringham, Surrey. 110

A C. Motors, 1/75th h.p. to 5 h.p., all voltages. Also D.C.—The Johnson Engineering Co., 319, Kennington Road, London, S.E.11. Telephones, Reliance 1412/3. 57

A LMOST new Diesel Generating Set, built 1944, 6 cyl., vert., cold start, on bed, coupled to dynamo, 70 kW, 220 v., 1,000 r.p.m. Latest design.—Box 3842, c/o The Electrical Review.

A APPROX. 750 Metal Coolicon Shades, slightly damaged. South London.—Box 3565, c/o The Electrical Review.

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MOTOR Generator Sets and Convertors, all sizes and voltages from $\frac{1}{2}$ 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 3” Bench Drilling Machine, 13 speeds, £15 5s.—John E. R. Steel, Clyde Mills, Bingley. Phone 1066. 51

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NEW or Secondhand A.C./D.C. Motors can be supplied from stock or at short notice. Specialists in rewinds and repairs. Send your requirements to—John Phillips & Co. (Electric), 31, Fortune Green Road, N.W.6 (Hampstead 8132). 3584

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ROTARY Converters, 200-kW, 6,600/3/50 input, 230 volts, 2-wire D.C. output, complete with Transformer and switchgear, seen running in Liverpool. 2,000-kW, 6,600/3/50 input, 418/462 volts, three-wire D.C. output, complete with transformers, starting panels, D.C. machine panels. First-class condition. Two sets available.—Stewart Thomson & Sons (Liverpool) Ltd., Port Road, Seaforth, Liverpool, 21 (Bootle 2697); or Dacre House, Victoria Street, London, S.W.1 (Abbey 4017). 72

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3 PEEBLES La Cour Motor Converters. Input 6,000/5,600 volts, 50 cycles A.C., 3-phase. Output, 440 volts D.C., 500 kW, 500 r.p.m. In good running order, these can be seen at Bayliss, Jones & Bayliss Limited, Victoria Works, Wolverhampton. 3638

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

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MOTORS and Starters, 1 h.p., 2,880 r.p.m.; 1½ h.p., 2,910 r.p.m.; 2 h.p., 710 r.p.m.; 4 h.p., 1,425 r.p.m.; 6 h.p., 1,425 r.p.m.—J.W., C.S. Ltd., Staffa Works, Staffa Road, E.10. 3441

NEW or good condition secondhand copy of "Electric Train Lighting," by Coppert, published by Pitman in 1921, required. Please write—Newton Brothers (Derby) Limited, Alfreton Road, Derby. 3561

NEW or reconditioned 220-v. Compound D.C. Dynamo for direct coupling to 100 h.p. Diesel engine running at 600 r.p.m. Full particulars, including age, maker's name and main dimensions, to—Martinfield Ltd., 8, The Lickey, Rednal, Worcestershire. 3453

NON-Ferrous Strip urgently wanted. Commercial Brass in coils: 360 lbs. 1" x 18 s.w.g.; 70 lbs. 1½" x 18 s.w.g.; 900 lbs. 2½" x 18 s.w.g.; 80 lbs. 9/32" x 20 s.w.g.; 100 lbs. ¾" x 20 s.w.g.; 100 lbs. 1" x 21 s.w.g. Hard Spring Phosphor Bronze in coils: 14 lbs. 1" x 24 s.w.g.; 20 lbs. 5/16" x 26 s.w.g.; 220 lbs. ¾" x 28 s.w.g.—Box 3596, c/o The Electrical Review.

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PLATING Generator 3,000 amps, 12 volts, preferably complete with exciter and slipring driving motor with starter etc.—M. E. D. Ltd. 19/21, Farringdon Street, E.C.4. Central 9042. 3612

REQUIRED for export, 500 dozen Switch, 5 amps., 220 volts, bakelite cover, brown on white base, or brown on brown, 20,000 yds. 1/644" Lead Alloy Sheathed Twin Flat Cable, conforming to C.M.A. specifications. Please communicate with—E. S. Mashal, 86, Alie Street, E.1 (Telephone Nos. Royal 4405/6). 3582

REQUIRED urgently, six or less 5 or 6-h.p. Totally Enclosed Motors, 3-phase, 400 volts, 50 cycle, 3,000 r.p.m., new or reconditioned, 1,500 r.p.m. considered.—Box 3564, c/o The Electrical Review.

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WANTED D.C. and A.C. ball-bearing Motors. Full details to—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 29

WANTED, Rotary Converters, any size.—Universal, 221, City Road, London, E.C.1. 22

WANTED urgently, any quantity Electrical Steel Sheet in stallo or similar quality, .020" or .014" thick.—Box 3622, c/o The Electrical Review.

WANTED urgently, Round Refractories suitable for boiling rings, required for export.—Box 3623, c/o The Electrical Review.

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1 4-dial Wheatstone Bridge, or P.O. Box complete with Galvanometer.—Box 3586, c/o The Electrical Review.

3 10-12-h.p., 415-volts, 3-phase, A.C., 720-r.p.m. Slipring Electric Motors, with starting gear.—Box 9947, c/o The Electrical Review.

5 and 15-amp. Single-pole Skeleton Kick Switches—Rowe Bros. & Co. Ltd., Pall Mall, Liverpool, 3. 3312

7½ h.p. Squirrel Cage Motors, foot or flange mounted, 3-ph., 50 cycles, 960/1,440 r.p.m., 220/350 and/or 400/440 volts, in good condition.—T.M.A., Leatherhead Road, South Chessington, Surbiton, Surrey (Tel. Epsom 2634). 3361

24 new or secondhand Wireless Receiving Sets suitable for 240 v., 50 cycle A.C. mains supply. Full particulars to—First Garden City Ltd., Electricity Department, Leitchworth, not later than November 30th. 3611

50 h.p., 400-volt, 50-cycles, 3-phase Slipring Motor, 1,500 r.p.m., with oil-immersed control gear.—Rouch & Penny, 8, Old King Street, Bristol, 1. 3599

100 h.p. (or near) A.C. Slip-ring Motor, 580 or 720 rev., 400 volt, 3-phase, 50 cycles.—Box 3558, c/o The Electrical Review.

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CAPACITY available for light assembly, December, January. Some machining, London area.—Box 91, c/o The Electrical Review.

ENGINEERS, Precision, South England, seek manufacture of electrical, mechanical or domestic assemblies or components. Press tools, gauges, small stampings, capstan turning, also Internal and External Grinding. Write—Box 74, c/o The Electrical Review.

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AGENCIES required, South of England, including the London area: (a) Cables; (b) Small Switchgear; (c) Transformers; or any lines suitable for distribution for wholesalers' business.—Box 40, c/o The Electrical Review.

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REPRESENTATIVES required all areas, with good connections, electricians, garages, ironmongers, engineering works, etc. Car essential. Reply, giving full details of past selling experience, age, etc., to—Box 105, c/o The Electrical Review.

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IT is desired to secure the full commercial development in the United Kingdom of British Patent No. 470047, which relates to Multipole Automatic Electric Circuit Breakers, either by way of the grant of licences or otherwise on terms acceptable to the patentee. Interested parties desiring copies of the patent specifications should apply to—Stevens, Langner, Parry & Rollinson, 5 to 9, Quality Court, London, W.C.2. 3553

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EDUCATIONAL NOTICES

THE ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS

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NOTICE is hereby given that the Swann Diploma Examination will be held at Centres on May 28th and 29th, 1947.

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A. BRAMMER, General Secretary.

31st October, 1946.

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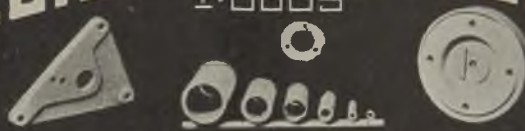
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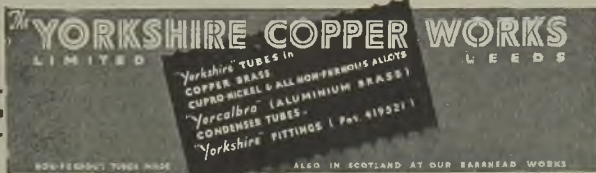
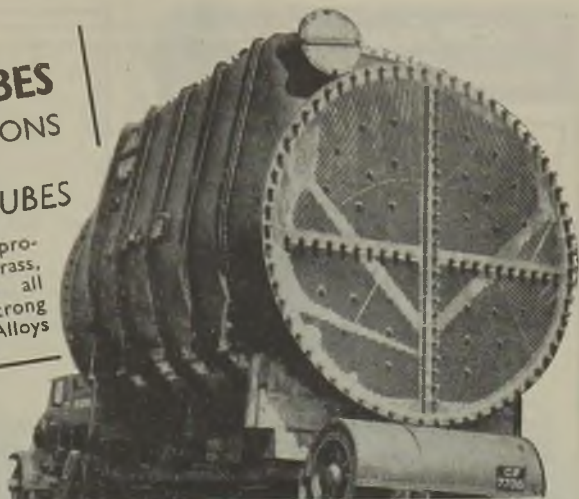
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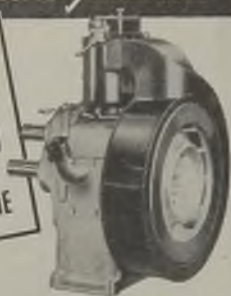
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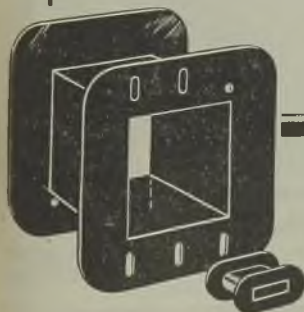
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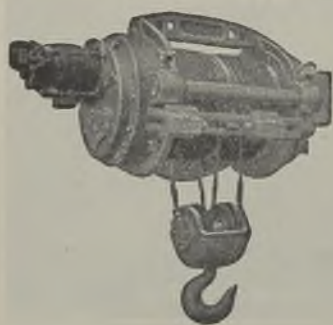
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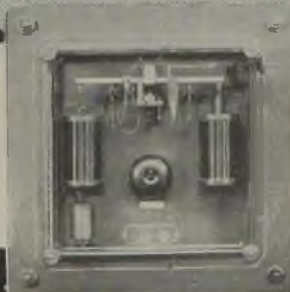
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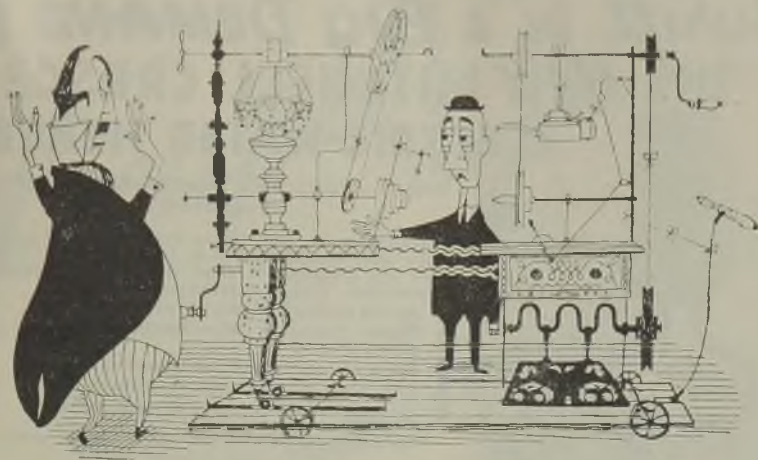
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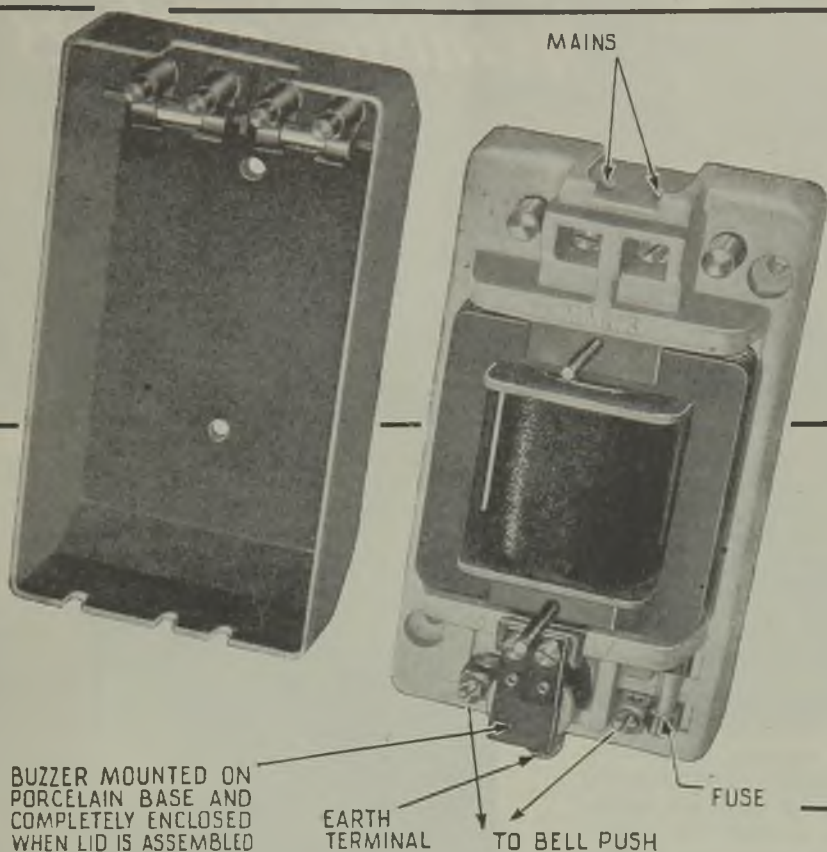
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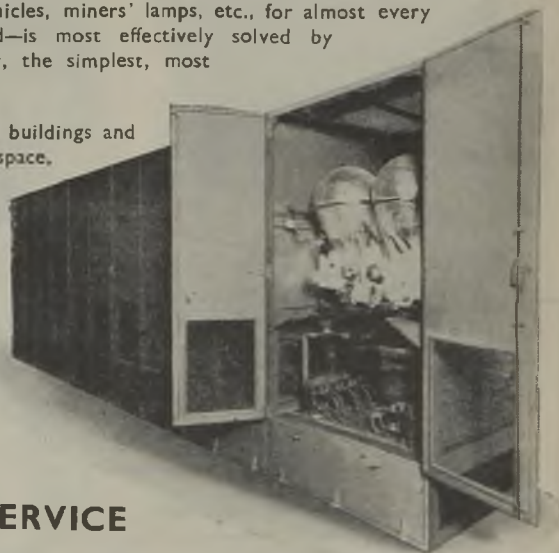
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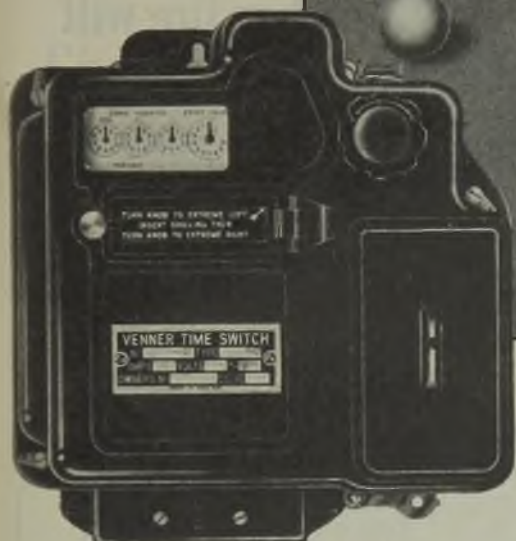
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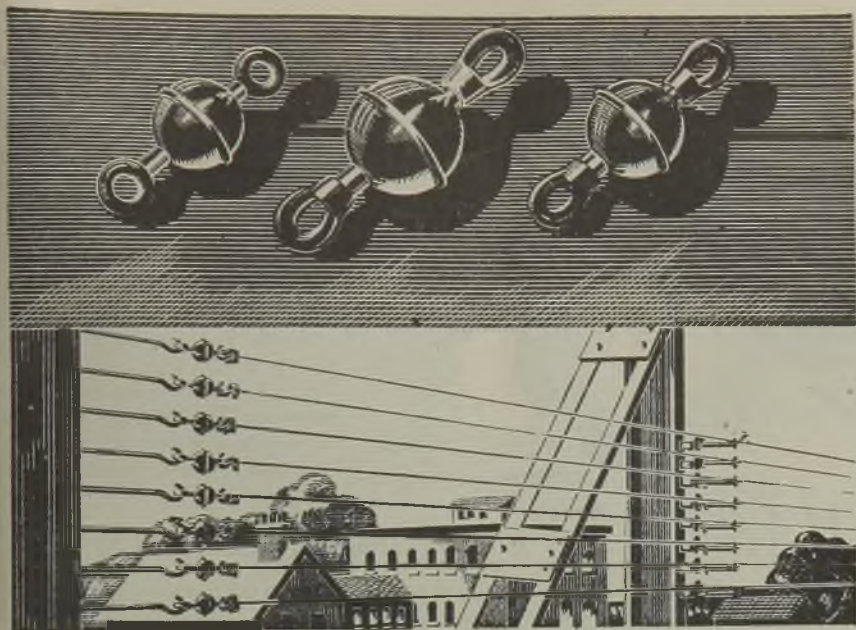
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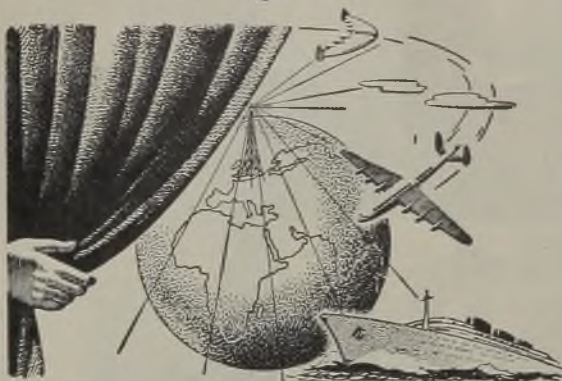
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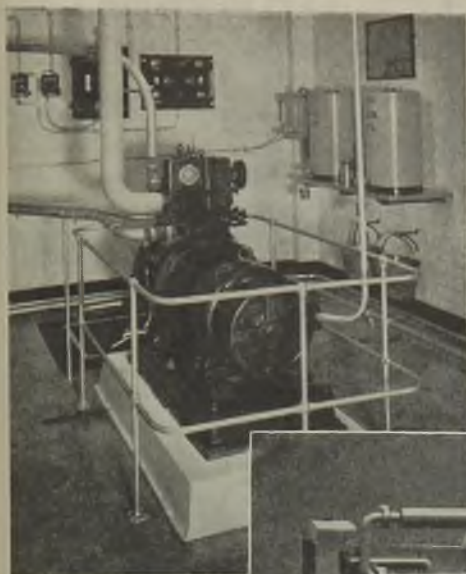
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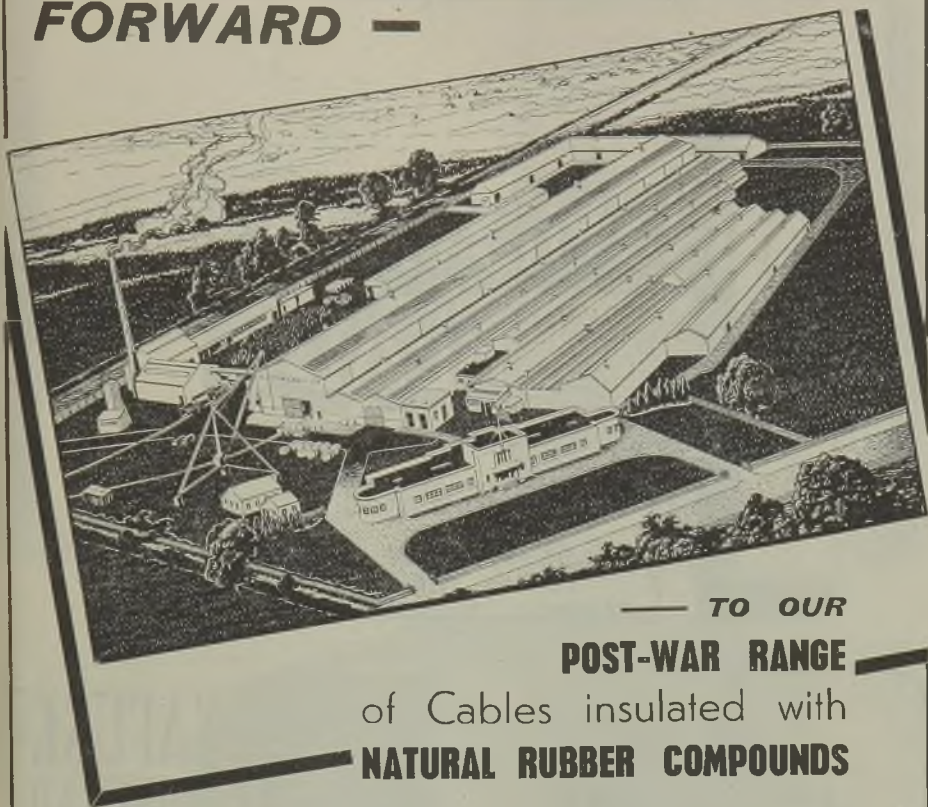
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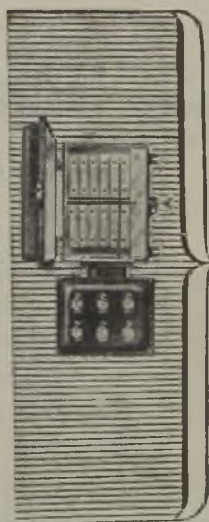
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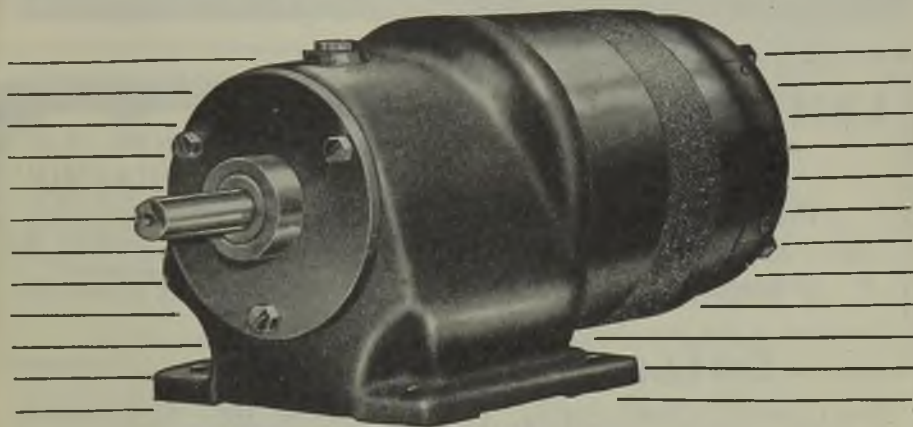
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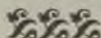
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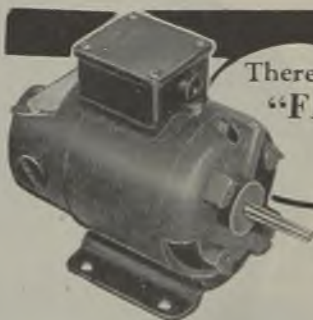
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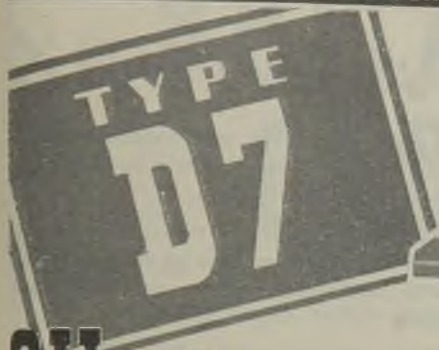
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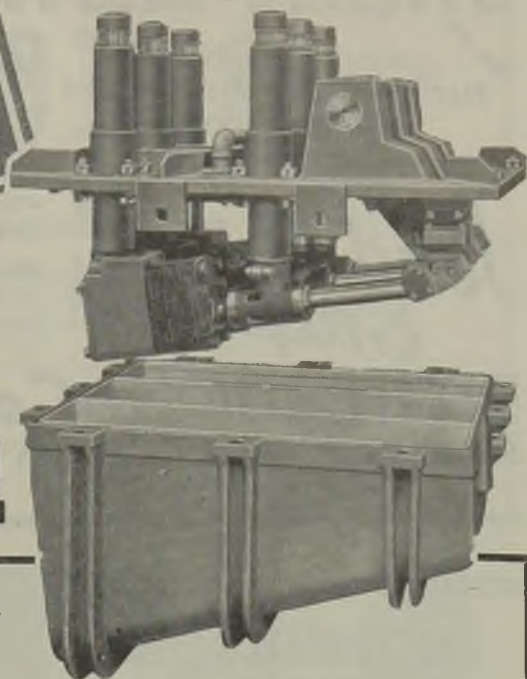
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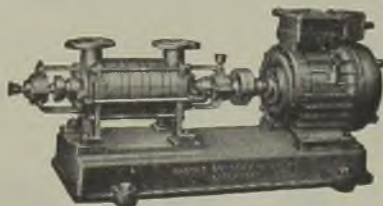
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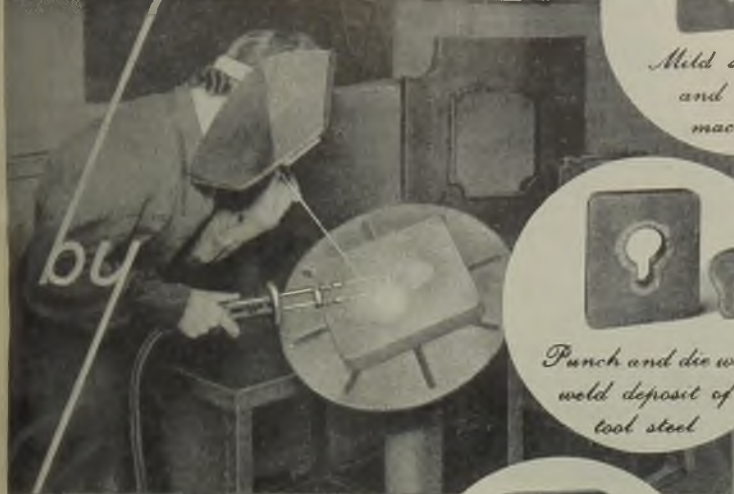
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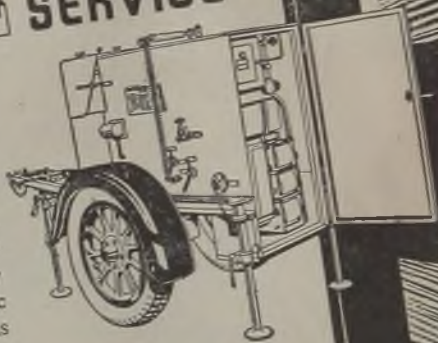
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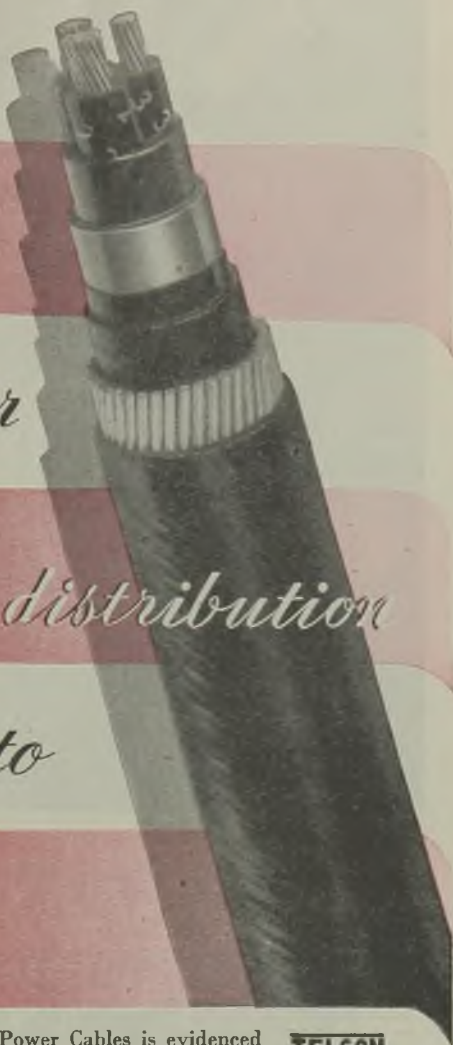
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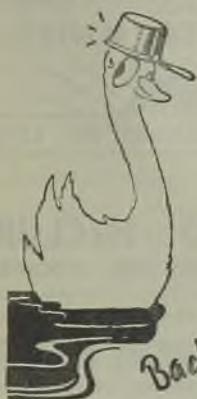
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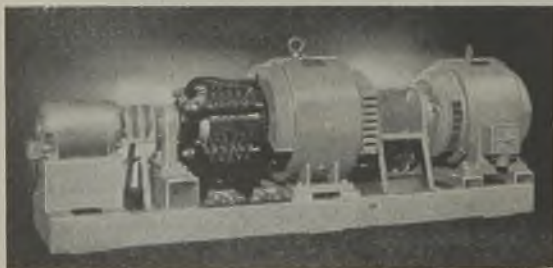
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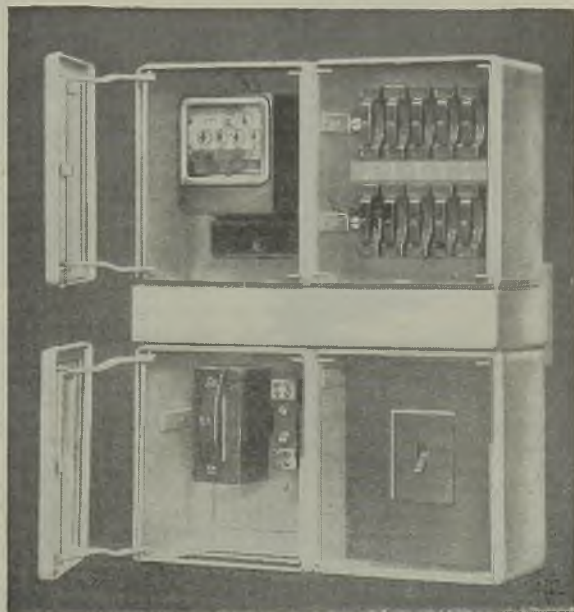
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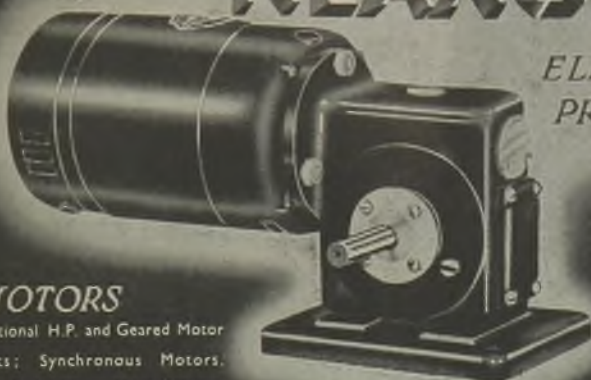
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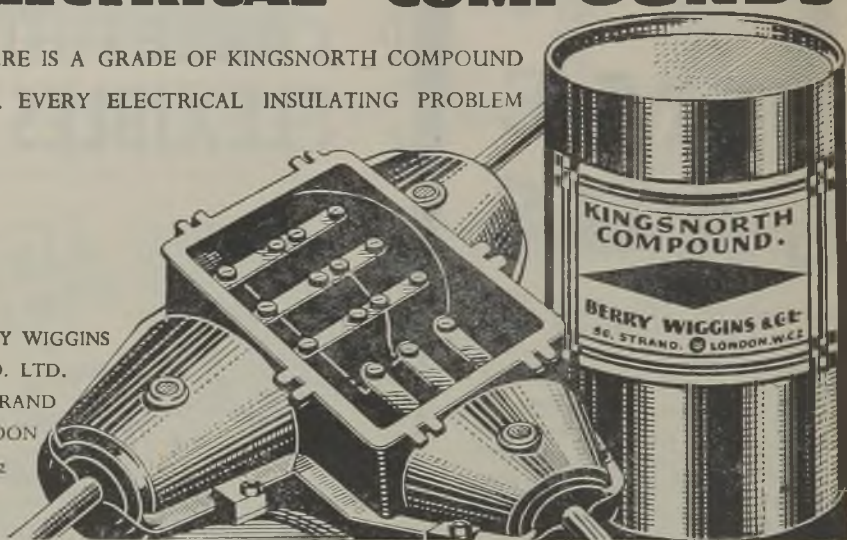
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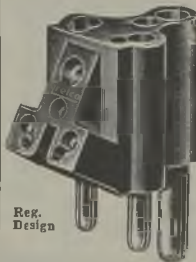
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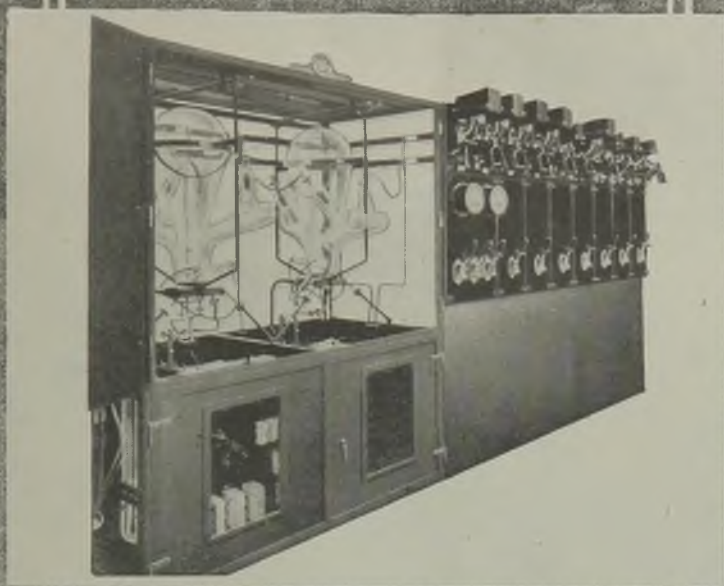


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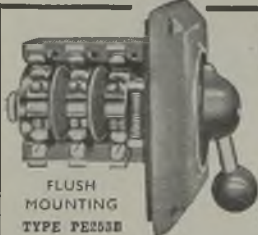
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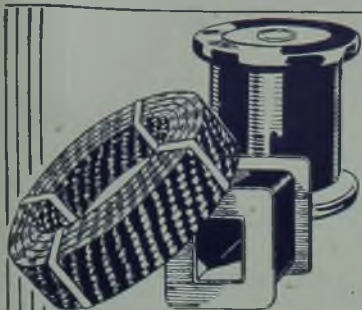
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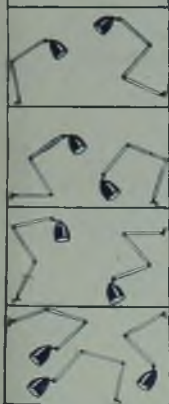
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