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Air-Blast Breaker Developments

In our later pages this week the types of air-blast circuit-breakers developed by Continental and American manufacturers are discussed. British designs are specifically outside the scope of this particular article. There is, however, one brief reference to British enterprise in this field to which attention may well be directed. This is the fact that it was British investigators who laid the foundations of air-blast breaker development. The first patent for a gas-blast breaker can be claimed by U.S.A., as early as 1900; and what was perhaps the first serious attempt to develop this class of apparatus commercially was made by Brown Boveri, about 1922. But it was the investigations of Wedmore and Whitney, of the British Electrical and Allied Industries Research Association, published in 1936 (British Patent 278,764), that initiated air-blast circuit-breaker design on a sound technical basis. Why nothing was done by British manufacturers to commercialise the new knowledge until many years later is another story. As in so many other instances of new engineering progress, this country sign-posted the way, but allowed others to take the lead in practical application.

Oil C.B.s Not Redundant

At the time when the principles of air-blast extinction of electrical arcs were established, the whole question of the performance and safety of power station switchgear was very much to the fore. It was appreciated by British manufacturers that actual arc suppression was only one element of the problem, and it was considered that for the special conditions obtaining in this country—the need to install increasingly more highly rated circuit-breakers in limited spaces in densely built-up urban areas—the oil breaker, in combination with completely enclosed metal-clad gear, represented the best line of development. That decision was fully justified. British switchgear of this class established a pre-eminent

reputation for performance and reliability, and similar apparatus was being increasingly adopted on the Continent and in the U.S.A. a few years before the war. Modern types of air-blast breakers are a new factor to be taken into account, but so also are modern explosion pot, single-pole and small oil content types of oil circuit-breakers. The proper way to regard the two classes of switchgear, air-blast and oil, is not as mutually-exclusive rivals, but as alternatives, each with its advantages and disabilities, the choice between them for any particular installation depending largely on local conditions and considerations other than circuit interruption. British manufacturers were actively developing both types before the war and will undoubtedly continue to pursue that policy in the future.

The M.O.F.—A Protest

Readers will remember that before the Ministry of Fuel and Power was set up we regarded the proposal with aversion, fearing that it might become an instrument for the restriction of electrical development. Since the Ministry was formed we have said little in the latter connection, but when earlier this year Lord Brabazon drew attention to the suggestion that “along some of the passages of the Ministry of Fuel building there is a distinct smell of gas,” he was only voicing publicly an impression widespread in electrical circles. With or without the knowledge of Major Lloyd George, the M.O.F. appears to be functioning not as an independent central authority holding the scales fairly between rival and competitive industries, but in a partisan spirit that fosters one group of interests at the expense of another, and also of the public. That sort of thing is commonly associated with Nazi and Fascist administration, but the temper of the Nation, we suggest, will not be such that anything of a like nature will long be tolerated in the British Civil Service, once peace returns.

Propaganda for Our Rivals

A minor example of the type of activity of the M.O.F. which gives cause for complaint is provided by the "Black Diamond" series of display posters recently prepared on the Ministry's behalf by the Ministry of Information. There are twenty-four pictures in the set, but only three concern us here. Poster No. 15 illustrates a gas works and carries the message that "Gas is refined and purified and stored for domestic use," and "many valuable by-products are recovered." Poster No. 16 states, "Coke, after the gas has been abstracted, . . . is used for water-heating in homes and factories." Poster No. 17 is the only one carrying a reference to electricity, and even then it is only incidental; the caption is, "Electricity is generated . . . in peace-time about 33,000,000 tons of coal a year were used in the production of gas and electricity." Maybe these posters are only of a minor significance, but that is no reason why Ministry of Fuel propaganda should stress exclusively the domestic uses of gas and coke and ignore electricity, which meets every domestic service that gas and solid fuel can provide better and more hygienically. The inference is obvious.

Glasgow Tramways' Jubilee

The Jubilee of the Municipal Transport Department of Glasgow was celebrated by a luncheon in the City Chambers on June 30, at which Mr. Noel-Baker, Joint Parliamentary Secretary to the Ministry of War Transport, was the principal guest. Only in a very limited sense can this commemoration be considered an electrical Jubilee, but the occasion will serve well enough to congratulate Glasgow Corporation on the famed success of its tramways undertaking, and to express the confident hope that electric transport will long continue to flourish in the city. The tramways undertaking that the Corporation acquired on July 1, 1894, was a horse-drawn system that had been in operation since 1872. The original track was laid down by the municipality and leased to the operating company. On taking over, the city authorities built their own depots, to the number of eleven, and acquired 250 brand-new cars and 3,000 horses. It is interesting to recall that initially a uniform fare of 1d. was charged for all distances, while

paternal care for the æsthetic susceptibilities of the citizens of Glasgow, as well as for their pockets, was evinced by the decision to exclude all advertisements from the new vehicles.

Lighting on the Early Cars

The first association of electricity with the Glasgow Tramways Undertaking was the provision of "the electric light" on the tramcars, effected within a few weeks of the Corporation acquiring ownership. On each car there were four lamps, two inside and two outside, each of 8 c.p. The outside lamps were elevated on iron standards 3 to 4 ft. above the level of the roof, in the centre of a disc 1 ft. diameter; they provided, on the one side, colour indication of the route, and on the other—so it is said—enough light to enable passengers to read their evening papers. The inside lamps were flush mounted in the roof. A problem of the time was the liability of lights to be extinguished owing to circuit interruption due to vibration, and a Board of Trade edict required that oil lamps should be carried in addition to electric. This requirement was overcome by adopting the Froggatt system, in which the accumulators were suspended by powerful india-rubber straps, to obviate vibration, and each lamp was fed from a separate accumulator, to ensure that all lamps would not fail simultaneously. Alas for the æsthetic ideal, from the start, the outside discs were utilised for advertisement purposes, to reduce the cost of the light.

A Unique Distinction

Electrification proper of Glasgow's tramways dates from October 13, 1898. In this instance thirteen has been a lucky association, the undertaking had outstanding financial success from the start, and achieved a distinction no other municipal undertaking has ever been able to boast. Up to 1917, a capital expenditure of close on £4 million was incurred in connection with the tramways, but by that year the whole of this sum had been repaid out of profits, and in addition large contributions had been made to the city's "Common Good" fund. In the aggregate this fund had benefited to the tune of £1,333,543 at May, 1941. Since 1917 new capital expenditure has been incurred for exten-

sions and other purposes, but the Glasgow Tramways Undertaking remains an outstanding example of successful municipal enterprise. May that success be continued through the next fifty years.

Ferranti Alternator at Caen

Another interesting event that took place just fifty years ago was the installation of a Ferranti alternator in the electric lighting station at Caen, the old-world Normandy town so prominently in the news to-day. A letter that Ferranti wrote to his wife at the time describing the ceremony with interesting local colour appears on page 48.

Apprenticeship

Mr. F. Twyman, managing director of Adam Hilger, Ltd., has set forth in a booklet published by Charles Griffin & Co., Ltd., his personal views on Apprenticeship for a Skilled Trade. He was moved to do so by first-hand knowledge of the skilled labour problems with which the optical instrument industry will be faced after the war, and the conviction that the proper way to ensure an adequate supply of craftsmen is to train them from youth onwards. Mr. Twyman's apprentice scheme proposals are concerned, of course, specifically with the optical instrument industry, the London District might serve for an initial experiment. Our concern is with the scheme as a possible model for general adoption, with appropriate adaptations, and the important issue that is raised concerning the age at which boys should enter industry via apprenticeship.

Four Basic Premises

There are, in Mr. Twyman's view, four main premises concerning which it is necessary to make up one's mind in respect of any apprenticeship scheme. These are: (1) Industry needs more good craftsmen; (2) These can only be obtained by apprenticeship; (3) Apprenticeship must embody a curriculum; (4) Independent inspection must be provided to ensure that the terms of the contract are fulfilled. Of these (1) and (3) will hardly provoke dissent, nor (2) if interpreted to mean that apprenticeship is the best rather than the only way of producing craftsmen. Item (4) is more controversial. Many firms have, in the past, operated their own apprenticeship

schemes, with entirely satisfactory results. The suggestion that independent inspection is necessary to ensure fulfilment of contractual obligations may provoke some resentment. Nevertheless, if apprentice training with a standard curriculum is to be imposed generally within an industry, individual firms cannot be left outside a common scheme. With tact and reason, however, and through co-ordination, rather than compulsion, it should be possible to overcome any difficulties of this nature.

Earning While Learning

The most controversial issue raised by Mr. Twyman is that apprenticeship, being a special form of vocational training, should have an accepted place in the new national educational scheme. Instead of every boy having to attend general school up to the age of 16, entry on apprenticeship might commence at, say, 14, and count as part of full-time education. From the point of view of the provision of craftsmen for industry, there is much to be said for commencing vocational training at this early age. But the provision of two alternative systems of juvenile education might have unexpected repercussions. On the one hand, there would be the general mass of boys compulsorily attending school full time up to the age of 16; on the other, their younger brothers of 14 and 15, apprenticed to industry, might be earning while learning.

Coal Industry Statistics

The Statistical Digest on the coal mining industry, just issued by the Ministry of Fuel and Power, presents a mass of data that needs a lot of digesting. Some of the thirty-eight tables will undoubtedly provoke controversy among the experts, but undoubtedly the digest is a valuable and authoritative analysis of the coal industry, disclosing information not previously available. There are only three references to electricity in the digest. Table 38 is a re-hash of the Electricity Commissioners' latest statistics, published in our issue January 6. Concerning Tables 23 and 24, scheduling coal distribution by classes of consumers and grades of coal used by different industries, we shall have something to say next week.

METEOR

Continental and American AIR-BLAST BREAKER DEVELOPMENTS

By F. Grünewald, Dr. Ing.

ABOUT the year 1900, R. A. Read, an engineer of the General Electric Co., Schenectady, U.S.A., applied for patents for gas-blast breakers in U.S.A. and in this country. Although these patents contained many sound ideas, they were not followed up by an industrial development because the oil circuit-breaker, developed at about the same time, met with more success and approval by engineers, and has held its own up to now. There was another attempt to develop an air-blast breaker, this time by the Swiss firm Brown Boveri in 1922,¹ but it did not lead to any practical results at that time. In 1926, B. W. Whitney and E. B. Wedmore, both of the Electrical Research Association, after very thorough investigations on oil breakers, made important proposals for the design of air-blast breakers.² Only a few months later the German firm A.E.G. independently started research work* on the extinction of an electric arc by compressed air, and brought the first air-blast breaker on the market in 1929. It was so acceptable to

* These investigations were initiated by Prof. Ruppel, who proposed to use compressed air for the arc extinction in lightning arrestors. The writer, who was engaged in the early development of the A.E.G. air-blast breakers, remembers that the great quenching effect of a blast upon an arc in a nozzle (Ruppel nozzle) came as a great surprise to that firm. Its importance for breakers was immediately recognised, and appreciated, because shortly before several severe accidents by oil-breaker explosions had occurred. As it was realised that oil-breakers for 220 kV required quite an unreasonable size, most stress was put upon the development of high voltage air-blast breakers.

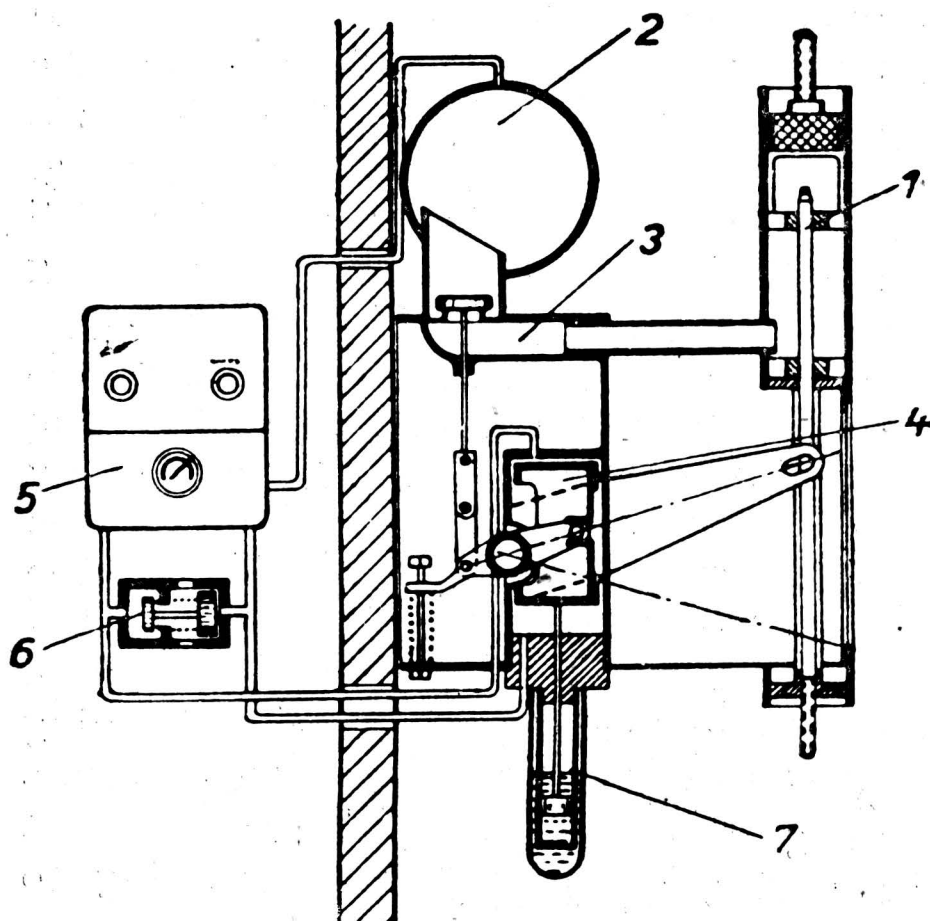


Fig. 1.—Indoor 10-30 kV Air-Blast Breaker.

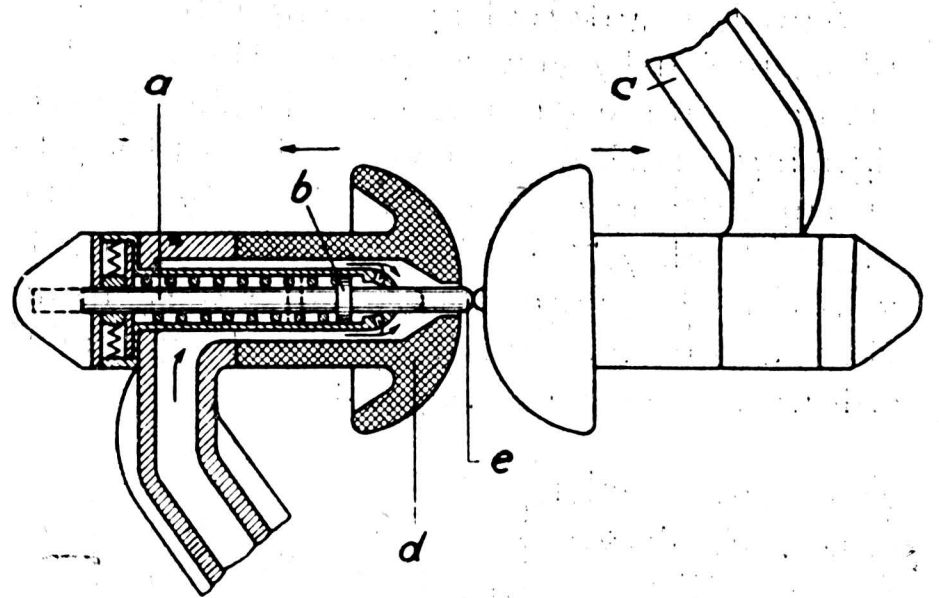


Fig. 2.—Air Chamber of Outdoor 30-100 kV Breaker.

engineers that soon other makers followed the example of the A.E.G. The Swiss firm, Brown Boveri, reverted to it in 1934, and also in France, Canada and the U.S.A. air-blast breaker designs were tackled, partly on quite new lines. The development in this country is beyond the scope of this article.

A.E.G. Designs.—In the following, only the main representative designs of air-blast breakers, as far as possible in their latest form, will be reviewed. Figs. 1 and 2 show typical examples of the A.E.G. air-blast breakers,³ Fig. 1 illustrating an indoor arrangement for 10-30 kV, and Fig. 2 representing the main elements of outdoor air-blast breakers as used for voltages from 30 to 100 kV. The main element of these breakers is a nozzle through which the arc is blown or drawn after contact separation, and in which it is exposed to the effect of the blast.

In Fig. 1 a contact rod is withdrawn from nozzle 1, by the piston action of the driving mechanism 4. The contact rod travels rapidly into its open position without pause, establishing between the contacts the final gap. During this time compressed air is released through the pipe 3 into the arc chamber, and exhausted through nozzle 1 and a silencer into the atmosphere. After the operating valve has cut off the air flow, the pressure in the arc chamber drops to atmosphere. Therefore, the gap between the contacts must be dimensioned for the nominal voltage of the breaker at atmospheric pressure. A fluid dash pot 7, is coupled with driver 4, effecting the retardation of the moving contact after it has parted from nozzle 1. The arrangement allows quick reclosure, and for this purpose a dumping valve 6 is incorporated.

The air-blast breaker, the arc chambers of which are shown in Fig. 2, works on a dif-

ferent principle. Each phase has two arc chambers mounted on separate pillars, through which compressed air is supplied when the breaker is operated. Each arc chamber has an insulating nozzle "d" within which a contact rod "e," fixed on a piston "b" is kept under spring pressure. The two contact rods are tipped with silver tungsten, and make contact outside the arc chamber in the open air. On tripping, the contact tips are rapidly withdrawn through the nozzles into a position most favourable for arc extinction, thus establishing an arc partly in atmosphere and partly under high pressure, the main effective zone for quenching the arc lying inside the arc chambers between the

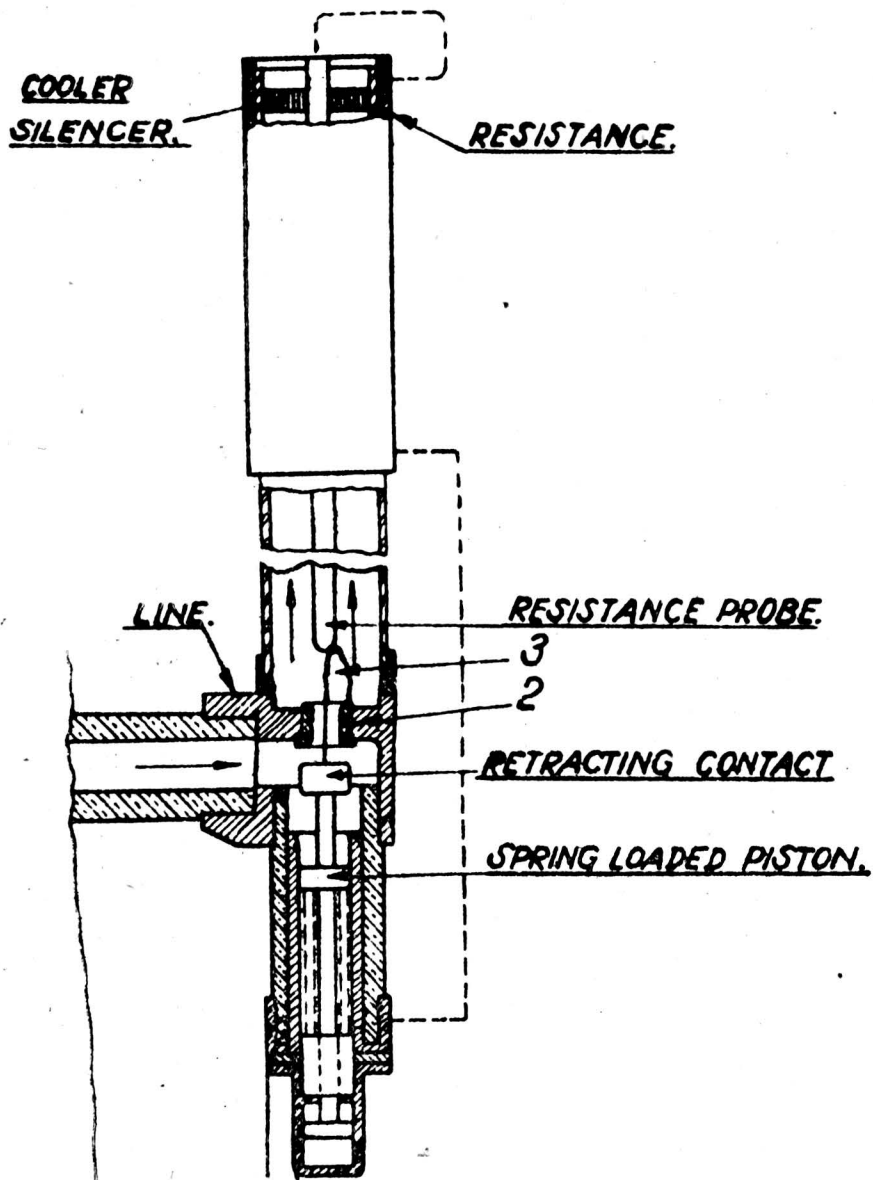


Fig. 3.—Indoor 30 kV Air-Blast Breaker.

nozzle throat and contact tip. After the arc has been quenched, the two rotating pillars separate the arc chambers like a rotary isolator, but if quick reclosure is required, the rotating pillars remain stationary and the contact rods fall back into their closed position as soon as the air pressure has dropped, thus making circuit outside the arc chamber in open air.

Theory of Ruppel Nozzle.—As a result of investigation into the theory of air-blast breakers the A.E.G. found that there exists an optimum position of the movable contact in relation to the nozzle. Further, the rupturing capacity of the Ruppel nozzle greatly depends on a time τ between current zero and the moment when the restriking voltage reaches the maximum of the 50 cycle recovery voltage curve.⁴ This time is available

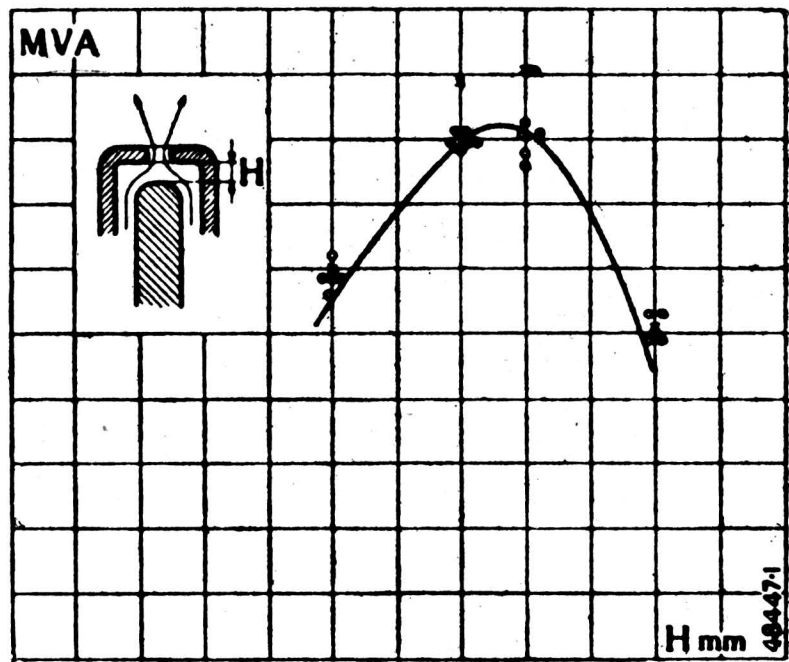


Fig. 4.—Relationship of Breaking Capacity MVA to Gap "H."

for cleansing the gap from ionised gas and metal vapour. Therefore rupturing capacity must increase by increasing τ , i.e., by decreasing the frequency of the oscillation of the restriking voltage by arranging capacitance in parallel with the gap.

Another quite interesting result of the investigations⁵ is the influence of the gas used in the arc chamber on the breaking capacity. Compared with air as 1 the breaking capacities have been found to be for nitrogen 1, oxygen 1.8, carbon-dioxide 2.6, water (steam) 3.8, and hydrogen 7.5; ratios which are nearly the same as those of the thermal conductivities of these gases. This connection between rupturing capacity and thermal conductivity of the gases, has been questioned by Kesselring,⁶ who tried carbon-dioxide, but could not confirm its contended superiority. In practice the A.E.G. have not used other gases than air, and have applied parallel condensers only in an exceptional case.

The Ruppel nozzle, similar to that shown in Fig. 1, was investigated by the General Electric Company, Schenectady, before deciding on the manufacture of definite types of air-blast breakers.⁷ It was found:

- (1) That with rate of rise of restriking

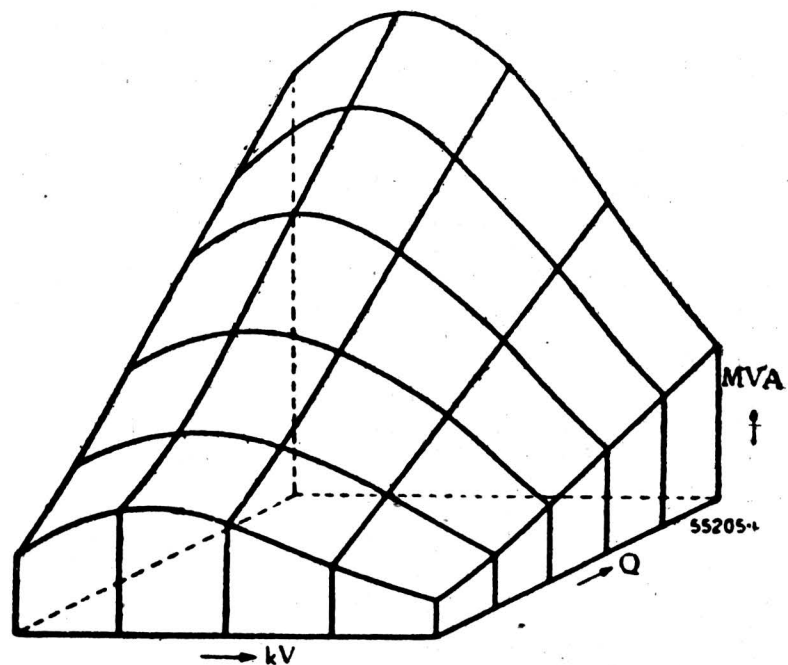


Fig. 5.—Relationship of Breaking Capacity, Voltage and Air Consumption "Q."

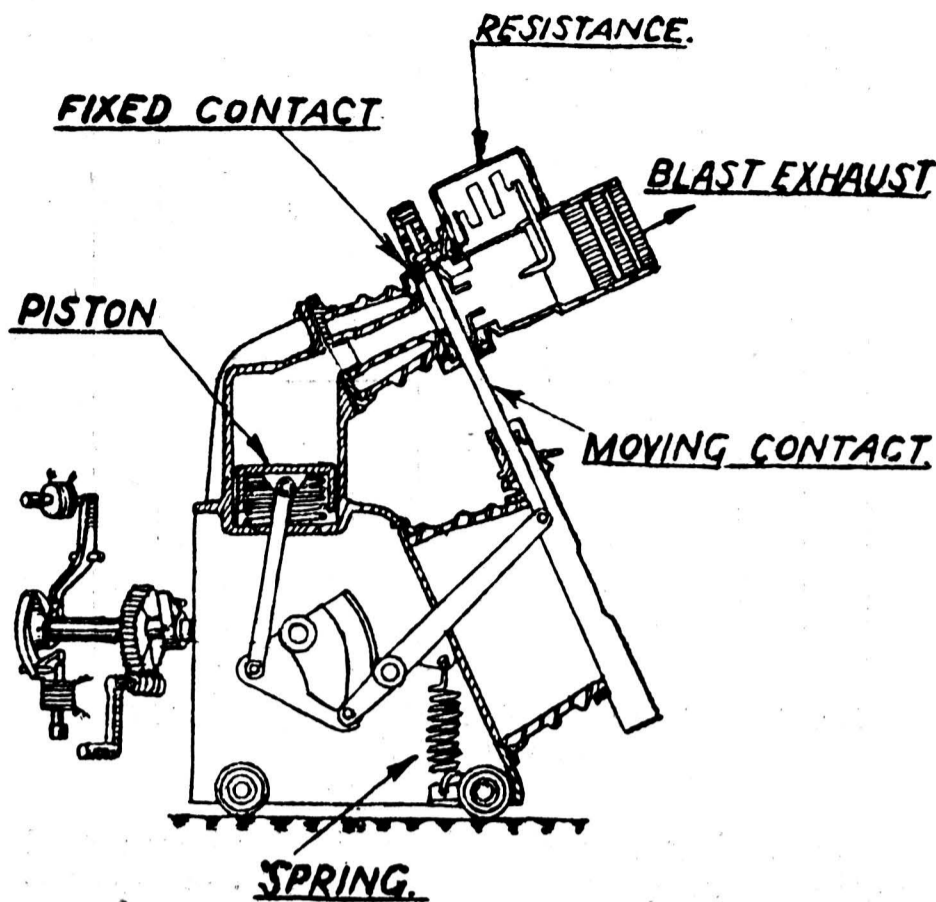


Fig. 6.—Breaker with Piston for Generation of Compressed Air.

voltage and air pressure constant, the current interrupting capacity is proportional to nozzle diameter. (Other investigators have found proportional relationship between the interrupting capacity and nozzle throat area.)⁸

- (2) That with rate of rise of restriking voltage and nozzle diameter constant, the current interrupted is proportional to the air pressure.
- (3) That with pressure and nozzle diameter constant, current interrupting capacity is inversely proportional to rate of rise of restriking voltage between limits.

As it will be shown later on in this article, the G.E.C. Schenectady decided in favour of types of air-blast breakers quite different from those of the A.E.G.

Parallel Resistance and Multi-break.—In Switzerland the firm Brown Boveri, followed the example of the A.E.G., but tried to overcome the weakness of the Ruppel nozzle in two different ways. Either a resistance was connected in parallel to the gap, whereby the rate of rise of restriking voltage was suitably reduced,⁹ or, for voltages over 60 kV up to 400 kV, a potential-controlled multiple break was used. In both cases an isolator is arranged in series with the rupturing gaps, thus allowing the latter to be chosen for optimum conditions with regard to distance between contacts, and also to applied voltage

in the case of a multiple break. This combination of isolator and separate arc chambers cuts down the mass of the movable arcing contacts to a minimum, so that their optimum position for arc extinction is attained in a very short time, a feature which is essential for quick reclosure.

In Fig. 3 it is shown how a parallel resistance is transitionally connected to a nozzle contact arrangement (2) by an auxiliary gap (3). The resistance is switched in when, on heavy currents, the auxiliary gap becomes sufficiently ionised by metal vapour blown through the nozzle contact after contact separation. The principle of the potential controlled multiple break may be explained in connection with Figs. 4 and 5.¹⁰ The breaking capacity (MVA) of a nozzle contact in relation to the gap (H) is illustrated in Fig. 4, which shows the strongly marked optimum for the gap. By connecting several such nozzle arrangements in series, their rupturing capacities can be added if their potential distribution is controlled, e.g. by parallel condensers. In this case, according to Brown Boveri, a voltage which is the most favourable with regard to MVA and air consumption Q can be established for the nozzles, as shown in Fig. 5.

The principle of connecting a resistance in parallel with the arc in an air-blast breaker was also used by the French firm "Ateliers de Construction Electrique de Delle." The arc extinction is affected also in two stages, but the arc which is transferred by the blast from the contacts proper to auxiliary electrodes, burns behind the nozzle under atmospheric pressure as in Fig. 6. Air consumption of this arrangement can be cut down to such a degree that it has been possible to use compressed air of 11 to 22 lb/sq. in. gauge for the arc extinction, generated by a spring-loaded piston, which is mechanically coupled with the movable contact.¹¹ But, as it has been stated by a maker of these breakers in Switzerland,¹² the generation of the compressed air by the interrupting mechanism is

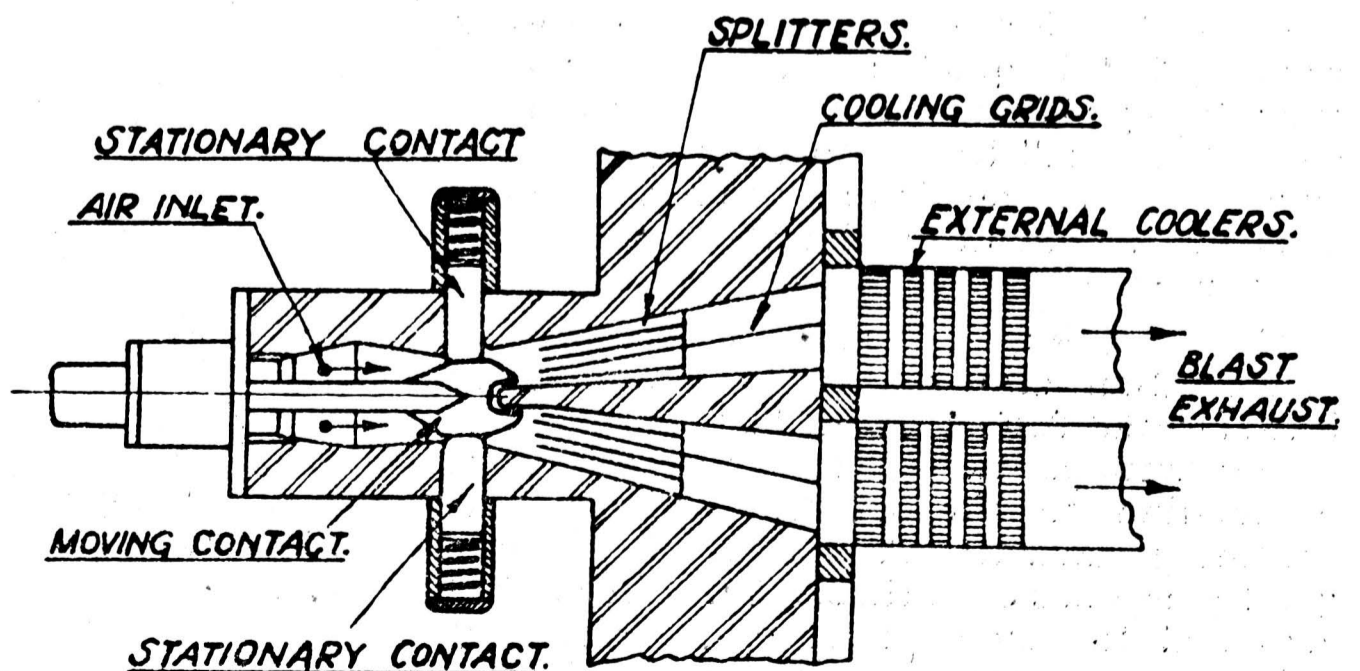


Fig. 7.—Rupturing Element for voltages up to 220 kV Breaker.

either too expensive or does not give a rupturing capacity as high as 200 MVA.

The principle of the Delle resistance breaker has been taken over by the English Electric Co. in Canada,¹³ for voltages up to 15 kV. These breakers have a storage of compressed air which is appropriate to high MVA ratings. Quite a different principle is used by this firm for high voltages up to 220 kV. In this case the poles are built up in columns from elements, Fig. 7, and the total voltage is divided more or less uniformly between these by large metal roofs. The elements, each of which is adequate for a voltage of 22 kV, represent a special type of cross-blast breaker. A movable contact actuated by a spring-loaded piston bridges over two stationary contacts. On tripping, an arc is blown against splitters into two channels from which the hot gases are exhausted over coolers into atmosphere.

Cross-Blast Breakers. — In U.S.A. the General Electric Co. and the Westinghouse Electric & Manufacturing Co. have developed new types of air-blast breakers, which are quite different from the Continental practice. For voltages up to at least 15 kV the General Electric Co. is using a cross-blast breaker principle, which has also been adopted by the Westinghouse Electric & Manufacturing Co., whereas for very high voltage both firms

follow quite different lines. They state that the Continental design for the low voltage range would not suffice in U.S.A., where circuit-breakers of 60,000 amps breaking current are standard, and 2,500 MVA at 15 kV are demanded, and furthermore, high

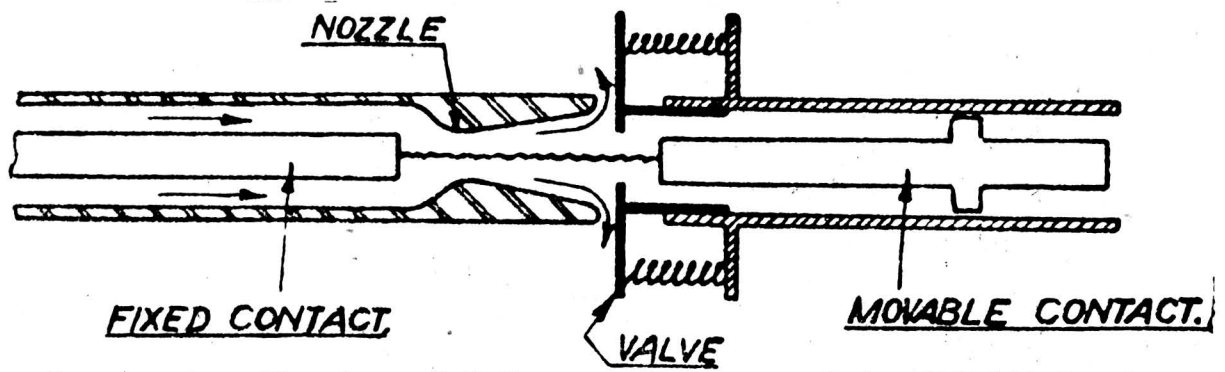


Fig. 9.—Arc Chamber of "Conserved Pressure" for 138 kV Breaker.

rates of rise of restriking voltage are the rule rather than the exception.

The cross-blast breaker principle may be explained by means of this schematic diagram of the General Electric Co. breaker shown in Fig. 8.¹⁴ This consists of a pair of contacts located in an arc chute of insulating material. Air is introduced at one side of the arc chute at right angles to the arc, which is thus blown against a number of insulating splitters. In order to prevent flashover beyond these splitters, cooling stacks are arranged between them at an adequate distance from the contacts. A further cooling device is provided at the top of the arc tube in order to prevent external flame. The two firms give a different explanation for the arc extinction in a cross-blast breaker. The theory advocated by Prince¹⁴ of the G.E.C. states that at current zero the physical continuity of the arc is broken by the interposition of a small quantity of a cool, un-ionised and dielectrically completely sound medium, and that from this moment the dielectric strength of the arc space is completely given by the dielectric strength of this interposed medium. Slepian¹⁵ of the Westinghouse Co. contradicts this theory, and contends that a diffusive effect, greatly enhanced by turbulence, will account for the interrupting capacity of all gas-blast circuit-breakers.

American Breakers. — For very high voltages the American G.E.C. has built a "conserved-pressure" breaker,¹⁶ in which a movable butt contact retracts from a fixed one through the throat into the diverging part of a nozzle of volatilising insulating material as in Fig. 9. As the inlet pressure of the air is at least 200 lb/sq. in., and the air pressure behind the throat is maintained at approximately 100 lb/sq. in. by means of a spring-loaded relief valve, the pressure difference is above the critical so that the air velocity in the throat is not affected by the pressure in the diverging part of the nozzle. Thus, after the extinction of the arc, which burns along its whole length in a zone of high pressure, the dielectric strength of the gap between the contacts is

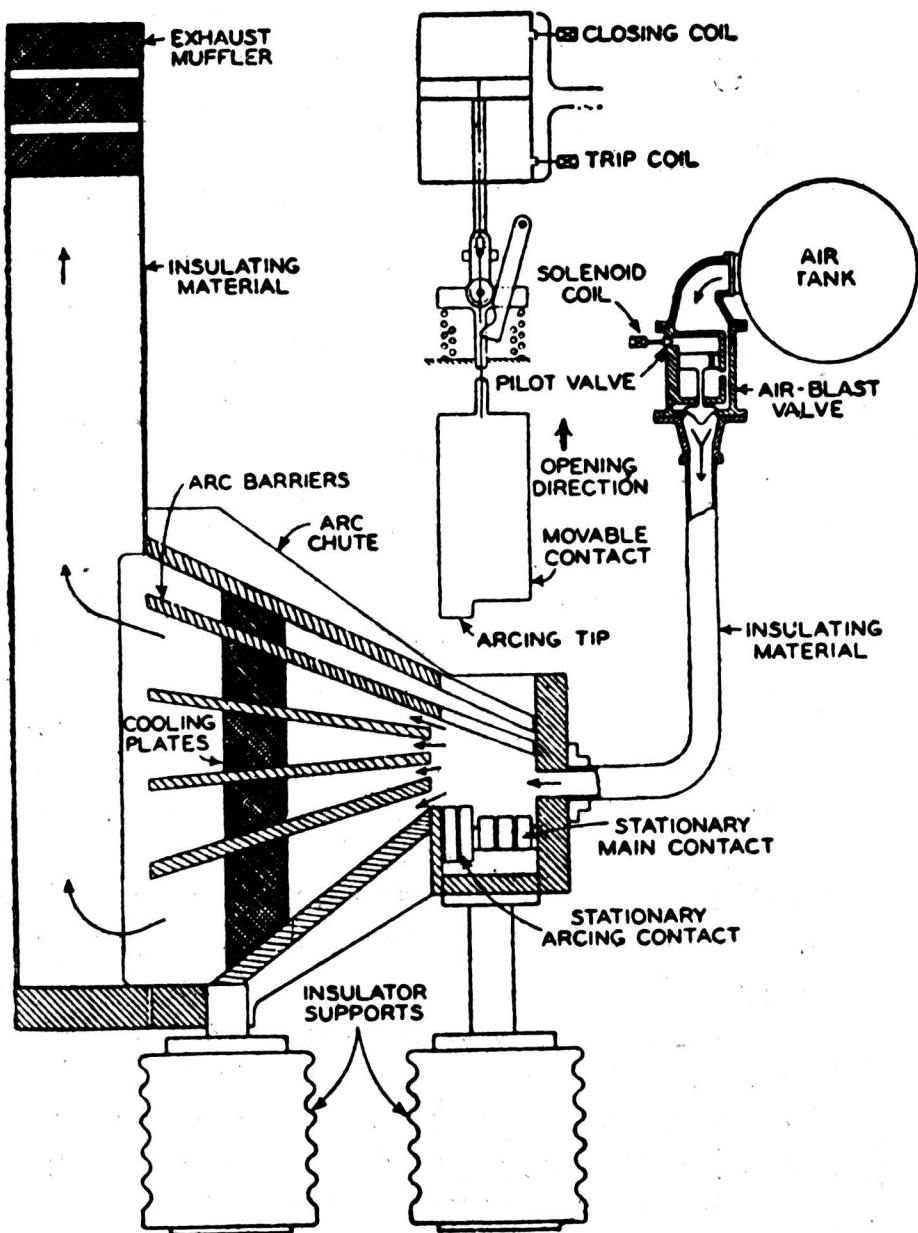


Fig. 8.—Cross-jet Breaker for Voltage up to 15 kV.

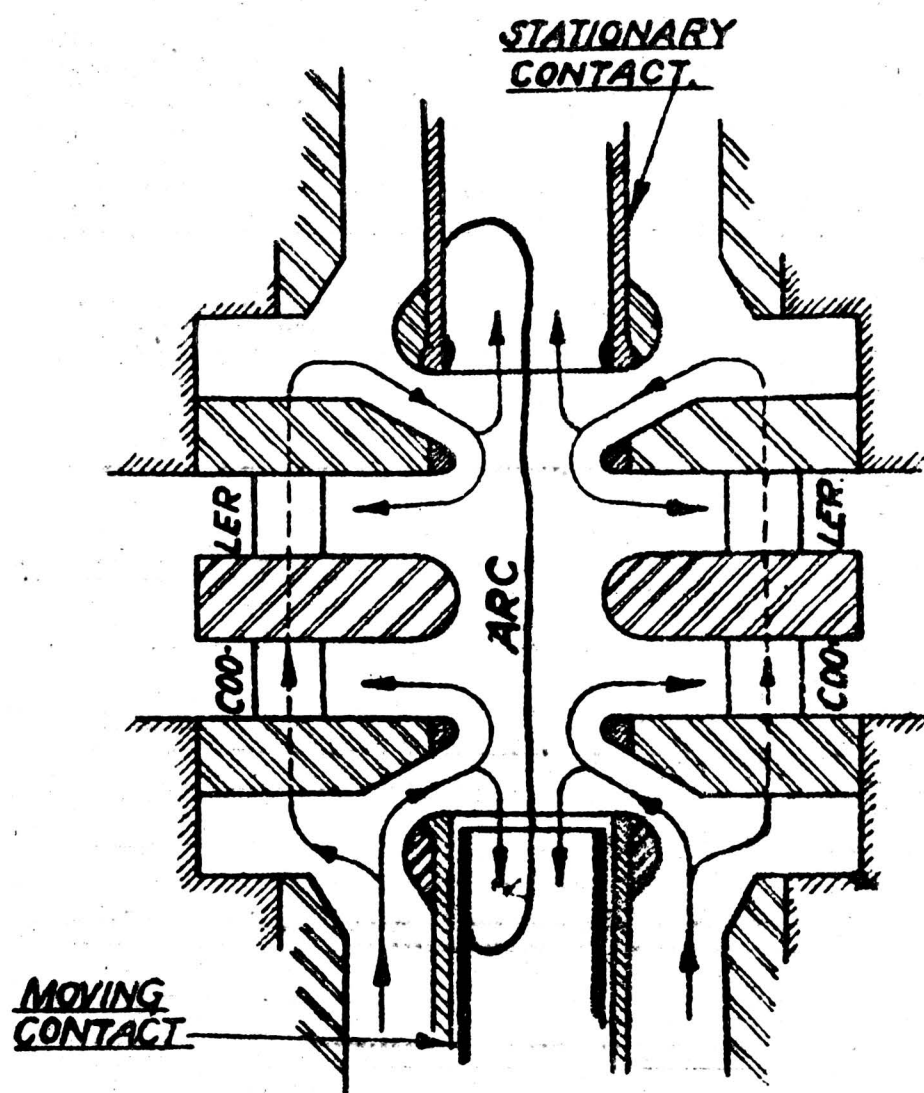


Fig. 10.—Arc Chamber of 138 kV Breaker.

expected to recover in the shortest time, and to withstand high rates of rise of restriking voltage. Two such arc chambers are arranged in series for one phase of 138 kV breakers; they are interconnected by an isolating switch.

The high voltage breaker¹⁷ of the Westinghouse Electric & Manufacturing Co. has an arc chamber built up from fibre discs (Fig. 10). Two of them have central orifices with a metal insert through which the arc is drawn, and a third insulating plate is introduced between these discs to restrain random motion of the arc. Two metal tubes, one forming the fixed contact, and the other a guide and final sheath for the movable contact, are fitted on each side of the disc arrangement, leaving two gaps which form a kind of double nozzle each. The air enters radially into them, and exhausts partly into the metal tubes in an axial direction and partly between the discs in a radial direction.

Allis-Chalmers U.S.A., who have built axial air-blast breakers for medium and very high voltages on the same lines as Brown Boveri, have adapted the medium high voltage breakers to the high breaking currents required in America. More recently, they have developed a small axial air-blast breaker for 5 kV, 150 MVA, which is claimed to be capable of breaking currents up to 50,000 A and suitable for current ratings up to 2,000 A, although adapted to standard metalclad switchgear units.¹⁸

Beside the types of air-blast breakers described above, there exist many other varieties manufactured by smaller firms. Further, the Continental designs have found a market in Canada and in the U.S.A.

Although the invention of the air-blast breaker is about 50 years old, and its commercial exploitation began 15 years ago, there is still room for further future developments.

The author wishes to express his thanks to Messrs. Ferguson, Pailin, Ltd., for the opportunity to compile the information used in this paper.

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NEW LITERATURE

Willis's Workmen's Compensation. 36th Edition. Published by Butterworth & Co. (Publishers), Ltd., Bell Yard, Temple Bar, London, W.C.2. Price 30s., postage 10d. extra.

We have frequently in the past called attention to the great value to employers of labour, particularly those who administer factories and other industrial organisations, of this exposition of the legal aspects of the liability of the employer to the worker. Few cases of injury and the compensation therefor have not at one time or another had their counterpart, and legal rulings connected therewith are given at sufficient length to indicate their effect. Arbitrations, National Health Insurance matters, Workmen's Compensation Rules, Life Annuities, County Court Fees, Medical Arrangements, Illnesses Special to Certain Trades, and much other information, is contained in this book. The legislation as to compensation connected with temporary increases, under the Act of 1943, is a special feature of this edition. Without doubt this is a book which should be on the shelves of all industrial managements.

Belgian Handbook. Compiled by Walter Ford. Published by the Belgian Information Office, 25, Eaton Place, S.W.1.

We have to acknowledge receipt of this Handbook, which gives some information as to Belgian industrial and other affairs which will be found useful to many when the country is again liberated.

PORTABLE LOCOMOTIVE LIGHTING EQUIPMENT

GENERAL lighting of the usual works type often cannot be provided effectively in steam locomotive running sheds, chiefly because of the narrow spaces between adjoining engine roads. Blackout conditions add a further difficulty, even during daylight hours. To facilitate and speed-up the overhaul of locomotives, the L.N.E.R. has, therefore, designed portable lighting equipment for the illumination of engines undergoing repairs, and six sets are to be tried out at various sheds with a view to more extensive use throughout the system, if found satisfactory.

Equipment.—To provide convenient handling and to economise flexible cable, the lighting equipment for each engine is divided into two sections, one for each side. Each section includes a portable 8-way-and-main plug and socket distribution box, arranged to be hung on engine hand rail, and into this box the portable lights are plugged. Lighting equipment for the near side comprises: three 60 or 100 W general lighting units, suspended at the ends of adjustable outrigger rods hooked on to engine handrail; two 40 W gripper handlamps; two 25 W tubular inspection lamps for examining interiors; and one 100 W pedestal general light for use in the pit. For the right-hand section there are three general lighting units, four 40 W handlamps, and one 25 W inspection lamp. To provide for mobility the whole of this equipment is mounted on a trolley, as shown in Fig. 1.

Electrical System.—For reasons of safety, low voltage is used for the portable equip-

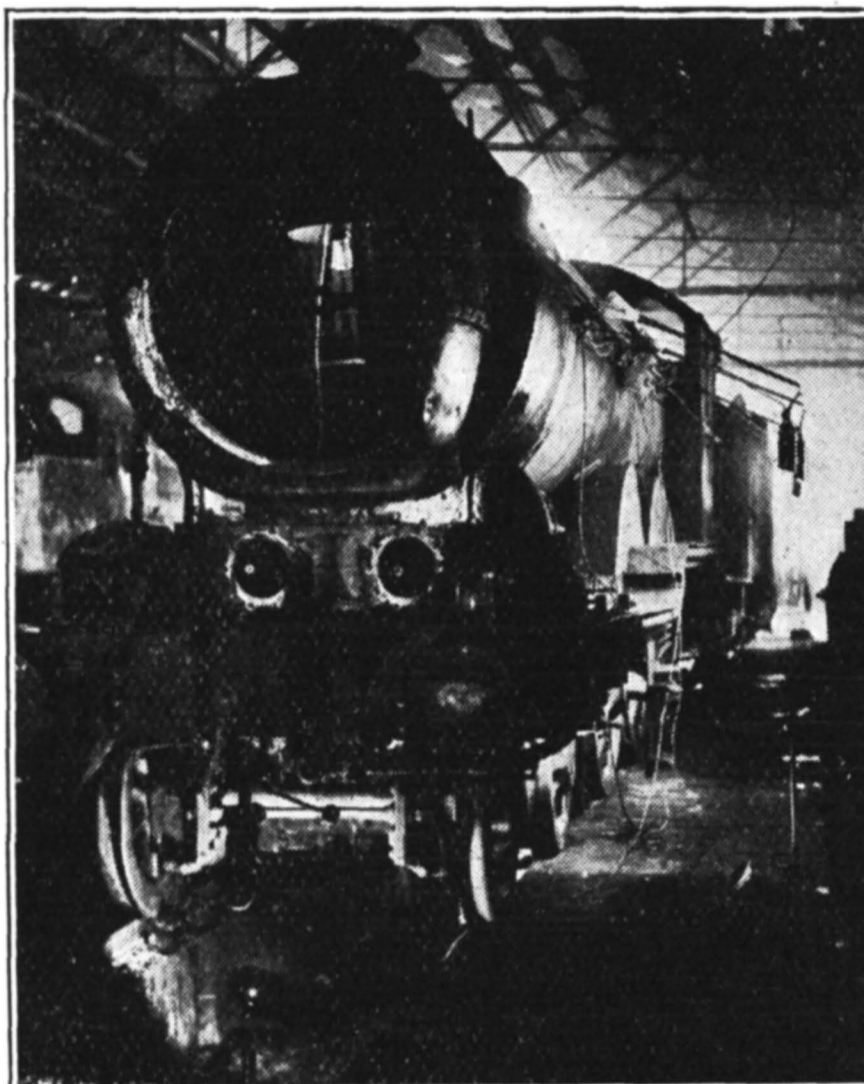


Fig. 2.—Engine with Portable Lighting.

ment, but as certain of the lamps are as large as 100 W, and the total loading on each distribution box may be just over 500 W, it is not practicable to use a lower pressure than 50 V. Double-wound 230/50 V transformers are used, with the mid-point of the secondary winding earthed, thereby limiting the voltage of possible shock to 25 V. For one complete engine equipment the capacity of the transformer is 1.25 kVA, but larger transformers, multiples of 1.25 kVA, are used where two or more engine repair berths are immediately adjacent.

Earthing.—The Home Office Regulations require that metal parts of portable equipment shall be earthed, with the exception of the metal guards, etc., of portable handlamps, if the latter be of what is known as the Home Office type. As the bodies of the plugs and sockets on the distribution boxes will be of metal, the main flexible cables connecting them to the fixed 50 V supply sockets must be of

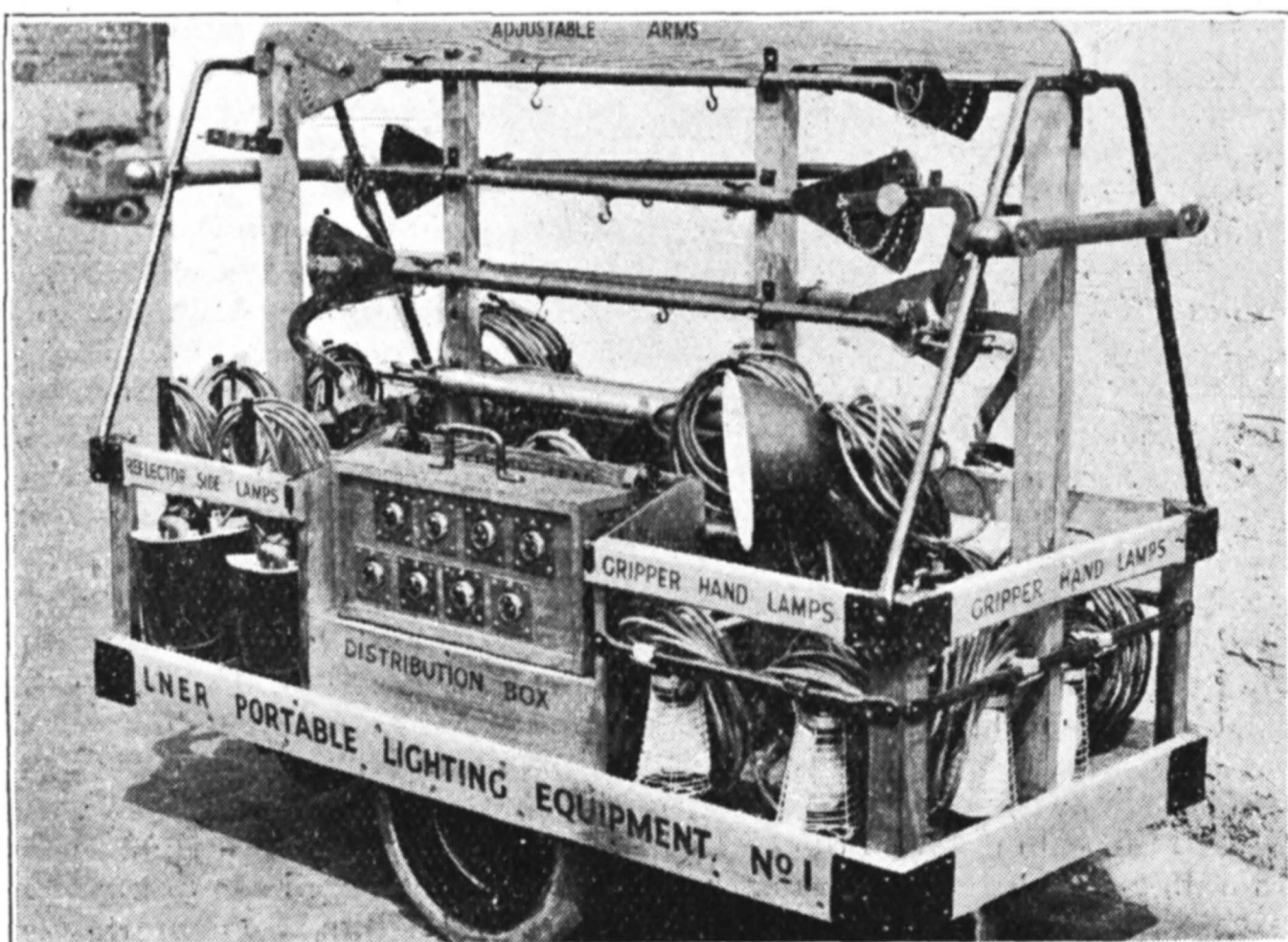


Fig. 1.—Trolley containing Complete Lighting Equipment.

3-core and the main plugs and sockets of the 3-pin type, the third core being the earth wire.

All the portable lighting fittings, however, will take the form of Home Office type hand-lamps, so that earthing of their metal parts is not necessary, and the flexible cables between the distribution boxes and the portable lighting fittings will, therefore, be 2-core.

Supply Points.—The supply plug points are fixed over the alley way at a sufficient height to clear a man leaning out of the cab of a moving engine and located one each side of an engine under repair, so that the main flex connected to each distribution box does not have to cross over the engine. There are thus two supply plug points for each

engine. The number of pairs of fixed supply plug points depends upon the number of engine positions for repairs and varies with each shed.

The plugs and sockets at the fixed points and connecting the main flex to each distribution box are of the Reyrolle 15 A 3-pin type. This plug meets the Home Office requirements for breaking circuits, so that switches with their attendant maintenance trouble, cost, weight and bulk are avoided.

The plugs and sockets connecting the individual portable lamps at the distribution box are of the Reyrolle 5 A 2-pin low-voltage type, and, to avoid possible accident, these plugs are made so that they will not enter normal voltage sockets.

ELECTROLYTIC DESCALING OF STEEL

INCREASING attention is being given to the descaling of steel by electrolysis in molten caustic soda, on account of its superiority over other methods. There are three distinct chemical reactions involved in the process. First, the caustic soda is split up to give sodium, and this sodium attacks the iron oxide to reduce it to iron; from the resulting sodium oxide, caustic soda is reformed. The reduced iron may remain on the parent metal as a fine powder or it may form sludge. If allowed to dry in the former case, it may readily be peeled off in the form of foil.

In order to ascertain the most favourable conditions of temperature, time and current density, a special investigation was made by **Mr. N. L. Evans**, and the results have been presented in a paper before the Iron and Steel Institute. This contains useful information on such subjects as the design of plant, safety precautions and the descaling of alloy steels. Particular attention is given to the brown stains that are sometimes experienced with this method of descaling. These may be due to various causes, and each cause is listed with suggested methods of prevention. Certain types of stain are particularly frequent in high temperature baths. The stains are indelible, but may be removed by a further brief treatment in a molten caustic cell.

This method of descaling produces a more uniform surface than other methods and allows the production of better coatings, whether they be plated, tinned or painted. The loss of weight of steel resulting from acid pickling is avoided. The consumption of chemicals is small, and there is no possibility of embrittlement of the steel consequent upon hydrogen absorption. A useful advantage is that by the use of appropriate salts and proper temperatures, the steel may be given heat treatment such as annealing and tempering at the same time as it is being

cleaned. As organic matter is removed in the process, there is no need for a preliminary degreasing step. It is particularly effective as a preliminary to inspection to show physical defects, and the steel can be stored subsequently without the rusting which occurs immediately after acid pickling. This makes it unnecessary to do the pickling immediately before the article is to be coated, thus permitting simplification of manufacturing flow.

WOMEN'S ENGINEERING SOCIETY

At the second annual meeting of the Manchester Branch of the Women's Engineering Society on June 15, the retiring chairman, Miss D. Smith, A.M.I.E.E., reviewed the first full year of the Branch's life. The major event of the year was the Society's 1943 annual conference, Wilmslow, under the auspices of the Branch. She paid tribute to the work of Miss Entwisle and Mrs. Barton, the first Branch chairman and secretary, respectively. Miss Smith envisaged a future more rosy for women engineers than the past, and expressed a hope that equal pay for equal work with equal qualifications would soon be the rule and not the exception. With improved conditions, there would soon be many more members of the W.E.S. eligible for corporate membership of the I.E.E. and the I.Mech.E. Officers elected for the year 1944 to 1945 were: *Chairman*, Miss D. Smith, A.M.I.E.E. (Metropolitan-Vickers) (re-elected); *vice-chairman*, Miss E. E. Verity (Verity's Garage) (re-elected); *secretary*, Miss B. H. Wright, A.C.G.I. (Metropolitan-Vickers); *treasurer*, Miss D. Baldwin (Ford Motors) (re-elected).

The Branch also decided to send a resolution to the W.E.S. Council to the effect that the Branch deplored the present difference in the cost-of-living bonus for men and women staff as arranged by the Engineering and Allied Employers' Federation.

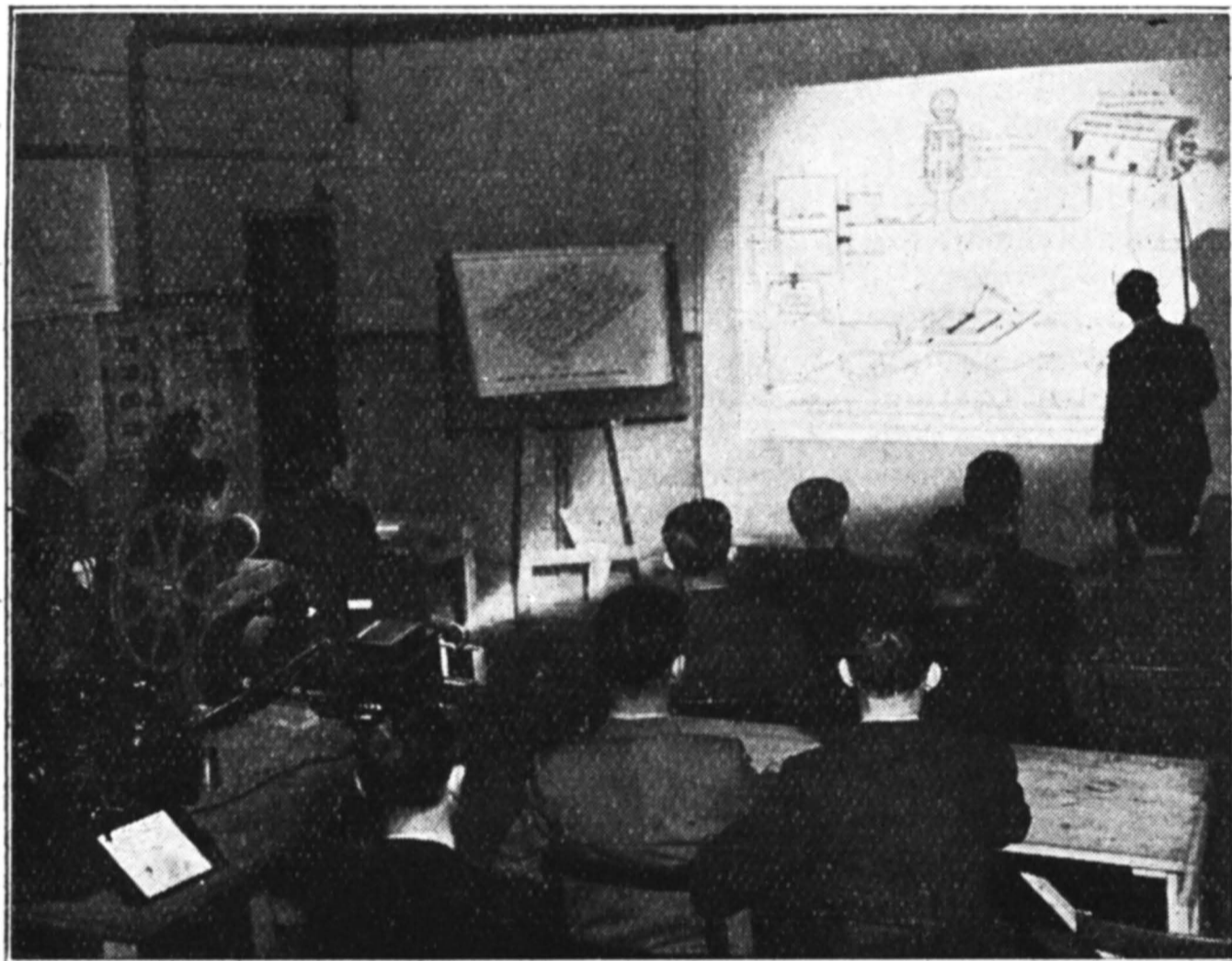
TRAINING IN WELDING

PRIOR to the war the possibilities of welding were becoming more and more realised; this understanding was quickened

the proportion of really skilled welders has steadily declined, and to maintain the necessary standards of quality, effective

supervision has become more necessary.

To meet the need for a considerable number of charge-hand and foreman welders, the Admiralty and the Ministry of Supply have collaborated in setting up a special training scheme at Portobello, near Edinburgh, where men selected by their firms are given a three weeks course of instruction in the elements of welding practice. The course includes lectures on welding technique, metallurgy and welding shop practice, costing, the reading of drawings, assembly and welding sequences for avoiding distortion, together with practical



Theory —

up by the needs of the times to a most remarkable degree—rapid production was urgent, and, in general, those with an engineering aptitude could quickly learn to become reliable welders; but it is necessary for the operative to appreciate, not alone that welding is an economical method, but that to secure its benefits the whys and wherefores must be understood and proper care taken in carrying out welding work.

The introduction of courses of training was, of course, an obvious need, and the training of the twenty thousand additional war-time welders was carried out in the Ministry of Labour Training Centres, in technical colleges, schools run by the welding material manufacturers, and in the works where the men were employed.

For simple operations men and women welders have been trained in a few days or weeks and given effective results, but

demonstrations of modern welding technique. During the demonstrations the use of deep penetration electrodes, heavy gauge electrodes for fillet welding, vertical welding with 6 gauge electrodes, and recent developments are shown, and the students are given an opportunity for practice, if not already



—and Practice.

familiar with the latest methods in use.

Much of the benefit of the course comes from the opportunity given to meet and talk to men doing similar work in other yards and other industries, and the social side of the course has been developed, so that when not at lectures the students still associate and discuss their problems. The lectures last about an hour and are followed by discussion, which has been found to help the instruction. Men are encouraged to take notes, and time is allowed for them to consult the lecturing staff for information other than that given in the lectures. A library of technical books is provided. Reports from firms who have sent men indicate that the courses are effective and that the men return to their works better equipped and with more confidence. Some vacancies exist in courses to come, we gather; billets are found near the Centre by the Ministry of Labour and National Service. Wages and subsistence allowance during the course and railway fares to and from Portobello are paid by the firms

from which the men being trained are drawn.

The Ministry of Supply has been in touch with the Employers' Federations and the Trade Unions concerned, and recommends that employers participating in the scheme should pay £6 per week as wages, plus £1 15s. per week as subsistence allowance to each man who attends the course. It is of course open to employers to make larger payments where this is considered justified—actual board and lodgings in Portobello average 50 to 55s. per week. At the end of each training period of three weeks the Ministry of Supply pays to employers the sum of £9 for each man who completes the course to the satisfaction of the Superintendent. This sum is at the rate of £2 per week towards wages and £1 per week towards subsistence. The sum is paid direct to employers after men have returned from the Training Centre.

Particulars from the Superintendent, Ministry of Supply Welding Training Centre, Marine Gardens, Portobello, Midlothian.

PARLIAMENTARY

Export Credits.—On July 4, **Mr. Ellis Smith** asked the President of the Board of Trade if he could make a statement on the consultation he had had on credit facilities, upon which much of our post-war trade would depend. **Mr. Dalton** replied that he hoped, following consultation with the Chancellor of the Exchequer, to be able to introduce legislation next Session to extend export credits facilities.

Patent Laws.—**Mr. Parker** asked the President of the Board of Trade, on July 4, whether the committee to consider reform of the Patent Laws was empowered to investigate the records of patentees with a view to ascertaining whether the existing law had been used in a manner contrary to the public interest. **Mr. Dalton** said an inquiry into this matter would certainly fall within the terms of reference to the committee.

District Heating Schemes.—**Mr. Parker**, on July 4, asked the Minister of Fuel and Power how many partial district heating schemes were now operating in this country in conjunction with electricity generating stations. In a written reply, **Major Lloyd George** said he was not aware of any district heating schemes operated in connection with generating stations owned by authorised electricity undertakings. He understood that some small schemes were operated in connection with private generating stations, but had no complete information about them.

On July 5, **Mr. Parker** asked the Minister of Fuel and Power if he was aware that the effective utilisation of waste heat would at least

double the thermal efficiency of electricity generating stations; and, in view of the importance to the national economy of this improvement, if he would give an assurance that no new plans will be drawn up for the erection of additional generating stations without taking full account of this possibility. **Major Lloyd George** said he assumed the question referred to the possibility that waste heat from generating stations should be used for district heating schemes. This subject was being at present considered by a sub-committee of the Heating and Ventilating (Reconstruction) Committee appointed by the Department of Scientific and Industrial Research. The Government would wish to see the report of that Committee before it could formulate any policy on this matter.

Joint Production Committees.—Asked by **Mr. Mander**, on July 6, what proportion of the 4,565 firms having joint production committees bore to the total number of firms in a position to form such committees; and in how many instances there had been resistance to the formation of such committees and by whom, **Mr. Garro Jones** said the Joint Production Committees were a feature of the Engineering and Allied Industries. The Ministry of Production could not give figures which would indicate the strength of a particular group of industries, but of firms employing over 150 workpeople about two-thirds had Joint Production Committees or equivalent bodies. No information was available as to the second part of the question.

BUSINESS ANNOUNCEMENTS

Official Notices ; Tenders Invited ; Situations Vacant and Wanted ; Etc.*

APPOINTMENTS VACANT

Electrical Power Engineers' Association

VACANCIES FOR ASSISTANT SECRETARIES

The National Executive Council invites applications for two appointments of Assistant Secretary on the Official Staff of the Association, one, for the Northern Area (location Edinburgh) to be made immediately, and the other, for the North Western Area (location Manchester) to be made in the near future.

Applicants should have had experience in the Electricity Supply Industry, preferably on the technical side.

The duties will comprise the conduct of negotiations on behalf of Members, propaganda work, etc. Salary Scale (basic), £350 rising to £500, subject to the operation of Clause 33 of the National Joint Board Agreement; present commencing salary, £401.

The successful applicants will be required to pass a medical examination, and to contribute to the Association's Staff Pension Scheme.

Applications, in writing, stating age, and endorsed "ASSISTANT SECRETARY," should be addressed to—

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

and should be received not later than Friday, the 11th August, 1944.

Stretford and District Electricity Board

APPOINTMENT OF DEPUTY CHIEF ENGINEER

Applications are invited from candidates for the appointment of Deputy Chief Engineer, at a salary of £800 per annum, rising, subject to satisfactory service, by annual increments of £50 to a maximum of £950 per annum. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the selected candidate will be required to pass a medical examination. Candidates must be between the ages of thirty-five and forty-five, and preference will be given to members of the

Institution of Electrical Engineers. Modern generating and transmission experience is essential. Applications endorsed "Deputy Chief Engineer," stating age, training, qualifications and previous experience, and accompanied by copies of three recent testimonials, must reach the undersigned not later than Monday, the 31st instant. Canvassing will disqualify.

C. TREWAVAS,
Clerk to the Board.

Town Hall,
Stretford,
Lancs.
8th July, 1944.

Corporation of Bristol

ELECTRICITY DEPARTMENT

APPOINTMENT OF JUNIOR CHARGE ENGINEER

The Electrical Committee of the City of Bristol have a vacancy for a JUNIOR CHARGE ENGINEER for Rotary Substation work.

The salary will be in accordance with the National Joint Board Schedule for the Electricity Supply Industry, Class "H," Grade 9a, which is at present £316 per annum.

Applications, accompanied by copies of at least three testimonials, must be received by the undersigned not later than Friday, the 21st day of July, 1944, endorsed "Junior Charge Engineer."

A. J. NEWMAN,
M.I.Mech.E., M.I.E.E.,

Chief Engineer and General Manager,
Dorset House,
Clifton Down,
Bristol, 8.
7th July, 1944.

County Borough of Doncaster

ELECTRICITY DEPARTMENT

APPOINTMENT OF COMMERCIAL ASSISTANT

Applications are invited for the above appointment from persons with suitable qualifications and experience in an Electricity Supply Undertaking.

The salary attached to the position is £550 per annum, plus War Bonus (at present £50 14s. 0d. per annum).

APPOINTMENTS VACANT—Continued

Particulars, with terms and conditions of the appointment and list of duties, can be obtained from the Borough Electrical Engineer, Grey Friars Road, Doncaster, by sending a stamped-addressed envelope.

H. S. ESSENHIGH,
Town Clerk's Office, Town Clerk.
Doncaster.
7th July, 1944.

County of the City of Worcester**LADY DEMONSTRATOR**

Applications are invited for the post of LADY DEMONSTRATOR in the Electricity Department of the Corporation.

Applicants must hold a Diploma of Domestic Science or other approved Certificate and have had previous experience in an electricity showroom.

The salary offered is £180 per annum, rising to £200 per annum by annual increments of £10, plus a war bonus of £40 6s.

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

Applications, stating age, qualifications and experience, with copy of testimonials, and endorsed "Demonstrator," must be received by the undersigned not later than 22nd July, 1944.

Canvassing in any form will be deemed a disqualification.

C. H. DIGBY-SEYMOUR,
Guildhall, Town Clerk.
Worcester.
8th July, 1944.

Borough of Ashton-under-Lyne**ELECTRICITY DEPARTMENT****APPOINTMENT OF
SUBSTATION CONTROL ENGINEER**

Applications are invited for the position of Substation Control Engineer for shift duties in the Council's Wellington Road Works, at a salary in accordance with the N.J.B. Schedule, Class F, Grade 9, commencing at the present rate of £310 per annum.

Applicants should have had sound technical training and experience in the control of high and low pressure switchboards, operation of rotary converting plant, and grid switching.

Applications, stating age, education, technical training, experience, and present position regarding service in H.M. Forces or release from present appointment, and accompanied by copies of not more than three testimonials, should be sent to the

Chief Engineer, Electricity Department, Wellington Road, Ashton-under-Lyne, not later than Monday, 24th July, 1944, endorsed "Sub Station Control Engineer," and preference will be given to applicants of Graduate standard of the I.E.E.

As the appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, the selected candidate will be required to pass a medical examination, and contribute to the superannuation fund.

D. W. BROMLEY,
Town Hall, Town Clerk.
Ashton-under-Lyne.
10th July, 1944.

Applications are invited from Electrical Engineers for appointment to TEMPORARY COMMISSIONS in the ROYAL INDIAN NAVAL VOLUNTEER RESERVE (Electrical Branch).

The following qualifications are required:—Candidates should possess a University degree in Electrical Engineering or be Graduates, Associates or Corporate Members of the Institution of Electrical Engineers, or should be able to produce documentary proof of having received a regular professional education in electrical engineering, such as a certificate of training at Faraday House or the City and Guilds Institute. Candidates should also have practical electrical experience of a general nature. Minimum age 20 years.

Applicants should write, quoting D.861A, to the Ministry of Labour and National Service, Room 432, Alexandra House, Kingsway, London, W.C.2, for the necessary forms and particulars, which should be returned completed on or before 24th July, 1944.

OVERSEAS EMPLOYMENT: INSTRUMENT MECHANICS required for service in the Middle East; must be familiar with both mechanical and electrical sides and have had experience in the adjustment and calibration of mechanical flow meters and pyrometers; knowledge of electrical technology desirable. Age not over 40. Total emoluments £600 a year or more in accordance with experience. Free passages, accommodation, medical attention, and kit allowance. Written applications (no interviews), giving full name, date of birth, Identity and National Service Registration Numbers, name of allocation Office and medical grade if known, industrial training and experience, name and address of present employers, and details of present work, should be sent to The Secretary, Overseas Manpower Committee (Ref. 480/9), Ministry of Labour and National Service, Alexandra House, Kingsway, London, W.C.2. Applications will not be formally acknowledged.

FACTORY SUPERINTENDENT required for Electric Lamp Factory in North London. Applicant must have had experience in handling female labour and be a good disciplinarian.—Reply, stating age, experience and salary required, to Box No. 8291, THE ELECTRICAL TIMES.

Buying Department, MANAGER required by Manufacturing Electrical Engineers in Birmingham. A permanent appointment, with excellent post-war prospects, is offered.—Box No. 8293, THE ELECTRICAL TIMES.

Assistant Estimating and SALES ENGINEER, with experience of Switchgear. A permanent and progressive position is offered at Birmingham Works.—Box No. 8295, THE ELECTRICAL TIMES.

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

WORK WANTED

STURDY REWINDS. Transformers and Coils, all sizes to 5 K.V.A. Special department for Radio Transformers.—**STURDY ELECTRIC Co., LTD.**, Dipton, Newcastle-upon-Tyne.

ARMATURE WINDING AND REWINDING. We are specialists in small motor winding and repairs, particularly electric tools. Prompt attention and guaranteed work.—**SOUTHERN IGNITION Co., LTD.**, 190 Thornton Road, Croydon. Phone: THORNTON Heath 4276 (3 lines).

PLASTIC MOULDING. Capacity available.—**BENDIX & HERBERT, LTD.**, 270, Neville Road, London, E.7.

AGENCIES

Agencies Required for Cables, Wires, Electric Motors, Instruments, Fans, Lamps, Cooking and Heating Appliances, Accessories and other Electrical Apparatus saleable in India. Communicate **MESSRS. J. RANCHHODDAS SHAH & COMPANY**, 31 Forbes Street, Fort, Bombay, India.

WANTED

SCRAP COPPER, Lead, Cable, Old Machinery and Plant, and any description of ferrous and non-ferrous metals and residues purchased for cash.—**W. & H. COOPER, LTD.**, Brady Street, Bethnal Green, E.1. 'Phone: Bishopsgate 7288-9.

Wanted, **ROTARY CONVERTERS**, any size.—**UNIVERSAL**, 221 City Road, London, E.C.1.

MERCURY (QUICKSILVER) wanted. Write for packing instructions. Gold, Silver and Platinum also purchased.—**COLLINGRIDGE & Co., LTD.**, Riverside Works, Riverside Road, Watford. (Tel. 5963.)

1—230 D.C. 15 in. **EXHAUST FAN**, approx. 1,000 R.P.M.

6—1 H.P., 400 V, 3-Ph., 50 C, 1,400 R.P.M., **BALL BEARING MOTORS.**

PARRY'S, ELECTRICAL ENGINEERS, 32/4 Russell Street, Liverpool, 3.

FOR SALE

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

Heavy-duty ARC - WELDING PLANTS, 200 amps. Price £31 10s. complete. Also Spot Welders, £36 15s.—**JOHN E. T. STEEL**, Clyde Mills, Bingley. 'Phone 1066.

Motorised - ½ in. BENCH DRILLING MACHINE, 13 speeds, £11 11s.—**JOHN E. T. STEEL**, Clyde Mills, Bingley. 'Phone 1066.

BELT GRINDERS or Sanders 4 in. wide Belt, £5 5s.; 6 in. wide Belt, £10 10s.—**JOHN E. T. STEEL**, Clyde Mills, Bingley. 'Phone 1066.

ELECTRIC Motors, Control Gear, etc., for disposal; all classes of Electrical Repairs, Rewinds, etc.—**OLDFIELD ENGINEERING COMPANY, LTD.**, 96 East Ordsall Lane, Salford, 5. Telephone Blackfriars 6821.

Self Priming ELECTRIC Pumps, 300 g.h.p., £11 11s.—**JOHN E. T. STEEL**, Clyde Mills, Bingley. 'Phone 1066.

TIMBER SECTIONAL BUILDINGS. Mostly in excellent condition, otherwise thoroughly reconditioned in our works. Over 30 buildings available, including:—16 ft. × 10 ft., 30 ft. × 15 ft., 72 ft. × 12 ft., 60 ft. × 18 ft., 60 ft. × 15 ft., 160 ft. × 15 ft. No Purchase Licence required. Suitable for Hostels, Offices, Canteens, Workshops or Storage Purposes. Send for full list and prices.—**D. McMASTER & Co.**, Mount Bures Works, Bures, Suffolk. Tel.: Bures 251.

A largest Stock Surplus **EBONITE, FIBRE, T.R.S. CABLES, etc.**, Searchlights (sale or hire). Mirrors, Carbon Rods, Enamelled cotton and silk Instrument and Resistance Wires, etc.—**LONDON ELECTRIC FIRM**, Croydon.

WATTMETER, Everett Edgumbe, Single-Phase, 100-230 volts, 300 watts. Voltmeter, A.C., Weston Electric, five ranges, 1.5-150 volts.—Particulars, **KNAPP & BATES**, 10 Gate Street, Kingsway.

STURDY TRANSFORMERS. 50 watts to 5 K.V.A. Air-cooled or oil immersed. Prompt deliveries. Quotations by return.—**STURDY ELECTRIC Co., LTD.,** Dipton, Newcastle-upon-Tyne.

The following, of interest to Electricians, can now be supplied:—Cards of Vacuum Cleaner Brushes, 19 sets; Hair Dryer Brushes, 12 sets; Egyptian Cotton Tape; Varnished Sleeving, $\frac{1}{2}$ m/m to 25 m/m (assorted gross-supplied to specification); Bakelite Sheets; Felt and Fibre Sheet; Rubber Grommets; Fuse Wire (small reels); Car Radio Suppressors, etc.—**L. S. COLLINGRIDGE & Co.,** 9 Dalkeith Road, Harpenden, 3755.

May we send our Engineer's **STETHOSCOPE** on approval (without obligation); in use in many power stations? Details on request.—**CAPAC Co., LTD.,** 2 Ullswater Road, London, S.W.13.

DRY BATTERIES, B Class. Best quality only. Secure your Autumn-Winter supplies now. Good stocks available for immediate delivery.—**DANGERFIELD & MOIR,** 100 Victoria Street, Bristol, 1.

MISCELLANEOUS

ENGINEERING TECHNICAL BOOKS (New or Secondhand) wanted in any quantity. Attractive cash offers. Call third floor, 356 Oxford Street, W.1, or "Stoneleigh," St. George's Avenue, Weybridge.

MONOMARK Service. Permanent confidential London address. Letters redirected. 5s. p.a.—Write **BM/MONO54,** W.C.1.

CONTRACTS OPEN

The date mentioned is the last day for the receipt of tenders or for making applications for forms of tender, etc., the name and address at the end is the person from whom or the place where forms of tender, etc., may be obtained.

July 24.—**Cheadle & Gatley U.D.C.:** One 10 cwt. battery electric vehicle. Mr. B. J. Russell, acting electrical engineer and manager, 37 High Street, Cheadle.

July 25.—**North-West Midlands Joint Electricity Authority:** Circulating water pumps. Messrs. Merz & McLellan, 32 Victoria Street, S.W. Deposit, £5 5s. Advertised May 18 issue.

July 27.—**Belfast T.C.:** (1) Armature coils, (2) steel pinions for tramcars. Acting general manager, Transport Department, Sandy Row, Belfast.

No date.—**Bangor T.C.:** Electric vehicle, Mr. F. O. Harber, borough electrical engineer, Bangor.

BUSINESS NOTICE

E.W.F.—We are informed by the Electrical Wholesalers' Federation, Ltd., that the following firm has been elected a member of the Federation, as from January 1, 1944: **F. D. Newcombe & Co., Ltd.,** 39-40 North Street, Exeter.

(Continued on page 55)

ELECTRICAL TIMES

Registered at the G.P.O. as a Newspaper.

SUBSCRIPTION RATES

(payable in advance)

Home and Abroad (except Canada), £1 15s. 0d, per annum. Canada £1 12s. 10d. Pro rata for shorter periods. Subscriptions can begin at any time.

CLASSIFIED ADVERTISEMENTS

Official Notices: Tenders Invited; Plant for Sale; Legal; Patents; Sale by Tender; Educational; and Miscellaneous, 1/6 per line (as printed, average 6 words to line, 9 lines to inch).

Prepaid Advertisements (set solid). Agencies; Partnerships; Second-hand Goods; etc., 3d. per word.

Situations* Vacant and Wanted, 3d. per word. Minimum 2/-. Prepayment essential. Box Number* and our Address count as five words.

CLOSING TIME for receipt is 10 a.m. **WEDNESDAYS**

COMMUNICATIONS AND REMITTANCES

These should be addressed to **THE ELECTRICAL TIMES,** Sardinia House, Sardinia Street, Kingsway, W.C.2. Tel: **HOL 6016.** Tele: "Equivolt, Estrand, London."

* Where applicants for posts advertised under box Numbers do not wish their letters to be forwarded to any specific advertiser (such as their own employer) and notify us to that effect, secrecy will be observed by us and the applications destroyed in this office. Applicants applying for positions should not send original testimonials.

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

NOTES ON WIRING**PROTECTION OF 400 V METAL**

I AM constantly receiving inquiries about the "6-ft. rule," which has been handed down since 2 by 200 V 3-wire distribution was first brought into consumers' premises, and even, if my recollection is correct, when 100 or 110 was the usual consumers' voltage and 3-wire systems were at 2 by 100 V. It is still applicable here and there, but for the most part may be regarded as a hoary tradition. Nobody nowadays, in designing a main fuseboard or switchboard for internal distribution from a 3-phase 4-wire network, would dream of endeavouring to keep 400 V terminals, connections and fuses 6 ft. apart, if they are properly protected. In a triple-pole switch on a 400 V supply, the switch arms must, of necessity, be comparatively close together, and so long as they are shielded from one another, no danger need be apprehended. In the ordinary course, these switches will generally be ironclad, and it is assumed that the covers will not be removed by unauthorised persons.

If d.p. switches connected between different phases and neutral are adjacent to one another the protection afforded is definitely greater, for two cases of earthed metal are interposed between the phases. The same applies to the fuses, which, in any event, will be shrouded to conform with regulations. Why, then, has this 6 ft. rule been retained? It dates back to the days when open type switchboards were accessible to every Tom, Dick or Harry, when busbars and contacts were not shrouded, and when any pressure above 100 V from earth was considered to introduce a potential danger which had to be sedulously watched.

The reason is that there are still some fools and ignoramuses in the world, even in the electrical industry, and that regulations must be framed to protect us from them—from these very people who never read regulations. In its application to switchgear and fuses, the 6 ft. rule in the I.E.E. regulations is given very clearly as an alternative to other more obvious and more practical safety precautions only. The regulation in question reads as follows:—

"117. Where a supply is given at medium voltage for the purpose of distribution and use at low voltage, any terminals or other metal parts between which there may be medium voltage shall be installed in a room accessible only to authorised persons, or shall be so fixed as to be not less than 6 ft. apart, or shall be enclosed in earthed metal marked to indicate the risk of dangerous shock due to the voltage between the conductors contained in them; and any low-voltage distribution fuseboards, switches, etc., shall be so arranged that they can be opened without exposing at the same time any terminals or other metal parts between which there may be medium voltage."

The distinction between the "ors" and the "and" should be noted. I think that

the words after the semicolon are not sufficiently explicit. Evidently some people still think that they condemn the 3-pole-and-neutral board from which either 400 or 230 V circuits can be taken. But I am convinced that this was never the intention, and that so long as everything is properly shrouded, the use of these boards is quite admissible. With adjacent 230 V fuseboards on different phases, or a 230 V board beside a 400 V board, I think that a similar latitude should apply. If both covers are opened at once and the shrouds removed, an element of danger would exist to the person who does this, but are we compelled to protect him? When unshrouded fuses were used, we arranged such boards so that the covers opened back to back, if space made the 6 ft. distance between the boards impossible, making it, at any rate, inconvenient to have both boards open at once. This is apparently not deemed sufficient, even if there are danger labels to keep the unauthorised person away, and even locking up the cases and entrusting the keys to authorised persons only would still be contrary to the part of the regulation after the semicolon, if read literally. "Opened up" is not a good expression to use; is it presumption to assume that it means simply opening the cover, in which case the rule should hardly be necessary if all live metal is shrouded?

The 6 ft. rule appears again in connection with accessories as distinct from mains switches. Regulation 613A requires that switches on different phases must be either 6 ft. apart or in earthed metal cases, and is not very burdensome. In fact, it would have been wise to add that the covers or cover-plates should have screwed corner fixing, and not covers simply screwed on to the threaded neck of the switch and easily removable. But here, again, the same words appear as to no live metal being exposed when they are opened. On tumbler switches live metal is normally exposed on taking off the cover. Are two adjacent ironclad tumbler switches allowable if they are in separate boxes? This situation need seldom arise, but it does most often on staircases with two-way switching when different floors are on different phases.

Regulation 612B refers to portable appliances on different low-voltage phases in the same room. "So far as practicable," provision shall not be made for their use, but I think that a ban should be placed on the practice altogether on domestic and commercial premises. In factories (which do not come under the I.E.E. Regulations) the Factory Electrical Regulation No. 13 regarding flexes does not cover the point

specifically, but it is generally covered by Regulations 1 and 3, the onus of preventing danger being placed on the occupier.

The chief difficulty in preventing proximity or arranging for proper protection of 2-wire circuits on different phases arises when an installation has to be changed over from single-phase to 3-phase distribution, or similarly from a 2-wire to a 3-wire system. A degree of considered judgment has then to be exercised as to what circuits, con-

nections and accessories can be left as they are and what should be altered. The 250 V d.p. switch may even constitute a problem in itself. Incidentally, I have always regretted that makers should consider it necessary to have separate categories for 250 and 500 V d.p. switches. An ironclad switch of good design and construction for use on 250 V between poles and the same voltage between live pole and earth should certainly stand up to 500 V. **MEGOHM**

ELECTRICAL PLANT PROBLEMS

FIRE PRECAUTIONS IN FACTORIES

Question 1399.—*What are the usual fire precautions taken in factory substations and installations?*—G.D.D.

One cannot talk of usual fire precautions, as so much depends on the situation of the plant and its importance. Where continuity of supply from a large substation is vital, the capital cost of an automatic fire-extinguishing system may be well justified, while in smaller installations some cheaper system must be looked for.

As the principal problem will be to protect against oil fires, proper provision must be made for oil drainage. If the transformers are outdoors, this is readily catered for by providing a sump filled with medium-sized pebbles, to absorb the oil. It is essential that sufficient capacity should be allowed to take the full volume of oil within the transformer, including a suitable allowance for the volume of pebbles. Similar provision may be made in the case of indoor transformers, but it is often preferred, where possible, to arrange for the oil to drain to a sump outside the building. This presupposes that the transformers adjoin an outside wall and the floor can be made sloping. Good spacing between adjoining transformers is one of the simplest safeguards against fire-spread. In addition, each transformer should be surrounded by a small wall, 6 to 9 in. high, to confine the oil. On more important installations the provision of fire barriers may be considered. These may be of fire-resisting material, but as there is always the possibility of explosion to be considered, there is much to be said in favour of brick, both on the score of efficiency and cheapness; but make sure a good quality mortar is used. Where transformers have to be placed in production areas, or other situations where such fire precautions are not practicable, it is well worth while considering the use of a non-inflammable filling in place of oil. In all cases proper protection should be given to the cables, and, if necessary, they should be surrounded by asbestos fire-resisting covering. In general, the above remarks apply equally to switchgear as to transformers.

The methods of fire-fighting also vary with the type of installation. For important plant, the most common arrangement is to use high-pressure water-spray on outdoor equipment and a centralised CO₂ system for indoor installations. In the latter case, barriers should be provided to restrict the volume of the space required to be filled with gas. It is usual in these systems to provide for automatic release of the extinguishing medium on the occurrence of a fire.

For smaller installations where the capital cost of automatic equipment is not justified, portable CO₂ bottles may be recommended. These vary in size from small hand units to trucks containing two full-sized cylinders. The use of water on oil fires, other than properly designed jet installations, is ineffective, and may even assist in spreading the fire. With regard to the general installation, provided the wiring is of a good standard, no particular precautions are necessary, except in special cases, such as cellulose spray booths. It is a useful precaution, however, to provide a number of hand extinguishers of the carbon tetrachloride or methyl bromide type. The former should not, however, be used on a hot oil fire in a confined space, as the resulting fumes may be toxic.—S.C.

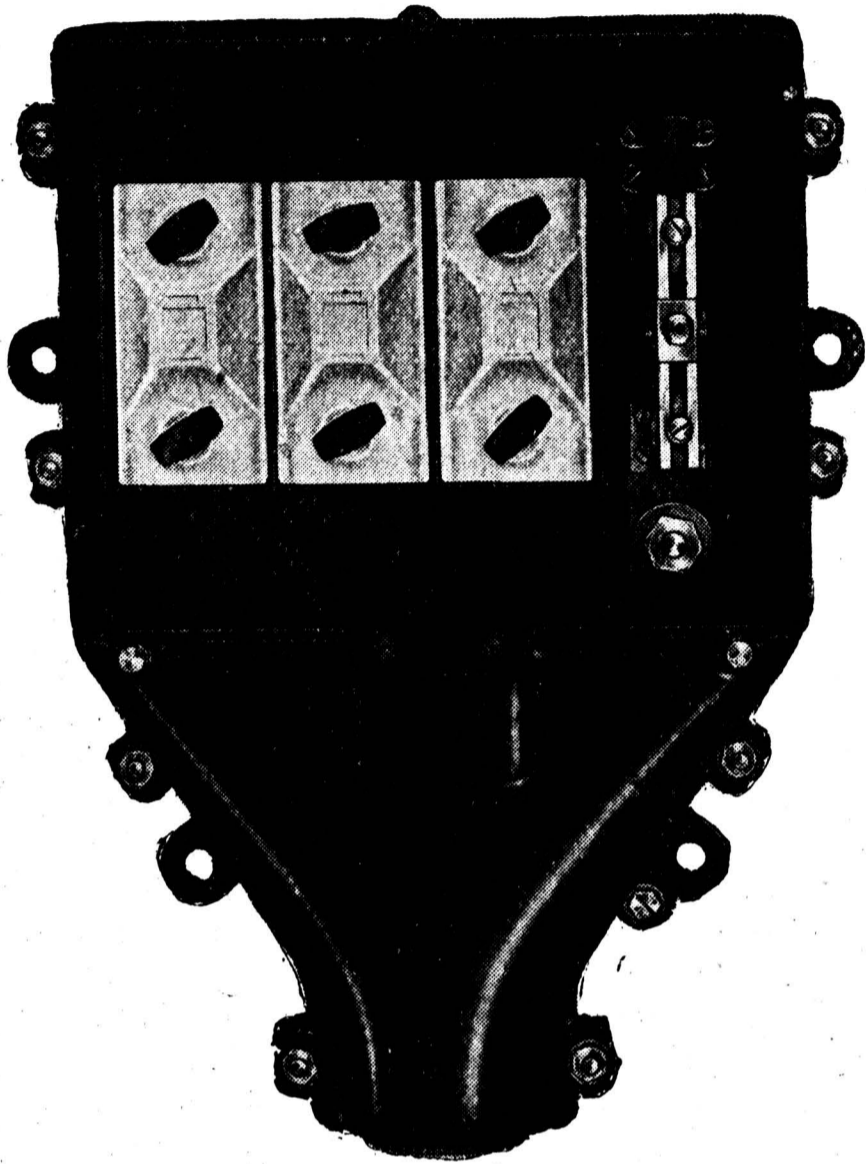
IRON AND STEEL—BUILDERS' GOODS

Further details of the amended procedure for the authorisation by the Ministry of Works of Iron and Steel for Civil Requirements in Manufactured Builders' Goods are now available from the Ministry of Works (Branch A.S.69), Lambeth Bridge House, S.E.1. Under this procedure M. Forms are no longer issued by Regional Licensing Officers; the requirements are now met by bulk allocations of iron and steel to manufacturers by Branch A.S.69 for the production of manufactured builders' goods. A list of such goods is given; when required in connection with the equipment of canteens they are, however, subject to a special procedure, about which information may also be obtained from the M.O.W. (Branch A.S.69).

THE BUYERS' COLUMN

Four-Pole Ironclad Service Unit

A new Isco ironclad service fuse unit has been put forward by W. T. Henley's Telegraph Works Co., Ltd., Milton Court,



Interior of New 4-pole "Isco."

Westcott, Dorking. This is a four-pole indoor unit with vertical entry sealing chambers. It is designed for use with

h.r.c. fuses of $3\frac{1}{4}$ in. centres and in capacities from 60 to 400 A. The porcelain fuse carriers have wedged-shaped tightening devices for the contacts, and they are operated by shaped insulating knobs in the front, as may be seen in the illustration. An unglazed square recess is provided on the front for marking the rating of the fuse.

High conductivity fittings mounted on an insulating base, are provided for the cable connections. These are of the non-sweating type, with the exception of the incoming fittings on Isco CF. Various arrangements of outgoing phase and neutral conductor fittings are available suitable for cables up to 0.15 sq. in. for type CE and up to 0.3 sq. in. for type CF. The sealing chambers are provided with wood bushes, but brass wiping glands can be provided. The glands, of a universal type, have a tapered portion grooved to facilitate cutting to suit various diameters of cable. They are of minimum bore, so that they may be cut on site to suit large diameter cables.

Industrial Lighting Equipment

A complete catalogue of industrial lighting equipment has recently been issued by the British Thomson-Houston Co., Ltd., Crown House, W.C.2. This is on a modest war-time scale, but, nevertheless, succeeds in giving all the necessary information and prices within a small compass. This covers equipment for 80 W fluorescent tubes, discharge lighting, tungsten lamps, as well as bulkhead fittings and local lighting equipment. This firm has also issued a broad folder illustrating the fittings that are available for fluorescent tubes.

CONTRACTORS' NOTES

FURTHER communications by Mr. L. C. Penwill, director and secretary of the E.C.A. and the N.F.E.A., to members deal with:

Cost of Living.—For the three months commencing the third pay-day in July, the operation of the current declaration as to wages and general working, dated April 5, 1944; in accordance with the agreement of November 24, 1939 (amended on September 24, 1943), arrangements are temporarily suspended, during which period an amount equal to the Cost of Living (War) Addition payment of 4½d. per hour awarded by the April 5 declaration shall be made, plus a further 1d. per hour. The resultant cost of living payment commencing on the first pay-day in July, 1944, for the pay period covered by that pay-day: Labourers over 21 years of age, 5½d. per hour; between 18 and 21 years, 3d. per hour, and under 18 years, 1½d. per hour.

P.V.C. Cables.—A temporary shortage in

the supply of p.v.c. cable has caused the Cable Planning Officer of the Ministry of Supply to issue instructions calculated to reserve supplies for those special cables for which p.v.c. provides the greatest economy in rubber. There is no reversal of the long-term policy of introducing p.v.c. as the primary substitute for natural rubber. The result is that for two or three months the manufacturers will take advantage of their option to supply the following in natural and/or synthetic rubber, except in so far as demand may be met from existing stocks: Cables and flexibles to B.S.7 (r.i. for light and power); B.S.883 (ship's cables); G.D.E.S. 1, 5, 8, 9, 10 and 19 (Government Department special r.i. cables and flexibles).

Insurance of Part-Completed Installations.

—With reference to plant and machinery under construction, in September, 1942, the Board of Trade introduced a scheme in conjunction with the War Damage Commission, whereby contractors or owners

could protect themselves against risk of enemy action damage during the period when plant or machinery was first fixed to the property and the time it became insured as "land" under Part I of the War Damage Act. The Association has now secured from

the W.D. Commission that similar coverage is applicable to an electrical installation (including private telephone installations) during the "partly installed" period. Mr. Penwill sends to his members full details of the scheme.

LETTERS TO THE EDITOR

We cannot be responsible for the opinions and expressions of our Correspondents

Socket-Outlets

SIR,—The *nom de plume* under which your correspondent *Megohm* writes is singularly appropriate, in view of his resistivity to new developments in plugs and sockets (June 29 issue). The essential point which he and other opponents appear to overlook is that they are struggling—in vain, I hope—to retain a non-existent standard. There never has been a domestic standard plug, unless by exceeding the elastic limit of credulity, three ill-assorted sizes can be so designated.

The industry is now offered a 3 kW plug, not much larger than the smallest of the existing assortment, which will do the work of all three. Without much fear of contradiction, I make the assertion that it will do the work better. Without any shadow of doubt it will do it much cheaper.

This is not a lone voice crying in the wilderness. The measure of support from supply authorities, users, contractors and manufacturers of domestic appliances is such as to make it certain that the 3 kW 230 V plug has come to stay.

In view of the fact that the industry is offered what can truly be called a domestic standard plug, it seems incredible that its opponents find themselves able to put up as an alternative an attenuated makeshift of an uprated 5 A plug which admittedly will not take a 3 kW fire, and of which a proportion are almost certain to overheat with a 2 kW load.

July 3.

R. AMBERTON.

32 Queen Victoria Street, E.C.4.

Caen Fifty Years Ago

SIR,—It is unlikely that the Ferranti alternator in the original electric light station at Caen is still running, but an interesting reminder of it and its ceremonial starting up comes to light in a letter from Dr. Ferranti, written almost 50 years ago, to tell Mrs. de Ferranti all about it. It is dated June 10, 1894. The Doctor had had to hurry away from the official opening of the Portsmouth Station, which has just celebrated its Jubilee (E.T., June 8—Ed.), to attend the ceremony at Caen. The following extract from his letter seems of particular interest to-day, when Caen features so prominently in the front-page news.

July 5.

R. J. HEBBERT.

Ferranti, Ltd., Hollinwood, Lancs.

"No doubt you had my wire from Caen. It is a pretty old place, with wonderful old churches, three of which I have visited.

"When I got to Southampton on Friday night, I found, to my great pleasure, that instead of the old boat in which I crossed before, there was a fine new one, very comfortable and making the passage in about six hours.

"I arrived at Havre in the morning and had breakfast on board whilst at anchor alongside the Quay.

"I then visited the E.L. Station, and afterwards, at 11 a.m., took the small steamer for Caen, which brought me there by about 2 p.m. It is a very pretty trip up the river to Caen.

"I was met at the boat and found that everything was ready to commence the opening of the station. The building is a very good one and my machine looks very well.

"At six o'clock in the evening the Bishop of Bayeux came to the works, attended by about 20 priests. Various hymns were chanted and then the machinery was blessed. After this the Bishop, who is a very old man, with a very kind face, turned on steam to the engine, set it going, and lit up the lamps, much as you saw at Portsmouth.

"I was introduced to him and he was very pleasant. He told me that he knew Cardinals Wisemann and Newman. The people of Caen, which is quite Norman, are very English in their general appearance.

"After the ceremony the directors had dinner in the station and afterwards received everybody of note in the town.

"Everybody was delighted and very proud to think that they had such an installation in Caen. If you see Mr. Ellis, you can tell him that this time I had a very good dinner and that there was not a shade of a blink, even to the most critical eye."

July 10, 1894.

S. Z. DE FERRANTI.

Two-Part Tariff Revision

SIR,—In a letter published in your June 29 issue, Mr. A. C. Eden suggests that it would help in establishing uniformity of domestic two-part tariffs if a uniform method of assessing rateable values were to be adopted.

The Rating and Valuation Act of 1925 actually aimed at achieving uniformity of assessment, but has never been fully implemented, mainly because of allegations that this would cause undue hardship with respect to certain classes of property. In 1937 the Ministry of Health set up a Departmental Committee to consider these allegations and make recommendations. This Committee prepared a report, which, due to the intervention of war, has not been published.

It may thus appear that lack of uniformity in rating assessments may some day cease.

July 15.

P. SCHILLER.

15 Savoy Street, London, W.C.2.

All-Electric Heating

SIR,—I have read with interest *Hotspot's* Notes and the article on "All-Electric Heating," in June 29 issue, but feel that the

comparisons made are not completely fair, particularly as *Hotspot* is comparing heating systems of different efficiencies.

The electric fire is, in itself, 100% efficient, but the normal coal fire is anything in the order of 15/20% efficient, and what the Coal Utilisation Committee are endeavouring to stress is that to obtain the same heating effect with either type of fire the same amount of coal is required to be consumed either in the grate or power station.

No one surely considers that a coal fire in its present form is an efficient method of heating or that it will take a very effective place in heating problems of the future. In order to obtain a truer basis of comparison, a more efficient heating system must be studied, such as a hot water circulation, central heating system with thermostatic control. Such systems were becoming extremely popular before the war, and there is good reason to believe that they will be perpetuated in the post-war period.

There are three methods of heating the actual boiler to be considered: (a) Coke or coal, (b) gas firing, (c) electric immersion. The coal fire, assuming an overall boiler and utilisation efficiency of 55%, will give a heating effect of 155 therms per ton of coal used.

The gas-fired system, assuming a 65% conversion efficiency, and 55% boiler and utilisation efficiency, gives 100 therms per ton of coal used.

The electric immersion heater, assuming 95% boiler and utilisation efficiency and 20% generation and transmission efficiency gives 53 therms per ton of coal used.

To obtain approximately the same heating effect as from a coal-fired boiler, 1.55 tons of coal are required for the equivalent gas and three tons for electricity.

It is, of course, admitted that the solid fuel fired boiler requires attention, and provision has to be made for ash disposal, but in many cases this would not be considered an inconvenience. In cases where the inconvenience cannot be permitted, either gas or electricity offers equivalent possibilities and conveniences. However, for the same heating effect twice as much coal is required in the case of the electric system, and since coal is our national fuel and great source of revenue in the export market, we must, without bias, carefully consider its best utilisation, particularly in the home market.

Actual cost to the consumer is a variable quantity. Assuming electricity at 0.5d. per unit and gas at 13d. per therm, the relative costs would be: gas, 13d. per therm; electricity, 14½d. per therm; so, even in actual costing, the balance might show in favour of gas.

I do feel that full consideration must be given to all different types of heating, particularly with a view to conservation of

coal, which will be just as important after the war as at present.

July 7. W. M. CRAIG,

B.SC.(ENG.), A.M.I.E.E., A.M.I.Mech.E.
Farnham Royal, Bucks.

Acidity in Transformer Oils

SIR,—Your correspondent, "*Gymnotus*" (issue July 6, p. 6) is on the right track. I wonder if he would oblige by replying to the following queries:—

- (1) Has he any evidence to indicate whether, when water is found in working transformers, it has been absorbed from the atmosphere or released during the gradual oxidation of the oil? I refer to transformers without conservators or dehydrating breathers.
- (2) Can he confirm that, if the air space is ventilated to obviate condensation, corrosion will not occur, and rise of acidity will have no ill-effects until at a value of about 6 mg. sludging troubles will begin?
- (3) Does he agree that treatment with any water process renders oil more prone to acidulation even though the water is afterwards so thoroughly extracted that a B.D.V. of 60 kV is obtained?
- (4) Has he any information as to the relative proneness to acidulation after alumina treatment?

July 8.

F. MATHER.
3 Southway, Fairfield, Manchester.

Automobile Batteries

SIR,—I am glad to see METEOR rise to the defence of British accumulator makers—but where is the evidence to justify such confidence as expressed in your editorial paragraph, "British Accumulators are Best"?

In the next paragraph you again refer to my letter of May 25—though why under the heading "Boost Charging Not New" is not clear—and you appear to be quoting Mr. Lockton's letter in yours of June 22. I feel that these statements and suggestions cannot be regarded as "authoritative evidence" without test figures to support them.

As to new discoveries, is it not very regrettable that there has been no really new discovery in connection with secondary batteries since their inception?

It should be clear that Messrs. Critchfield & Crouse's statement refers to standard 6 V passenger car batteries as used on American cars, on which the electrical duties are usually much heavier than on British cars.

To settle the point, will any British battery manufacturer put up a standard 6 V car cell for a discharge test at 300 A for 3½ minutes at 0°F, the final voltage to be not less than 1 V per cell. If so, perhaps you could arrange for the test to be carried out in an unbiased manner and the results published.

July 8.

J. COXON., M.I.E.E.
Church Stretton, 37.

PERSONAL

The Central Electricity Board has made the following further appointments, consequent upon the staff changes already announced to take effect at the beginning of next month: **Mr. J. D. Peattie, M.I.E.E.**, operation engineer, Head Office, to be deputy chief engineer, and **Mr. A. R. Cooper, A.M.I.E.E., M.Inst.F.**, operation engineer for the South-East England and East England Areas, to be operation engineer, Head Office. Mr. Peattie has been the Board's chief operation engineer for the past 15 years. A native of Dundee, where he received his early education, he took his technical course at the City and Guild College, London University, gaining a B.Sc. in Engineering with first-class honours. For three years before the last war, in which he served with the Royal Naval Division, he was with Siemens Schuckertwerke, Berlin, and in the interval between the war and his joining the staff of the Board in 1929 he held appointments successively with Metropolitan-Vickers at Trafford Park; Edmiston Brown & Co., Ltd., at Glasgow, and the Manchester Corporation Electricity Department. Mr. Cooper entered the Board's service as assistant operation engineer for the North-West England and North Wales Area in 1935 and joined the Head Office staff as chief assistant operation engineer two years later. He has held his present appointment since November, 1942.

The announcement is made by Brush Coachwork, Ltd., Loughborough, that **Mr. George Holdorf, A.M.I.Mech.E., A.F.R.Ae.S.**, has been appointed chief engineer to the Company. He is a Hull man, and was apprenticed to marine engineering and shipbuilding, including the manufacture of power plant and hull structure. From 1916 to 1919 he was an Engineering Officer, R.N.R., and for

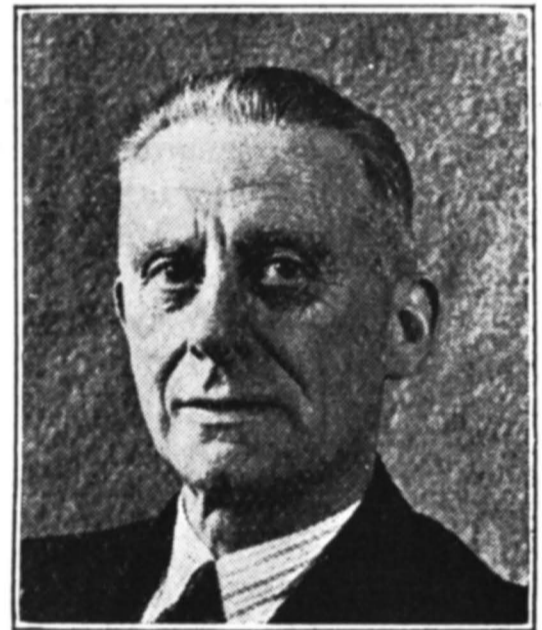


Mr. G. Holdorf.

a time on the staff of the Engineer Rear Admiral at Portsmouth Dockyard. He later studied aeronautical engineering, and was, from 1924 to 1938, engaged in aircraft design and construction with Blackburns, Boulton & Paul Aircraft and Vickers Armstrong. His interest in light alloys developed, and he joined the staff of Birmid Industries, making

extensive studies in England and on the Continent with a view to encouraging the use of light alloys in industry generally. After Dunkirk, he was loaned to the Ministry of Aircraft Production for two years as supervisor of aeronautical engine casting production, but in 1942 was recalled to Birmetals, Ltd., to assist in the development of marine light alloys in naval architecture.

Mr. Frederick H. Rayer, appointed chief designer of Brush Coachwork, Ltd., was born at Swindon, and was educated at Swindon Technical College. He was apprenticed to G.W.R. Locomotive Department, afterwards being given a position in the Locomotive drawing office. Later he was loaned to the Metropolitan Carriage Wagon & Finance Co., Ltd., on the design of electric locomotives for the Brighton Railway. He then took a permanent position with Metropolitan Carriage Wagon & Finance Co., Ltd., on design of railway rolling stock principally all-steel coaches, including electric stock for home

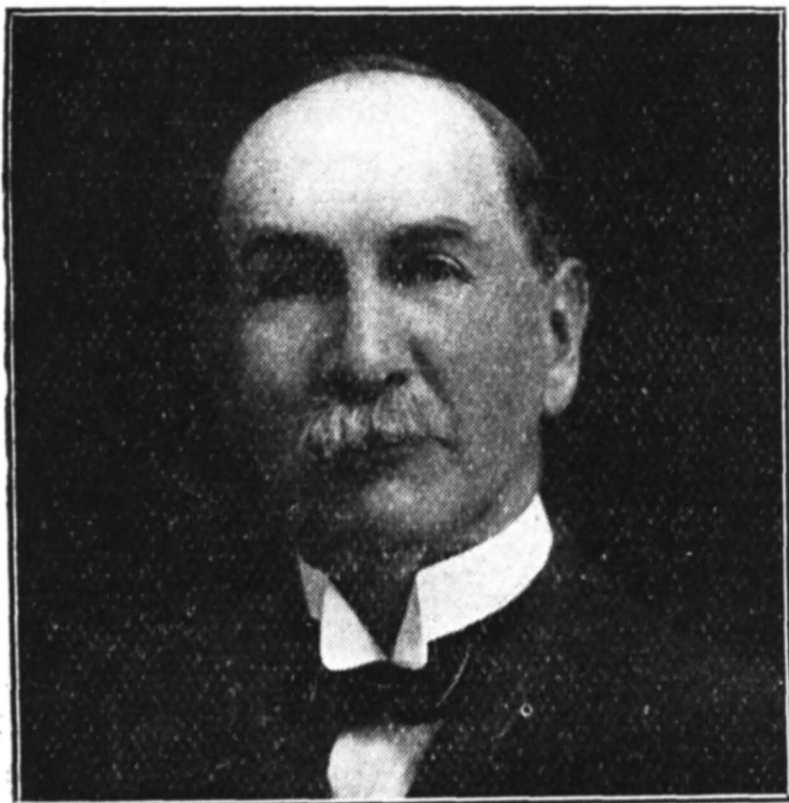


Mr. F. H. Rayer.

and abroad. During the last war he was engaged with Major Wilson (inventor of the Wilson gearbox) on the design of the interior mechanism of the first tanks. After the war, he accepted an appointment with the Leeds Forge Co., Ltd., taking a leading part in the design of the first all-steel coaches for the French railways, also dealing with the first all-steel electric rolling stock for Sydney, Australia. On the amalgamation of Leeds Forge Co., in 1929, he transferred to the Midland works of the Metropolitan Cammell Carriage & Wagon Co., Ltd. He continued as chief draughtsman and was responsible for bus body design, including L.P.T.B. vehicles; he became bus engineer, responsible for all designs, which position he has resigned to take up his appointment as chief designer with Brush Coachwork, Ltd.

We are sorry to hear that **Mr. R. P. Hilton**, of the London Office of Bruce Peebles & Co., Ltd., recently sustained serious injuries as the result of enemy action. He is at present in hospital where we understand he is making satisfactory progress.

Sir James Devonshire, K.B.E., has, owing to ill-health, resigned his seat on the board of the Northmet Power Company and its subsidiary companies. Sir James Devonshire, who had been a director of the



Sir James Devonshire.

Northmet Power Company for over 40 years, was managing director from 1907 to 1923, chairman and managing director from 1923 to 1929, and deputy chairman from 1929 until his resignation.

Chester Electricity Committee has considered 35 applications for the post of temporary chief assistant electrical engineer and have interviewed **Messrs. E. W. Hewlett**, Preston, **G. H. Gould**, Chester, **J. W. Parkinson**, Yorkshire Power Company, and **A. M. Perry**, London and Home Counties Joint Electricity Authority. A recommendation to the Electricity Commissioners and the Ministry of Labour has been made.

Major Simon Green has been appointed managing director of E. Green & Son, Ltd., fuel economiser makers, Wakefield, in succession to **Mr. Harold Livsey**, who has recently retired.

Obituary.—We regret to record the sudden death, on July 2, in Birmingham, of **Mr. Frederick Hughes-Caley**. Mr. Hughes-Caley had been identified with Birmingham for several years, having been manager of the Birmingham district office of the British Thomson-Houston Co., Ltd., from 1923 until his retirement a few months ago. Mr. Hughes-Caley was born in 1876 in Birkenhead, where he started his business life with Geo. F. Milnes & Co., tramway and railway carriage builders. By 1900 he was commercial manager, when there was a large expansion of business in connection with the development of electric tramway systems throughout the country. In 1903 he joined the B.T.H. Co. at Rugby, as commercial assistant in the traction department. In 1907 he was appointed to represent the B.T.H. Co. throughout the Midlands and South of England for the sale of industrial electrical equipment. Reorganisation brought him back to Rugby in 1918, and in 1923 he was appointed manager of the Birmingham district office, controlling also the lamp and lighting department depots at Leicester, Norwich, Cambridge, Northampton, Stoke and Cheltenham. He was a great all-round sportsman. His three sons all received engineering training at the B.T.H. Co.'s works.

With great regret we hear of the death recently by enemy action of **Mr. G. T. C. Macgowan**, manager of the Turbine Department of W. B. Dick & Co., Ltd.

ELECTRIC SUPPLY NEWS

Ammanford.—The Urban District Council has stated that from October next there will be a reduction of 2d. per unit in the tariff for lighting, the charge to be 4d. instead of 6d. per unit.

Bath.—Out of the surplus on the Electricity Undertaking for the past financial year the Corporation's Electricity Committee proposes to allocate £6,265 to rate relief—the equivalent of approximately a 2½d. rate.

Durham.—A post-war plan by the North-Eastern Electric Supply Co., Ltd., to build a £3,500,000 generating station at Kepier was discussed at a meeting of the City Council, and after a long discussion, it was decided to inform the Electricity Commissioners that the Council did not formally object to the Kepier site, provided no other alternative site was available. It was

suggested that the station should be built in a manner to harmonise with the surrounding country, and that emissions of steam and fumes should be controlled. Councillor Gradon, who opposed the plan, said the new building would be nearly as long as Durham Cathedral. There would be three cooling towers 260 ft. high and two chimneys 350 ft. high. He doubted whether the building could be made to harmonise with the district, and spoke of the tons of grit which would be emitted daily from the chimneys. There were other speakers, pro and con the suggested station; we note also that the ecclesiastical view is unfavourable, for at a school speech day the Dean of Durham described the scheme as an "outrage," but, then, æsthetics always did tend to be at variance with practical things.

NOTES AND NOTICES

Good Advertising

We have referred often to the enterprise shown by Edmundsons Electricity Corporation in regard to its advertising schemes in the large areas which it controls. In its July series comparison is made between everyday pocket expenses and the equivalent money's worth of service from electricity. Thus it is shown that for the price of a bus fare Edmundsons Companies supply enough electricity to light a room for a whole day. When twenty-four hours' lighting can be had for the price of a few minutes' travelling, one can judge the job done by a free enterprise in bringing cheap lighting and power to large rural areas in England and Wales. At the same time it is pointed out that no matter how much electricity saves the consumer, it is his job to save it till the war is over.

Fluorescent Lighting for Factories

The correct solution of industrial lighting problems is now very much of a science—so many considerations go to making up a perfect relighting scheme. A case in point is a national butter blending and packing factory. In this instance "Sieray" 80 W fluorescent tubes, in slotted top reflector fittings, were introduced in substitution for the existing standard tungsten filament lamps. The "Sierays" are placed where best to illuminate the intricate packing machines. The new lighting showed immediate benefit, with a reduction in the loading. The colour question was solved; good intensity of illumination was provided, not only on the machines and scales, but for the general shop lighting also; the upwardly directed light gives an illuminated ceiling, dispelling overhead gloom, there is no glare, shadow outlines are softened owing to low surface brilliancy and the length of the tubes. The relighting scheme was planned by the technical staff of Siemens Electric Lamps and Supplies, Ltd. Illuminating Engineering Department, in collaboration with the factory engineering staff; installation was carried out by R. J. Farmer & Co., electrical engineers, of East Dulwich.

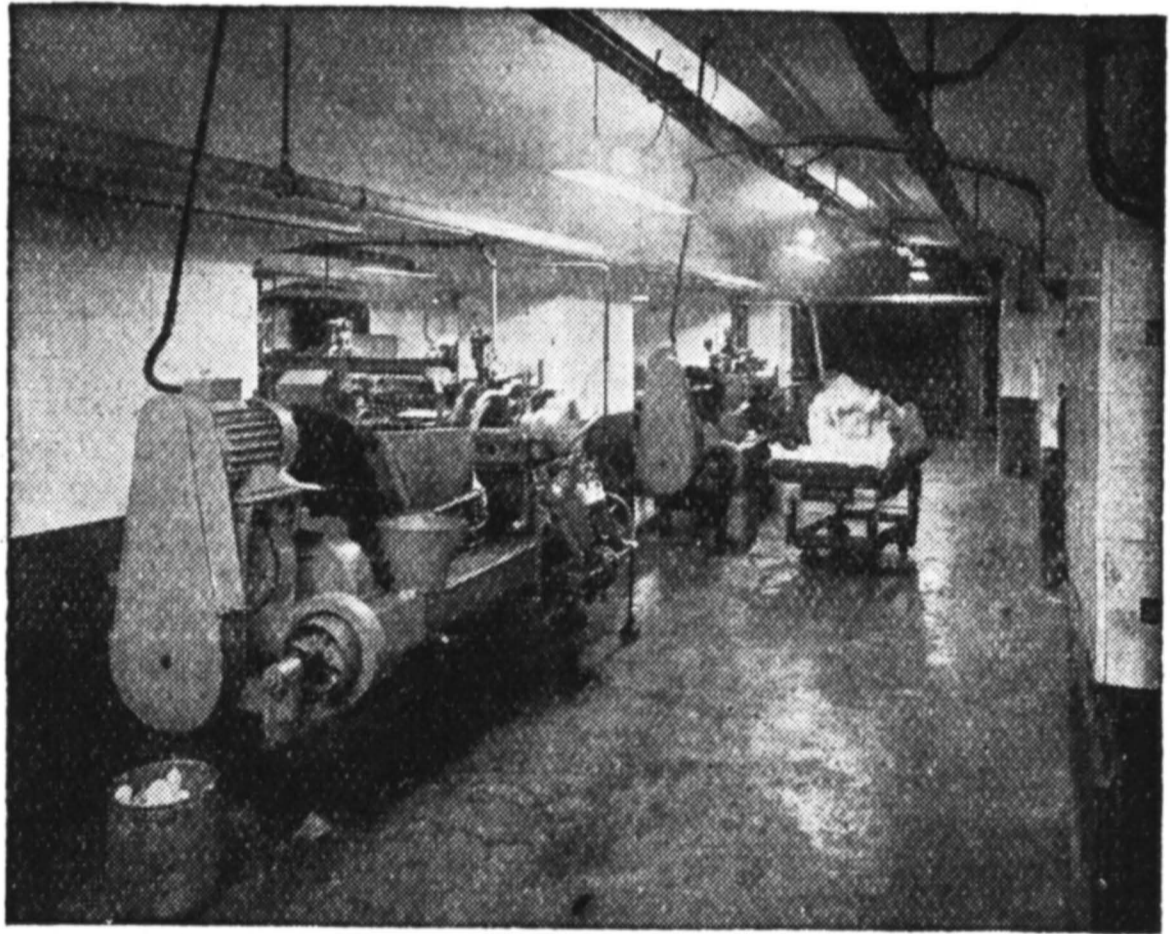
C.E.M.A.

The valuable efforts of the "Council for the Encouragement of Music and the Arts" (C.E.M.A.) to improve the amenities of life in these dull days are perhaps not so widely appreciated as they deserve. In the Electrical Industry, however, interest in this venture is

more generally active; we note that on several occasions the Metropolitan-Vickers Dramatic and Operatic Society, as a tribute to its standing in the amateur dramatic field, has been honoured by being called on to sponsor a performance by a C.E.M.A. company. The most recent occasion was June 27, when the M-V. D. & O.S. engaged the Sale Town Hall for a memorable rendering of Clemence Dane's play, "A Bill of Divorcement." The show went extremely well.

Technical Staff Salaries

In accordance with Clause 33 of the National Joint Board Agreement of November 26, 1943, the new cost of living revision of technical staff salaries took place as from July 1, 1944, based upon the average of the six latest available cost of living figures as published in the *Labour Gazette*. The calculation works out to 28.83%, which equals 5 cycles of 5%. Therefore the salaries as printed in the Schedule to the National Joint Board Agreement will, as from July 1, 1944, until December 31, 1944, remain adjusted to 5 points of addition, i.e., as



Butter Production under Fluorescent Lighting.

printed on the back of the yellow tinted circular letter dated December 1, 1943.

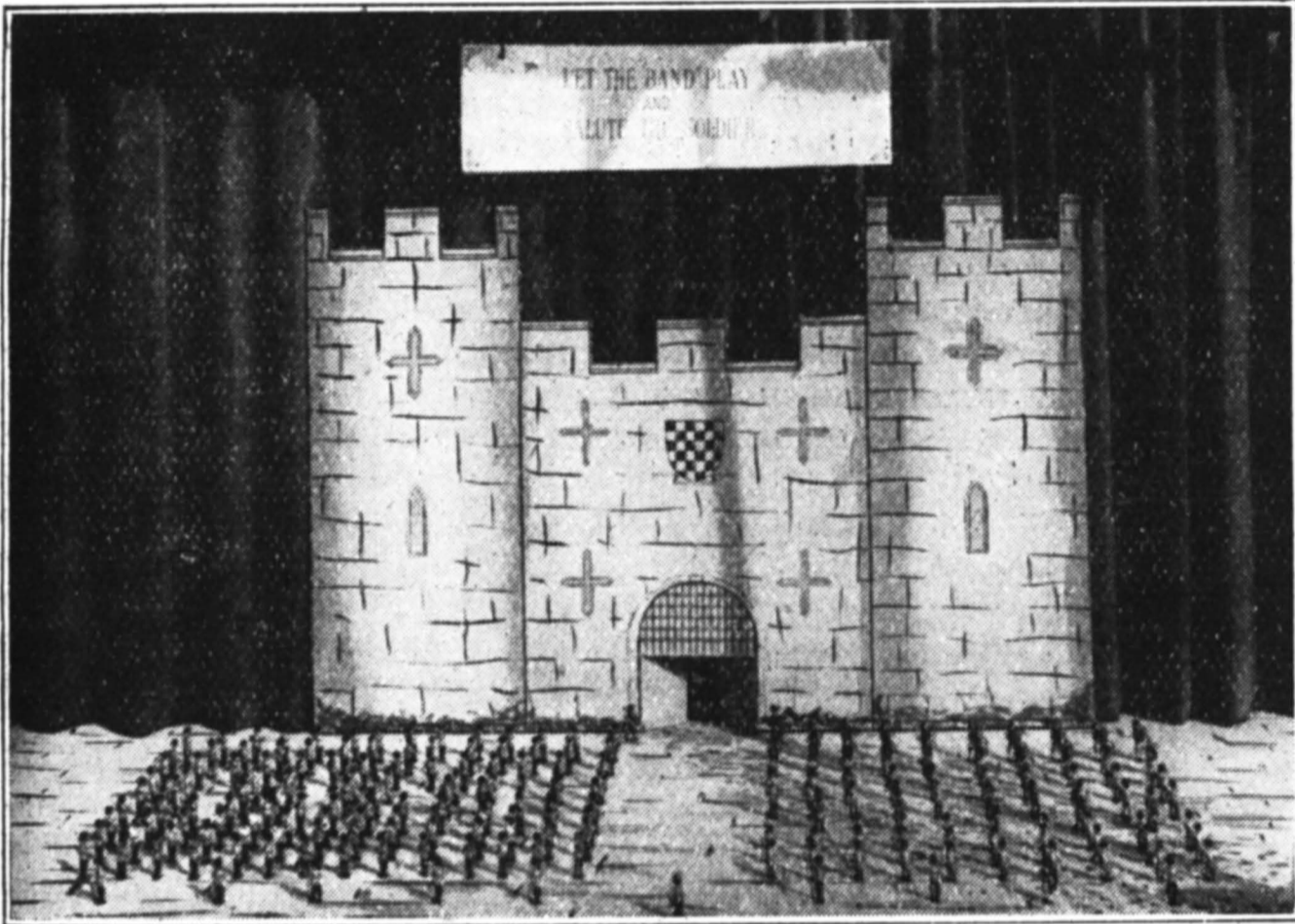
Luton Electrical Society

The Luton Electrical Society has now been inaugurated with Mr. C. T. Melling as chairman.

Iceland Electrification

Speaking to the Icelandic Canadian Club recently, Dr. Arni Helgason, Icelandic Consul at Chicago, said that £400,000 had been earmarked for the extension of electrification in Iceland.

USING THE SHOWROOMS AT REIGATE



Electricity Showrooms, their real purpose in life restricted, have been a valuable aid in various aspects of the National War Effort. Thus Reigate, where the Municipal Electricity Undertaking materially assisted the local "Salute the Soldier" Campaign.— There was an exhibition of modern war weapons, and each main window, had an attractive feature; one window showed in miniature a section of a battlefield in North Africa, a most realistic attack on an enemy strong point. No. 2 window reproduced herewith, showed massed bands outside Reigate Castle. The 236 bandsmen were correct in detail; from each of the Guards Regiments in full dress uniform. Congratulations on the display were showered on Mr. C. Rowbotham, the borough electrical engineer, and his staff.

AND PORTSMOUTH

One of the special attractions at the exhibition held in connection with the recent public celebrations of the Portsmouth Corporation Electricity Undertaking was LUCINDA, an amazingly lifelike Robot, with a knowledge of cookery which would put Mrs. Beeton to shame. Our picture shows "Lucinda" at her desk, advising a caller.



E.V.A.'s WORK IN 1943

THE annual meeting of the Electric Vehicle Association of Great Britain was held on June 21; the report of the Executive Committee deals first with membership. This is, to some extent, unusual in composition, and is set out in an Appendix to the Report—members of the B.E.D.A. (representing the I.M.E.A., the I.A.E.P.C., London E.S.A., and Provincial E.S.A.), the B.E.A.M.A., Electrical Contractors' Association, and Commercial Motor Users' Association, certain personal members, fourteen vehicle manufacturers, ten accumulator manufacturers, two charging equipment manufacturers, and an accessories manufacturer. The Association is discussing the question of enrolment of service depots and distributors as associate members.

The president of the Association is Sir Felix Pole, and at the 1942 annual meeting Mr. V. W. Dale was appointed secretary, in succession to Mr. A. C. Cramb. The chairman of the Association is Mr. A. W. Barham, Mr. A. J. Fippard vice-chairman, and Mr. H. M. Drake hon. treasurer. Sub-committees operating during the year were the Electric Vehicle Manufacturers' Committee, the Publicity and Exhibition Committee, which fixed up an Advertising Campaign in papers associated with trades attracted by the electric vehicle for distribution of goods. B.E.D.A. made a special contribution to the cost of this campaign, and as a result of this advertising and other activities, 245 special and general enquiries

were dealt with. A scheme for circulating enquiries promptly to members has operated satisfactorily. There is a Standardisation Committee—its work was revived during the year, and it proposes to consider, amongst other things, standardisation of traction batteries and one-year and three-quarter-year batteries. The National Standard Electric Vehicle Committee is a sub-committee of the Standardisation Committee. During the year the first prototype national standard electric vehicle was completed, and was viewed by the Minister of Transport (Lord Leathers), Sir C. Hurcomb, Mr. F. G. Smith and other officials of the Ministry, under the guidance of Sir Felix Pole. Application was made to the Ministry of Supply for authorisation to manufacture, and arrangements are in hand to make the vehicle available in London for inspection by those interested. A small *ad hoc* committee was formed to deal with the withdrawal of certain authorisations for the manufacture of electric delivery "prams"; a deputation was received by the Ministry of Supply.

The Industrial Supplies Department of the Board of Trade has been informed by members of the Association of obstacles likely to confront the Electric Vehicle Industry immediately after the war ends; also other matters concerning rehabilitation of equipment, technology, repair parts and goods for stock during the transition period. The accounts show that the bulk of the income was expended on advertising.

ELECTRICAL COMPANIES

Dividends.—*Midland Bank.*—Interim dividend for the half-year ended June 30 at the rate of 8% actual, less tax.

Electrical Finance & Securities Co.—Final dividend of 6% and bonus of 3½%, making 13½%, less tax, for 1943.

Chloride Electrical Storage Co.—The profit for the year to March, after provision for E.P.T. and including dividends from subsidiaries, etc., was £517,672, almost the same as last time. The profit available is £267,672, a decrease of £22,134. To create a reserve for development in the post-war years, £150,000 is transferred from this year's profits and also added is £50,000 previously set aside to meet fluctuations in the cost of raw materials. The distribution for the year is 15%, less tax, and including a 5% bonus.

Walsall Conduits.—This company was fully engaged throughout the year on national work, but trading profits fell a little from the record high level of 1942; they were £206,742, against £213,152. The reduction is more than offset by smaller provisions for A.R.P. expenditure, war risk insurance and

taxation; and the net surplus available is at £73,597 is about £4,400 more. The ordinary dividend is brought to 55%; and the usual allocation of £20,000 to general reserve has been made; balance of £93,542 is carried forward. General reserve amounts to £140,000. The financial position is such as to ensure a comparatively easy transition from war-time to normal commercial production. The directors have given careful consideration to the possibilities of a further extension of business after the war and are confident of the prospects.

Keith Blackman.—Business done in the year ended March last exceeded that of the previous year; the profit was £192,451 (£149,601 in 1943), plus £44,546 brought in, making £236,997. The dividend is 20%, less tax, and £43,497 is carried forward. In his statement, the chairman, Mr. G. Keith expresses appreciation of the work done by the staff and employees; he mentions also the death, on May 14, of Mr. W. B. Davidson, of Arbroath, after 31 years' service; Mr. W. G. Calder fills the vacancy.

BUSINESS ANNOUNCEMENTS

Continued from page 44

COMMERCIAL INTELLIGENCE LONDON GAZETTE

Order on Discharge

Exeter.—Smith, Harold Lawrence, and Hockley, Arthur Thomas, lately trading as Woolbrook Services Co., Woolbrook, near Sidmouth, motor agents and electrical engineers. Application of Harold Lawrence Smith. Order for discharge made as from July 8.

Partnership Dissolved

Oldham.—Between Thomas William Caton, Benjamin Caton and Sydney Caton, electrical engineers, trading at 28 Peter Street, Oldham, s W. Caton & Sons.

Bankruptcy

Eugene Cookson (W. Turnbull & Co.) Express Magneto Works, Elizabeth Street, and Charles Street, Blackpool, automobile, electrical and mechanical engineer. This application for discharge was heard recently at the Court House, South King Street, Blackpool. The receiving order was made in 1922, and a first and final dividend 5s. 2d. in the £ had been paid on proofs for 1920. On an offered payment of £5 the debtor was granted immediate discharge.

CONTRACTS CLOSED OR RECOMMENDED

Where it is stated that tenders are accepted by a Committee it will be understood that this is subject to confirmation.

ATH.—Accepted by Electricity Committee: **London Computator Co.**, Friden electric calculating machine, £147 12s.

LEEDS.—Accepted by Transport Committee: **Titan Trackwork Co.**, special trackwork, £1,064 and £1,144; **Hadfields, Ltd.**, special trackwork, £2,082. Accepted by Electricity Committee: **Aberdare Cables, Ltd.**, cables, £641 and £273; **Davenport Engineering Co.**, cooling tower and accessories; **Worthington Simpson, Ltd.**, circulating water pumps for cooling tower.

LIVERPOOL.—Accepted by Passenger Transport Committee: **Edgar Allen & Co.**, special trackwork, £534.

MANCHESTER.—Accepted by Public Health Committee: **Hobart Manufacturing Co.**, potato peeling machine; **Mottershead & Co.**, portable X-ray unit; **Electricars, Ltd.**, electric battery truck and all metal rectifier; **Cambridge Instrument Co.**, electro-cardiographic apparatus. Accepted by Town Hall Committee: **General Electric Co.**, loud-speaker equipment. Accepted by Electricity Committee: **John Thompson Water Tube Boilers, Ltd.**, two boiler plants (sub-contractor for pulverised fuel equipment, **International Combustion, Ltd.**); **W. J. Jenkins & Co.**, conveyor links.

HEFFIELD.—Accepted by Electricity Committee: **Mitchell Engineering, Ltd.**, two steam generator units.

SOUTHPORT.—Accepted by Gas Committee: **Electric Construction Co.**, 250 kW generating set, £3,355, and renewal of yearly contract for transformers.

TOKE NEWINGTON.—Accepted by Electricity Committee: **Standard Telephones & Cables, Ltd.**, cable, £158 11s. 3d.

AIR MINISTRY.—Contracts of £500 or over for electrical work accepted in week ending June 24: **H. Saunders (Electrical Contractors), Ltd.**, Ventnor.

PROSPECTIVE BUSINESS

The information given below is compiled from various sources, and while every care is taken to see that it is accurate no responsibility is taken.

Annfield Plain.—Extension to miners' training centre.

Brighton.—Conversion of 39 Upper Rock Gardens to flats and maisonettes, for B. Stone.

Chelmsford.—Kitchens and dining-rooms at King's Road and Moulsham schools.

Chertsey.—Civil defence store.

Chester.—Nursery, Lache School.

Chesterfield.—Extension to Peter Webster school.

Doncaster.—Extensions, Yorkshire School for Deaf.

Dublin.—New gymnasium at Baldonnel Aerodrome.

Durham.—Twenty central kitchens, for C.C.

Godmanchester.—School kitchen, for Hunts C.C.

Kidderminster.—Youth centre, Foley Park, for C.C.

Oxford.—Conversion of 18 Parks Road to three flats, for Knowles & Son.

Quarndon.—Four cottages, for Belper R.D.C. Builders, Broderick Bros., Duffield.

Rotherham.—School and canteen kitchens, for T.C.

Southampton.—Reconstruction of premises, for Una Star Laundry, Ltd.

Worcester.—Conversion of "Avenbury" to maternity home.

York.—Adaptation of various houses for flats, for T.C.

Yarmouth.—Kitchen, Northgate infants' school.

NOTES AND QUERIES

We are constantly receiving inquiries from readers on all sorts of matters. Technical questions are dealt with in *Electrical Plant Problems* and by Megohm. Most questions we are able to answer right away by letter or telephone, but occasionally we are at a loss. We shall be pleased to insert questions of this kind under the above heading in the hope that readers possessing the information will assist in the solution. Publishers' names are in brackets. Where samples are sent which it is desired should be returned the cost of postage must be prepaid.

(13500) "**Westinghouse**" refrigerator, address for service? N.E.L. & P.C.—Electrical & Refrigeration Services, Ltd., 159 Brookwood Road, Southfields, S.W.18.

(13501) "**Magnum**" hair dryer, makers of? F.J.—Magnum Co., Cannon Street, Manchester.

(13502) "**National**" vacuum cleaner, makers of? F.J.—Home Appliances, Ltd., 211 Deansgate, Manchester.

(13503) "**Q-Ray**" heating pad, makers of? B.—Radium Electric, Ltd., 2 Stratford Place, W.1.

(13504) **Hotpoint Electric Appliances, Ltd.**, address of? F.R.W.—24 Newman Street, Oxford Street, W.1.

(13505) "**Swan Brand**" goods, makers of? F.R.W.—Bulpitt & Sons, Ltd., 158-161 Camden Street, Birmingham.

- (13506) "**Ergon**" Sunray Lamp, makers of? J.B. & S.—Ergon Electrical Manufacturing Co., Ltd., Vencourt Place, W.6.
- (13507) **Halliwell & Co.**, address of? P.—76 Holdenhurst Road, Bournemouth.
- (13508) **Leland Motors (American)**, agents for? T.C.—Batwin Electric Motors, Ltd., 302 Malden Road, New Malden, Surrey.
- (13509) **Electrical Utilities, Ltd.**, address of? M.I. & E.C.—This concern was taken over by Buchan, Cartwright & Co., 2 Bridge Road, N.W.10.
- (13510) "**Riviera**" fire, makers of? N.E.—Drake & Gorham Wholesale, Ltd., 77 Long Acre, W.C.2.
- (13511) "**Thor**" washing machines, makers of? N.E.—Agents: Hurley Machine Co. (England), Ltd., 55-59 Oxford Street, W.1. Service and Works Department: 62 Oaklands Road, N.W.2.
- (13512) "**Raydex**" immersion heater, makers of? N.E.—Raydex Electric Heaters, Ltd., 61 Chester Street, Birmingham.
- (13513) **Willis's Workmen's Compensation**, publishers and price? I.G.E.—New edition just ready, price 30s., plus postage 10d. Published by Butterworth & Co. (Publishers), Ltd., Bell Yard, Temple Bar, E.C.4.

(Advs. continued from page 44)

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BUSINESS ENTERPRISE

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