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Why Two Reports?

It seems desirable to make clear beyond doubt the relationship, one to the other, of the Memoranda on Electricity Supply Reorganisation prepared respectively by the Incorporated Association of Electric Power Companies and the Special Committee appointed by the Electricity Supply Associations. The former was made public last December, the latter last Thursday. Were two reports necessary? In our view they were not.

The I.A.E.P.C. Memorandum

The position with regard to the I.A.E.P.C. Memorandum was explained in our issues of December 2 and 9. It expressed the views on reorganisation of the majority of the Power Companies, and it had the status of Association backing. When the document had been prepared in April last it was submitted to L.E.S.A. and P.E.S.A. for their consideration, and it was amended so as to form a basis for discussion with the I.M.E.A. In due course at a joint meeting which took place between the I.M.E.A. and the Company Associations, the I.M.E.A. also produced a Memorandum as a basis for discussion, and many people hoped that the two main sections of the Industry would be able to prepare a joint memorandum containing the greatest measure of agreement. The I.A.E.P.C. felt, however, that there could be no agreement on the political question of ownership, and they accordingly decided to send their own document to the Minister. The manner in which they did so created the impression that they had the full support of the L.E.S.A. and the P.E.S.A. To remove any misunderstanding these two Associations authorised us to publish a disclaimer—see these notes of December 9—to the effect that they did not agree to the submission of the Memorandum to the Minister and that the use of their names in connection therewith was unauthorised.

The Joint Committee Report

So much for the I.A.E.P.C. document. After it had been presented to the Minister, representatives of the I.M.E.A., L.E.S.A., P.E.S.A., and a Group of important Power Companies formed an *ad hoc* Committee to prepare a joint memorandum, and it was this document which was published last week. The Memorandum has not been considered by the individual undertakings whose representatives agreed the draft, and it therefore has no official status at the moment. But that it will be approved by the overwhelming majority of all supply undertakings is hardly in doubt, because the *ad hoc* Committee represented over 90% of all Authorised Undertakings in the Country.

The Opportunity that Waits

THE ELECTRICAL TIMES has consistently and persistently advocated that the electricity supply industry should prepare a single joint report as to its future organisation and activities, and that this should be presented to the Minister of Fuel and Power with the whole weight of the Industry behind it. If that is done, whoever holds that Ministerial office, now or in the future, could not afford to do otherwise than accept the recommendations. In the light of past electricity supply legislation, with the succession of egregious blunders that politicians have perpetrated via the Statute Book, how could the solid opinion of the Industry be ignored or flouted? The Memorandum of the Special Committee provides an opportunity to present a unanimous report to the Government. It wisely ignores political issues which are for Parliament to decide, and it gives the views of practical and experienced men who have spent their working lives within the Industry. If the supply industry backs the Memorandum with a sufficiently large majority, its recommendations must in due course become Law.

Official and Prepaid Advts. in Central Pages. For Subscription and Prepaid Ad. Rates and List of Contents see page 174.

Boiler Plant and Fuel Supply

War-time experience has brought out very clearly the importance of correct correlation of boiler plants and their fuel supplies. Due to circumstances which it is alleged cannot be obviated under war conditions, coal deliveries to power stations have been, in general, very unsatisfactory. In place of the uniform quality and sizing secured by negotiated contracts in peace time, in the war years power station users have had to accept anything offered them. In some cases, quality and sizing, and proportions of ash, moisture and fines have differed widely in successive deliveries, sometimes in a single delivery. The consequences, including lowered thermal efficiency and steaming capacity, with reduced availability and increased maintenance, have been a nightmare to boiler plant engineers. With depleted staffs they have worked wonders, and it is greatly to their credit that all war demands for power have in fact been met. But it is at least arguable that better organisation of coal distribution, with deliveries of selected supplies to the plants best suited to burn them, would have saved much worry and anxiety, and would have served better the national war effort. We are not out of the wood yet, and reforms on these lines would still be worth while.

Importance of Stoker Rating

A general review of the way in which boiler plant design is intimately linked with the class and quality of fuel to be burned is given by Mr. F. L. Brown in his article, "Stoker Ratings for Modern Generating Stations," on page 160 of this issue. As the title indicates, stoker rating is the main theme, but it is primarily war-time conditions that have brought that problem prominently to the fore. With modern plants, burning rates of 50 lb. per hour per sq. ft. of grate area are not uncommon, and with appropriate fuel they may be fully justified. When lower and varying grades of coal have to be burned, however, maintenance of such high combustion rates results in inefficiency and serious practical difficulties. Mr. Brown suggests that when lower grade slacks, particularly those containing a high proportion of fines, are to be burned, maximum overall boiler plant efficiency is associated with more moderate stoker ratings, of the order of, say, 35 lb. per hr. per sq. ft.

Should Stoker Ratings be Specified?

What the above conclusion means is that in the design of post-war plants it may be more economical to spend more capital on larger, lower-rated stokers than to continue the trend of recent years towards maximum attainable combustion ratings. It all depends on the quality of the coal. The ideal, of course, would be assurance of uniform quality of fuel throughout the life of the boiler plant, say 20 years; designers could then plan with confidence and predetermine the most economical stoker rating, and other details, with certainty. Mr. Brown would like to see stoker ratings definitely laid down in plant specifications, so that all tenderers would then be on a common footing as far as this important factor is concerned. It would be interesting to know boiler plant manufacturers' views on this proposal. Another interesting suggestion is that, failing washing and grading of coal at the mines, which is obviously best, power station users might install their own coal-screening plant, to ensure uniform supplies to their boiler units. Different qualities would be fed to individual boilers, designed to utilise the respective grades. A combination of high-rated stokers, burning cleaned and sized coal, and pulverised fuel boilers, in which the powdered "fines" would be consumed, has possibilities.

Mr. F. Forrest Retires

By the resignation of Frank Forrest from his appointment of chief engineer and manager of the City of Birmingham Electric Supply Department, on reaching the superannuation age, the electricity supply industry loses one of its most able engineers. Mr. Forrest has been associated with the Birmingham Undertaking since 1906; he succeeded Mr. R. A. Chattock in the chiefship in 1930. Under his direction the change-over to standard frequency in the Birmingham area was carried out—one of the biggest things ever done in the electricity supply industry—and he designed and built Hams Hall B. At various times Mr. Forrest has served on the Council of the

I.E.E., the Electrical Development Association, and as Chairman of the South Midland Centre I.E.E., President of the Birmingham University Society, Chairman of the District Consultative Committee of the C.E.B., member of the National Consultative Committee, President of the I.M.E.A. in 1937, and district spokesman of the Public Utilities Coal Conference. On behalf of the Birmingham Corporation he has visited many of the larger electric supply undertakings in the U.S.A., Canada, Germany and other countries. Mr. Forrest takes with him in his retirement the sincere good wishes of a host of friends. He is a young sixty-five. Will the pleasures of leisure and the amenities of Lyme Regis hold him permanently ?

Building Methods in U.S.A.

Lord Portal, the Minister of Works, has authorised publication of the report of the British Building Mission which Mr. Alfred Bossom recently took to the States to study building methods in that country. The Report is minus certain detailed appendices which are being prepared, also it is appreciated that some of the matters referred to may prove to be controversial; but owing to the urgency and importance of post-war housing plans, it was desired the Report should be available for general consideration and discussion without delay. Copies are obtainable from H.M. Stationery Office. Naturally the Report is preponderantly concerned with building methods, but there are included various items of electrical importance. Concerning economy of designs, one means whereby this is secured is the provision of electrical and mechanical installations concurrently with the construction of the building. The setting out and forming of openings, ducts and chases is minimised by designing for the fixing of pipes, etc., in advance of wall construction. The use of small hand power tools is widespread in U.S.A., especially in the carpentry trades. It is a little surprising to learn that welding is only occasionally used in American structural steel frame buildings, but owing to the war-time advance in welding technique the method will probably be adopted more widely post-war.

Provision of Amenities

Special mention is made in the Report of the provision for the use of electrical appliances in American houses, to reduce the housewife's labour. A number of plug-in socket outlets is provided in every room. Also a refrigerator, or ice box, is regarded as a necessity in most kitchens. For the small house, a favourite method of heating is the single gas or oil-burning hot air heater through which air is forced, in many cases by a small electric fan. Central heating systems employing either steam, hot water or hot air are installed in practically all buildings; open fires are rarely provided in other than better-class homes. There is a trend towards district heating, utilising a single central boiler to supply heat and abundant hot water to communities numbering anything up to 40,000. In New York, waste steam from electricity generating stations provides heat to large buildings such as offices and hotels. One other noteworthy item concerns the influence of modern lighting on the design of museums, art galleries, etc. The British practice of providing top lighting has led to a horizontal development of design for such buildings. Recent advances in artificial lighting permit such buildings to be of several storeys.

The Faraday Medal

The Council of the I.E.E. have made the 22nd award of the Faraday Medal to Dr. Irving Langmuir, for his outstanding contributions to electrical science. Dr. Langmuir's work has extended over an exceptionally wide field, including hard vacuum valves, thyratrons, gasfilled lamps, atomic hydrogen welding and fundamental researches on oil films. The Council's award will be universally applauded.

Rebuilding Humanity

Of all the Christmas Greetings we have received this year, we like best the message accompanying the Good Wishes just received from Mr. E. Hitchcock and the staff of the Christchurch,. N.Z., municipal electricity department.

In rebuilding Humanity—
" Search and see if there is not some place where you may invest your *humanity."*

Therein lies inspiration and the means to a better world. **METEOR**

STOKER RATINGS
for Modern Generating Stations

By F. J. Brown,* B.Sc. (Eng.), A.M.I.E.E.

THE chief aim of boiler designers is the attainment of three main objects: (1) Maximum availability; (2) maximum efficiency; and (3) minimum capital costs. As one would expect, the factors which tend to promote the first two aims render the third more difficult. It is here that the question of stoker rating is of primary importance; stripped of all technicalities, the proposition may be simply stated thus: How large should the stoker be to burn a given quantity of coal per hour?

Advance in Boiler Ratings.—Before proceeding to investigate the present-day position and the probable trend of future designs, it would be of value to look back twenty or thirty years and to review the difficulties which have arisen and how they have been overcome. In order to appreciate the nature of these problems it is important to bear in mind the two main functions performed by any boiler unit. These are, first, to convert as much as possible of the chemical energy in the coal into heat energy, and secondly, to absorb as much as possible of this heat energy in the water. In any successful boiler plant it is essential that the gas temperature in the region of the water and steam heating surfaces must not approach too closely the fusion point of ash, since otherwise the ash particles carried up in the gas stream will melt and the heating surfaces will quickly become coated with slag. In earlier plants employing refractory walls, this factor imposed a definite limitation on the rating of the boiler unit, which had to be made large enough to accommodate sufficient water tubes to absorb the heat liberated from the coal and at the same time keep the gas temperature down to within the limit referred to above. Thus, a boiler of 40,000 lb. per hour evaporation was considered to be a very large unit twenty years ago, whereas to-day boilers of ten times that evaporative capacity are not uncommon.

This remarkable progress has been made possible in the first instance by the introduction of the water-walled furnace. This design, evolved originally with a view to protecting the refractory walls, has the added advantage of enabling a much greater heating surface to be incorporated in a boiler unit of given dimensions. In fact, in the modern boiler a considerable part of the heat transfer takes place in the water walls.

This point is well illustrated in the following table showing the relative quantities of heat absorbed by the superheater, economiser, boiler tubes and water walls for a typical modern boiler unit. For comparative purposes the figures for a 25-years-old refractory wall unit are also given.

	Water-walled Boiler	Refractory-Walled Boiler
	Percentage Heat Absorbed	Percentage Heat Absorbed
Superheater ..	20·3	9·3
Economiser ..	8·3	5·2
Boiler tubes ..	25·1	85·5
Wall tubes ..	46·3	—
	100·0	100·0

Adverse Effects of High Rates of Combustion.—The large increase brought about in the rate of heat absorption has made possible a corresponding increase in rate of combustion. Twenty years ago rates of combustion on travelling grate stokers were of the order of 20 to 25 lb. per sq. ft. per hour, whereas to-day rates of 50 lb. per sq. ft. per hour and over are not uncommon. These high rates of combustion are not altogether an unmixed blessing, especially when fairly low-grade coal of the order of 9,000-9,500 B.Th.U.s per lb. is being fired. The chief disadvantages affecting the boiler unit as a whole are: (1) Loss of efficiency; (2) poor availability; and (3) inability to maintain maximum output.

(1) *Loss of Efficiency.*—When operating at a high duty of, say, 50 lb. per sq. ft. per hour, the stoker is very sensitive to variations in the quality or sizing of the coal supply, and as a result loss of efficiency due to incomplete combustion on the grate is a common occurrence. In fact, much, if not all, of the capital cost saved by reduction in the size of the unit can easily be lost in the form of unburnt carbon in the ash hopper. This defect has been noticeable to a greater or less degree ever since high ratings have been adopted, and the exigencies of war-time operation have driven the point well home to a number of boiler plant operators who have been forced to burn coal of a different quality from that to which they had been accustomed.

The reason why such high ratings have come about is not far to seek, if one considers the conditions under which most plants are purchased. The specifications for these plants usually call for boilers which will give a certain guaranteed efficiency at the rated output when burning a certain class of

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coal, which is specified in detail and corresponds with that normally burnt by the purchaser. The rating of the stoker and combustion chamber are rarely laid down, these details being left to the discretion of the manufacturer. The latter's obligations regarding efficiency are fully discharged on the successful completion of the official efficiency trial, and he naturally designs the plant with this object in view. It should be realised, however, that during this trial the boiler is operating under very favourable conditions; for not only is the test carried out on a boiler which has just been thoroughly cleaned, but care is taken to ensure a coal supply of consistent quality not inferior to that specified. It is understandable, therefore, that, when the unit is called upon to operate under commercial conditions at varying degrees of cleanliness, and with coal which is liable to vary from hour to hour, both in grading and in ash and moisture content, the average efficiency obtained is liable to be somewhat disappointing.

(2) *Poor Availability.*—The second disadvantage of high ratings, namely, poor availability, is caused through the more rapid fouling-up of the external tube surfaces. Much thought and investigation is at present being given to this question, the exact causes of which are not yet altogether proved, but there is no doubt that the increased air velocities associated with highly rated boilers considerably aggravate the situation by increasing the amount of solid matter carried up in the gas stream, particularly when burning coals containing a large percentage of "fines." Some progress has been made towards the mitigation of this trouble by the extensive use of soot-blowers, and more recently by the introduction of water lancing, but these devices are merely palliatives that do not strike at the root of the problem.

(3) *Reduced Capacity.*—Inability to maintain maximum output is largely interrelated with loss of efficiency referred to above. When difficulty is experienced in burning-off the fire at the rear of the grate, steam output tends to fall on account of the reduction in heat liberated through incomplete combustion. In these circumstances the combustion engineer is presented with the alternative either of reducing his grate speed in the interests of economy and at the expense of output, or of increasing it in an endeavour to maintain output at the expense of efficiency. By choosing the former course, he is, in effect, temporarily de-rating the stoker.

This state of affairs is not an exceptional occurrence which can be tolerated by virtue of its rarity; unfortunately it is a commonplace. In some cases it is even necessary to steam an additional boiler theoretically regarded as spare, in order that full load may be maintained on the station and efficiency kept up to a reasonable level. This is also equivalent to de-rating, and is not a practice which can be maintained over long periods, as the modern generating station is not usually generously endowed with spare boiler plant.

Coal Quality and Stoker Ratings.—The question of determining the most suitable stoker rating for any boiler plant is not one to which a definite answer applicable to all cases can be given. Obviously the nature and quality of the available coal supplies must be a deciding factor. In the case of anthracite, low ratings are essential, for, owing to the low percentage of volatile matter present in this fuel, it does not readily ignite. The front portion of the stoker, therefore, functions merely as a warming zone, and the actual burning takes place towards the rear. A satisfactory rating taken over the whole grate area with this type of fuel would be approximately 25-30 lb. per square ft. per hour. For good quality bituminous slacks, having a calorific value of 11,000 B.Th.U.s per lb. and upwards, ratings of up to 50 lb. per sq. ft. per hour are probably justified, provided the coal does not contain too high a percentage of "fines" (i.e. particles under $\frac{1}{8}$in. sizing). This rating should also prove satisfactory for screened coal from which everything under, say, $\frac{1}{8}$in. has been removed, even when the calorific value is as low as 9,500 to 10,000 B.Th.U.s. per lb.

Economics of Moderate Ratings.—It is with the lower grade slacks, particularly those containing a high proportion of "fines," that the difficulties outlined above are most commonly experienced. Where coal of this nature has to be burnt, the extra capital cost of installing boiler plant with stokers rated down to about 35 lb. per sq. ft. per hour is amply justified. The truth of this statement can easily be demonstrated by a rough examination of the financial position. As a basis, let us consider a hypothetical station containing 60,000 kW of generating plant and five 150,000 lb. per hour boilers (one of which would be regarded as spare), working at a load factor of 45%, and burning coal at 30s. per ton. The additional capital cost of installing boiler plant of 35 lb. per sq. ft. per hour stoker rating, as compared with a rating of 50, would be approximately £50,000, and the annual charges on this sum spread over 20 years would be about £3,750. In order to justify these extra overhead charges on grounds of economy alone, a corresponding saving in operation costs would have to be achieved. The annual coal bill for such a station would be about £240,000, of which sum £3,750 represents just over $1\frac{1}{2}$%. Thus, an improvement in average boiler operating efficiency

of about 1½%—not an unreasonable expectation—would offset the increased capital costs incurred. Further, if one presumes that boiler cleaning charges could be halved on account of the reduced fouling of heating surfaces resulting from the lower combustion rate, this would effect a saving of about 1½d. per ton of coal burnt, i.e. about £1,000 per annum. The required saving on coal would then become £2,750 per annum, calling for an increase in boiler efficiency of just over 1%. An improvement of this order should easily be attainable with the lower rating when burning slacks of the type under consideration. The further advantage of being able to maintain maximum output is difficult to assess in terms of money, but it can conveniently be regarded as an additional dividend on the policy of adopting lower stoker ratings.

Factors Influencing Choice of Rating.—It must not be thought that it is the purpose of this article to condemn the higher-rated stoker. It merely seeks to point out that high ratings are unsuitable for the burning of certain classes of coal, which form a large percentage of the total fuel burnt by electricity undertakings. It would be much more satisfactory if coal suppliers could be persuaded to undertake the treatment of small coals by using washing and screening plants on a much more extensive scale than at present. This, however, is a question which is outside the control of the generating station owner, who has to tackle the problem of dealing with the supplies available to him in the best possible manner. Within the limitations thus set he is forced, therefore, to adopt what appears to be the retrogressive step of installing low-rated stokers in order to utilise the coal he receives to its best advantage.

Before making a final decision as to the most suitable rating, a careful review should be made of the classes of coal which the station is likely to be called upon to burn. If possible, tests should be carried out with these coals on existing boiler plant of modern design to determine their burning qualities. A rating should then be chosen which will deal satisfactorily not only with the average class of coal to be burnt, but with the worst coal which is likely to be used to any appreciable extent. The forecasting of future coal quality may be a little difficult in some instances, especially at the present time, when the future policy of the coal industry is somewhat uncertain. The station engineer would, however, be well advised to adopt a pessimistic, rather than an optimistic, outlook in this matter, and to prepare for the worst, while hoping for the best.

Specification Requirements.—When the rating has been fixed it should be definitely laid down in the specification, so that all tenderers shall be on a common footing as far as this important factor is concerned. Details should also be included of the poorer types of coal to be used, and the manufacturer should be called upon to guarantee the efficiency of the boiler when burning these coals. At the same time care should be taken to ensure that the boiler auxiliaries are also sufficiently liberally rated to permit full steam output to be obtained under adverse conditions. This applies particularly to forced and induced draught fans, for the load imposed on these rises considerably when the boiler becomes dirty, and deficiencies in this respect do not necessarily reveal themselves under official test conditions. A satisfactory method of covering this point is to specify that forced and induced draught fans shall be capable of handling air and gas at full boiler output with a percentage of CO_2 about 2% lower than the design figure. Although such a low percentage of CO_2 is not met with under normal operation, a clause of this nature will ensure that adequate fan power is available to meet dirty boiler conditions. This matter is, perhaps, not entirely relevant to the question of stoker ratings, but it is considered to be of sufficient importance to warrant its mention here: many a good boiler plant has had to be de-rated during a considerable portion of its life through lack of appreciation of this point.

Pulverised Fuel Firing.—If one accepts the contention in favour of lower rated stokers, one is bound also to consider the possibility of pulverised fuel firing as an alternative. In general, it is true to say that the main reason why the p.f. boiler has not been more universally adopted, is the higher total capital cost of this type of unit, with its associated expensive grit precipitation, ash-handling and ash-disposal plant. Thus, any policy which tends to increase the capital cost of stoker-fired units—such as lower-stoker ratings—must, of necessity, render the alternative of p.f. firing a relatively more attractive proposition, owing to the reduction thus brought about in the price difference between stoker-fired and p.f. plants.

A compromise solution of the problem, which has several commendable features, would be the installation of both stoker-fired and p.f. boilers in the same station, in conjunction with a coal-screening equipment incorporated in the coal-handling plant. With such an arrangement the station engineer would be in a position to exercise a large measure of control over his incoming coal supplies. Normally, the excess of "fines," which is so undesirable on stoker units, would be screened off and sent to the p.f. side, while the larger product passing over the screens would provide an admirable fuel for the stokers. When burning this

type of coal, stoker ratings of 50 lb. per sq. ft. per hour and over should prove quite satisfactory. It would, therefore, be possible to offset some of the extra capital cost involved in installing p.f. boilers by employing higher stoker ratings on the stoker-fired side of the station.

The necessity of adopting such a scheme would, of course, be eliminated, if the treatment of coal at the collieries was carried out on a more widespread scale than at present, and it is hoped that in the future steps will be taken to bring this about. In the meantime, however, if adequate facilities do not exist at the collieries for carrying out this work, there is no reason why it should not be performed at the generating station.

In Conclusion.—It must be said that in the ultimate analysis local considerations will usually play a decisive role in determining the type and rating of the boiler plant to be installed. This applies not only to the character of the coal supply, but also to the prevailing site conditions for the station, which often impose their own limitations on the design. All that has been attempted in this short article is the enumeration of some of the more important factors of a general nature which the station designer must consider before ordering his boiler plant.

BOILER AVAILABILITY

By G. Flavell

THE availability of the modern boiler can usually be measured by the extent to which the external surfaces can be maintained in a clean condition while the boiler is in service, and how quickly those surfaces can be cleaned when the unit has to be shut down, due to the fouling of the boiler, superheater, economiser and air heaters. The cause of the fouling originates within the furnace, and operation should be so adjusted as to lessen the amount of fly ash being lifted off the grates.

Fuels.—The fuel available to-day is below pre-war standard as regards grading. It contains too many fines for the high rate of combustion per square foot of grate demanded by war-time conditions. Experience proves that when burning 100% fine fuel on chain grate stokers, using only induced draught, there is very little fouling of the heating surfaces of the boiler, but when a higher rate of evaporation is required, forced draught is necessary. The increase in the rate of combustion results in the heating surfaces becoming fouled. From this experience it appears that fuel containing fines cannot be burned at the rate demanded to-day, which may reach over 50 lb. per square foot of grate per hour on a modern chain grate stoker.

The under-grate air pressure necessary to complete combustion lifts off the fly ash and lighter particles, which are carried upwards into the gas passes. Furnace conditions may be adjusted to minimise this lifting of fly ash by keeping the under-grate air pressure down to the minimum.

Different fuels vary in the time taken to be consumed on a chain grate stoker, and although it is possible to speed up the rate of combustion to some extent, there appears a minimum time which cannot be further shortened without excessive agitation and lifting of the fire bed. The length of time that the fuel can remain on the grate can be extended by running with a fire bed as thick as conditions will allow, so as to maintain a good CO_2 and a complete burn off.

Dust Extraction.—In some boilers, provision is not made for the extraction of the flue dust from the trap situated in the hot zone. This trap, in a large boiler generating 150,000 lb. per hour, will collect as much as three tons of flue dust per week, and after the trap is full the dust that follows is carried forward to foul further passes in the economiser and air heaters. The operating staff can help themselves by taking advantage of the period when the boiler is banked, and drawing the flue dust, by use of rakes, out of the side doors, or by having a loose tile that can be lifted, in the bottom of the trap, allowing the dust to run through on to the stationary grates, after which it can be run over the dumpers. A series of small holes is usually left in the baffle forming the bottom of the trap, and better results have been obtained by having these holes plugged with loose-fitting fire-bricks that can easily be removed for cleaning purposes when the boiler is shut down. The plugging of these holes prevents the short circuiting of flames from the combustion chamber, which burn the loose dust into a solid clinker.

Although the boiler makers do not make provision for the extraction of dust from this trap, it appears possible to arrange a false bottom, high in the centre of the boiler and sloping towards the doors at the sides, the angle of slope being as steep as conditions will allow, so that the dust will fall towards the doors. A hopper could be built on the door frame, to receive the dust on withdrawing a slide, the slide to be shut after the hopper is full. The hopper could then be emptied by the dust extraction plant.

Cleaning.—Soot-blower operation should receive every attention, and the men concerned should be instructed how many

times each blower must be operated, together with the speed of rotation. The frequency of soot blower operation will have to be guided by the results obtained, and the state of the scavenged areas when the boiler is shut down.

Water lancing of the superheater tubes while the boiler is steaming is becoming more common, and the results of observations may be useful. The lancing jet requires to be as near to the tubes as possible; bearing in mind the arc that the water has to sweep, the pressure of water supplied to the lance should be such that when the superheater zone is at its working temperature, the jets of water will reach the maximum distance required. It is essential that the scale on the tubes be washed with water sufficiently cool to chill it and so cause the scale to crack when reheated. It may be necessary to reduce the boiler to half load during the time of lancing, for the temperature of the superheater zone may change the water to steam before it strikes the scale. The frequency at which lancing is necessary can only be solved by experience on site, but as a guide the scale should be treated as early as possible. When the superheater is so fouled that the temperature of the outlet steam is greatly reduced, lancing has not been found successful, for if the thick scale is cracked off, the narrow gas passes between tubes will not allow the scale to fall away, but will possibly form a bridge upon which more fly ash will rest. It is advisable to operate the soot blowers in the superheater zone, after lancing, to remove any loose scale.

Economisers.—The economiser and air heaters present a more complex problem, for the choking is aggravated by the acidity in the flue dust coming in contact with the cool surfaces upon which water vapour in the flue gases has probably condensed. The dust and vapour mixture forms a porcelain-like scale, which is very hard to remove. To ease this trouble it is advisable to maintain the water entering the economiser at its maximum temperature. Care should be taken to drain thoroughly the steam line to economiser soot blowers before use.

The temperature of the air entering the air heaters should be kept sufficiently high to prevent condensation. Control of the inlet air temperature can be maintained by recirculating hot air from the outlet side. If the temperature of the outlet gases from the air heater falls too low during the time the boiler is lightly loaded, the air heater should be by-passed altogether. Where soot blowers are not fitted in the air heater it is worth while to make up a portable steam steam lance, and lance the gas passes as required.

External Boiler Scale.—The removal of scale from the external surfaces of boiler tubes during the time the boiler is shut down presents a problem, for the scale is so hard and bonded that chipping hammers are almost useless. A light spray of water played on to the tubes, just sufficient to wet the scale, no water being allowed to drip from the tubes or come in contact with any brickwork, easily softens the scale, which can be scraped away. This scale is mostly on the gas leaving side of the tubes, and must not be confused with the slagging on the first few rows of tubes above the furnace. These tubes are best cleaned by breaking away the slag with an iron bar.

A more successful method of cleaning hard scale off boiler tubes is to start the tubes to "sweat." This can be done by getting the work inside the drums, headers, etc., completed, then fill the boiler with cold water. The warm air rising through the boiler condenses when in contact with the cold surfaces, and starts the action.

The cleaning of the fouled surfaces in the economiser and air heaters when the boiler is shut down is much simplified by washing them with water. Water at high pressure is not required; just enough to keep the scale thoroughly wet, care being taken that the water has a free outlet, and that no water is allowed to run over any brickwork, or into the boiler flues.

CERTIFICATION OF MINING TECHNICIANS

A resolution by the North Staffs. branch of the Association of Mining, Electrical and Mechanical Engineers, held last November, urged that a new certification committee be appointed, to consider all avenues of approach leading to compulsory certification, and to deal with any matters appertaining thereto. This has been forwarded to the general secretary of the Association for inclusion on the agenda of the next general council meeting. A Certification Committee functioned some years—at a time when there appeared to be little hope of certification receiving official recognition. Though there is no direct evidence proving that its efforts had any effect, it probably did not work in vain. Reasons adduced for forming a new committee at the present time include the fact that in Circular MD 131 concerning the new draft regulations, the Secretary for Mines states he earnestly hopes that all concerned will apply the new code; the matter is receiving considerable attention, as far as equipment is concerned, and the question the Staffordshire branch asks is whether it is not the duty of the Association to endeavour to have the code applied to its members. It is suggested that the Association is the competent body to implement the suggestion embodied in the Royal Commission Report, viz., that the Association might be entrusted with the duty of conducting examinations for technical competence and awarding official certificates.

STANDARDS OF GENERATION PERFORMANCE

IN a paper before the Institution of Electrical Engineers on Thursday, February 3, **Messrs. R. W. Biles*** and **G. W. Maxfield*** reviewed the performance of a group of generating stations over a five-year period. The plant was separated into groups A, B and C, the first being pre-1930 plant working at 150 to 275 lb. pressure, the second of 300 to 600 lb. relating to 1930–1938, and the third of the same pressure relating to plant installed between 1938 and 1942. There are 77 turbines and 144 boilers, the average age of the former being 17 years, 12 years and 3 years in the respective groups, and of the boilers 18 years, 12 years and 3 years respectively.

The installed capacity of the plant rose during the five years by just over 40%, the average running plant load factor by 37½% and the average available plant capacity increased by just under 27%. In fact, the available capacity did not increase at all during the last three years of the period.

Attention is called to the analysis of fuel supplied in 1939 and 1942 respectively and to the notable decline in quality. During the last six months in 1942, out of 821,000 tons of coal burned, 136,500 tons of ash had to be transported away from the power stations, or 16·6%. Due to unsuitable fuels, the loss in generating capacity varied between 10% and 15% of the total installed. Whilst both quality and suitability of fuel have declined appreciably, in the group of stations under review the calorific value seems to have been well maintained.

In an analysis of breakdowns numbering 2,723 divided into appropriate groups of plant, it is pointed out that the breakdowns per plant item do not show a uniform trend, and disappointment is expressed that in some sections the more modern plant has a greater number of breakdowns per plant item than the older plant. Boiler breakdowns represent 67% of the total and turbine breakdowns represent 26%. Special attention is drawn to the breakdowns on " boiler tubes, drums and ranges " and " stokers and brickwork," the latter representing 30·6% of the total. Group A plant has something in its favour for giving a better performance, the average plant running load factor being less than the other two Groups B and C. There is a tendency shown for breakdowns to increase with load factor in all groups. The number of breakdowns of less than one day's duration are about equal in boilers and turbines, but curves show that boiler plant outages predominate.

With regard to the average operating periods of freedom from breakdown, the figures suggest that the operating life of some items of plant is becoming shorter in the most recently constructed plant and the Authors state this is probably associated with operation at higher pressures and temperatures.

The Authors point out that it is difficult to draw conclusions from the figures obtained relating to plant availability and its relation to running plant load factor. The maximum results which have been achieved in the three groups are given and maximum probable figures to be expected are suggested. Thus, in Group A, 90% availability should be obtained at about 45% running plant load factor; in Group B, 90% at 60% running plant load factor, and in Group C, 90% at 80% running plant load factor.

Comparison of Performance.—Discussing operation efficiency, the Authors propose a method with the object of bringing about a uniform basis of comparison of performance of all stations of differing steam pressures and various operating conditions. They take into account the principal operating conditions which they say, as far as they are aware, have not previously been generally applied. Allowances are made for running plant load factor and banking, as well as other minor operating effects. The exactitude of the method proposed is considered to be within practical limits and commensurate with commercial metering errors. Briefly, the recommended system is evolved in the following sequence :

(*a*) Determine the cycle ideal efficiency from terminal steam conditions.

(*b*) Correct for overall efficiency ratio as per Fig. 6 of the paper. This gives an estimated maximum probable efficiency of the best station for the year of survey at a high load factor by reason of the fact that all record-breaking stations in the past have obtained such records at or about economic rating—probably 80% of m.c.r.

(*c*) Correct according to running plant load factors, correction curves as in Fig. 5 of the paper. This makes an allowance for the varying proportion of fixed heat increasing at the lower loads and with average size of plant run.

Analysis of Load.—Having once determined the operating efficiency of a station, the Authors state that it is not satisfactory to leave the matter at that point. Consequently a form of analysis of loss has been included, although it is agreed that some engineers may find other methods more convenient.

Finally, a " standard merit " is discussed. For uniformity of comparison, it is suggested that the percentage operating efficiency should be calculated and, in combination

* Central Electricity Board.

with percentage availability, form a combined factor representing overall performance. The "standard merit" represents the maximum performance to be expected from a station; its actual performance is judged by the percentage of the maximum which it attains. Once the system is instituted, with all the upper limits of "standard merit" fixed, and working data readily to hand, the results for 20 stations, it is claimed, can be computed in under four hours. This is one of the outstanding reasons why the Authors are confident that the institution of this "standard merit" will be welcomed and will foster the desired competitive spirit so essential to the fuel economy campaigning of to-day. They conclude by remarking that the stations surveyed in their paper have made an improvement of 3·8 points—from 84·8% to 88·6%—since the institution of the scheme ten months ago.

DISCUSSION

Mr. J. R. Beard (Messrs. Merz & McLellan) said that from the financial point the importance of the problems dealt with was very great. To take a very rough figure, in the 1938–39 statistics, the working cost was given as about £19,500,000, of which about three-quarters was for coal. Since then, output had increased by about 50% and the price of coal had been about doubled. Therefore, at the present moment, station operators had in their charge the efficient utilisation of about £30,000,000 worth of coal per annum. There was also something like £200,000,000 of capital sunk in power station plant on which charges had to be paid. Therefore, very slight improvements in efficiency and availability represented very considerable sums. Personally, he was a great believer in the effect of statistical comparisons as a spur to competition, but the methods must be accurate, otherwise they might lead to erroneous action. The fundamental thing in power generation was the lowest cost of electricity delivered to the mains and the statistical emphasis placed on thermal efficiency in the Electricity Commissioners' figures had tended to detract somewhat from this.

As regards availability, whilst the Authors had done an enormous service in bringing this forward in a statistical form, he was very surprised to note that where the boiler capacity was higher than the turbine capacity, the availability was reckoned on the higher of the two figures. Finally, Mr. Beard said he viewed with some doubt the proposed standard of merit. It seemed to be the product of two entirely different and separate matters and was, therefore, an extremely artificial expression.

Mr. J. D. Peattie (C.E.B.) said that if the Authors had succeeded in arousing the interest of younger engineers in making accurate measurements, keeping precise records and analysing them carefully, their efforts would have been well worth while. He knew the Authors had had very good success with the application of the principle set out in the paper in their own area. The paper, of course, was open to a good deal of criticism, which was probably what the Authors wanted, because only by examining our shortcomings and eliminating faults could progress be made. The paper referred to a section of the generating plant in stations under the control of the C.E.B., but it was not necessarily a fair sample. It was about 10% of the whole.

As regards coal, there would be a general sympathy with power station engineers in their difficulties during the past few years concerning quality. It was puzzling that whereas engineers had been successful in agreeing specifications for raw materials, there was no precise specification for coal. It was to be hoped that through the aid of more precise measurements the hand of the coal interests would be forced and a precise specification for coal arrived at.

Whilst it was very good to be able to simplify the comparison of operating efficiencies in the manner the Authors had done, he felt that some of the low figures shown in Fig. 7 were due to causes quite outside the control of the operating staff. Therefore, it was necessary to analyse where all the losses occurred, and the table in the paper showing how to get at that was one of the most important parts of it.

Mr. C. G. Carrothers (Messrs. Kennedy & Donkin) said that as the greater number of shut-downs, according to the paper, were of less than one day's duration—and only in rare cases had the period been as long as four days or more—it suggested that tidal schemes, which were now reciving so much attention, would be valuable in enabling the greater number of shut-downs on steam stations to be dealt with when tidal power was available. He asked for the Authors' opinion on the value of this type of output to a large interconnected steam station. It should provide a considerable addition to the type of relief provided by week-ends, which were of great value in maintenance and of great importance in the practical operation of every station. In their choice of an ideal thermal efficiency, the Authors used a cycle of feed heating in stages of 50°F. This did not appear to be a very representative increment and in actual practice, and certainly in America, increments of 75°F and even 100°F were used. In Table 5, an analysis was made of the controllable sources of inefficiency, but no reference was made to excess air as a source of low efficiency.

Mr. H. V. Pugh (South Wales Electric Power Co.), who is connected with one of the stations included in the paper, said that a large measure of success had been obtained in the area by the methods adopted. The Authors' aim had been, in essence, to produce a method of comparison which would enable the operators in smaller stations to compare their results with those obtained in the bigger stations, and the Authors' results had been well worth the study and trouble involved. With regard to the deteriorating quality of coal, he said that in one station approximately 47,000 tons of coal were burned last month and there were 47 different varieties. The ash content of that coal varied from about 9% to 28% and the volatile from 10% to 21%. Whilst design had a great influence on availability, full credit should be given to the operators in obtaining high efficiency and high availability even on modern boilers. Mr. Pugh emphasised the desirability of choosing power station staffs, and making use of their services, on somewhat different lines from those usually adopted. Boiler operators and turbine drivers should start with a secondary school education and be given better names than at present.

Mr. S. M. Hill (Bristol Corp. Elec. Dept.) said it was not exceptional for a turbine to have an availability of more than 90% to 85%. It was accepted that lack of output of stations was generally due to lack of boiler plant.

Mr. A. R. Cooper expressed satisfaction that this paper, for the first time, put a cash value on the unsuitability of coal. In the area dealt with, representing about 10% of the total C.E.B. plant, the net effect of unsuitable fuels—not necessarily bad fuels—was to stultify a capital expenditure of about £1,500,000, and, in addition, the coal industry had to supply still more coal. In connection with thermal efficiency, he emphasised that increasing the load factor on a generating station usually raised its thermal efficiency, but increasing the load factor on an interconnected system such as a C.E.B. area, usually reduced the thermal efficiency, because the less efficient plants became more heavily loaded. This fact was not always appreciated when extolling the benefits of high load factor. The inference to be drawn from Fig. 8 was that a better economic performance could be expected from modern plant than from older plant, and the facts collected by the Authors supported that general conclusion. There was, however, sufficient evidence available to show that this was not a safe generalisation for the country as a whole. The conclusion reached from figures which he had taken out for some 2,000,000 kW of plant for a three-year period was that some radical change in design, manufacture or operating technique was urgently required. There seemed to be many difficulties in attempting to compare relative performances of stations by the standard merit method. When full account had been taken of all the variables connected with the operation of a station, the comparison became essentially one of the quality of performance of the operating personnel and that being so, surely some account should be taken of the numbers of the personnel engaged in producing higher availability and also the remuneration paid to those responsible for producing higher availability.

Mr. R. A. W. Connor (Luton Corp. Electy. Dept.) suggested that the time was ripe to formulate a standard code of practice for evaluating the efficiency of power stations. He was in agreement with most of the conclusions reached in the paper but criticised one or two minor points. In connection with the load factor, Fig. 5 showed this to vary in a somewhat consistent manner with sizes of station, the turbine capacity of which varied from 5 to 10 MW. Curves showing the operating efficiency determined by the method suggested by Mr. Beard compared with the plant load factor, however, were very erratic in shape and supported the contention that there was no fixed relationship between load factor and operation efficiency.

Mr. E. T. G. Emery (London Power Co.) said that in the calculation of maximum probable efficiency, the Authors included vacuum as one of the factors. Surely the fouling of condensers should be taken into account. Therefore, he proposed that circulating water temperature should be substituted for vacuum. Although the Authors mentioned two methods of calculating their " maximum probable efficiency," these were not the only methods, and at least two thers had been published. In his view " maximum probable efficiency " must be calculated for each case. In all the methods one of the given quantities was the final feed water temperature, but this varied with the plant load factor and, if this was to be taken as a terminal condition, the ideal efficiency also varied with the plant load factor. Could the Authors suggest any practical method of determining what the optimum final feed temperature would be, because if its value could be fixed it could be used in all calculations irrespective of the final feed temperature actually produced? Finally, Mr. Emery said that if the work involved in carrying out the Authors' proposals was going to bring about improved operation in the way of efficiency and availability, it might be worth while, but the methods proposed seemed to have so many approximations that he wondered whether some simpler and more reliable method was not possible.

Mr. E. McCabe said he believed it was generally agreed between the engineers responsible for the plants which had so far participated in this scheme that interest in economic operation had been stimulated by it and that, in fact, the operating efficiency figures derived by the Authors' methods reflected with a certain degree of fidelity the information they were intended to convey. The operating figure shared with the thermal efficiency figure the disadvantage of being, in all probability, less accurate than its least accurate factor. One of the major sources of inaccuracy was the errors which could arise in arriving at the fundamental factor of heat input, in which careless sampling of coal might lead to errors of from 2% to 5% in the final result.

Mr. Maxfield, in the course of a short reply, said that so many outstanding questions had been raised that he would like to defer replying to some of them until there had been sufficient time to reach definite conclusions. The main point he wished to emphasise was that in the general investigation of operation efficiency and availability, the Authors had wished to arrive at some index which would be a merit figure for the operation of the station. The general effort has been directed to finding a common denominator by which to compare the efforts of the staff to obtain the maximum possible efficiency. If as a result of the application of this system there was a revival of enthusiasm in the second-grade stations, he was sure the effort would have been well worth while.

A UNIVERSAL DOMESTIC PLUG

THE design and construction of domestic electrical installations has been widely discussed in the last few months. A number of eminent engineers have expressed themselves in favour of ring main distribution through the rooms with the ring fed at each end from the fuse board. Such a system gives rise to certain considerations as to the types of socket-outlet and other fittings to be used. At present there are four British Standard ratings of plugs and socket-outlets. It is generally acknowledged that the 15 A size is clumsy and is unnecessarily large for the majority of domestic installations where the largest fire used has a rating not exceeding 2 kW. For this reason there is a body of opinion that advocates increasing the rating of the 5 A plug to 10 A to allow of its use for such fires. This would leave the 2 A plug for lighting circuits.

Some, however, go beyond this and suggest that there should be one size only of plug and socket-outlet for domestic installations, so that complete interchangeability is obtained throughout the house. There is then raised the problem of proper protection of the appliances; this may be met by the use of local fuses. The question next arises, should the fuse be placed in the socket-outlet or the plug? If in the former, then every fuse must be of a size suitable for the largest rated appliance, otherwise the desired interchangeability will be lost, Yet the adoption of such fuses means that the lighter circuits will be insufficiently protected. By inserting the fuse in the plug, the rating can be chosen of a value most suitable for protecting the appliance and its flexible; thus the above objection does not arise.

One other point should be mentioned in connection with the use of socket-outlets for ring mains. It is obviously most desirable that the ring main should not be cut at any outlet point. The socket-outlet should therefore provide means for teeing-off without cutting the main.

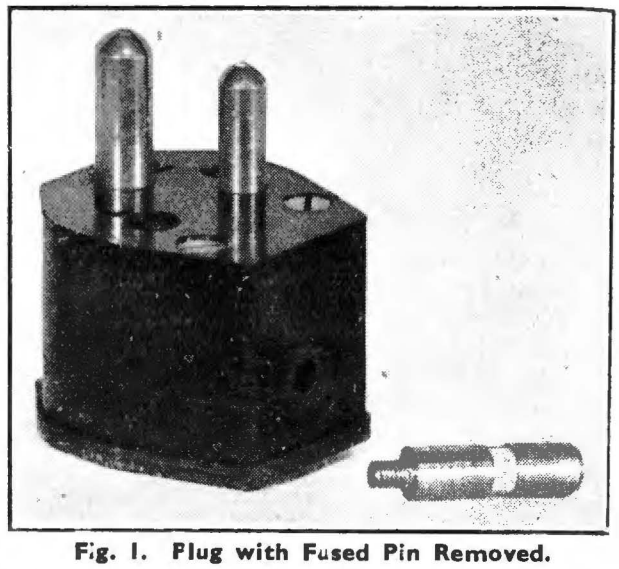


Fig. 1. Plug with Fused Pin Removed.

The above notes present an outline of the present background which must be kept in mind when considering the new design of plug and socket-outlet which is described in this article. This accessory has been put forward by Dorman & Smith, Ltd., 32 Queen Victoria Street, E.C.4, and the general construction may be seen from the accompanying photographs. The plug is rated at 3 kW at 230 V and incorporates a fuse. The design and construction are robust and in general conform to the best modern practice.

Plug.—The most striking feature of the plug is its compact size. The body measures

$1\frac{5}{8}$ in. by $1\frac{1}{2}$ in. wide and $1\frac{3}{16}$ deep. For such a high rating this small size, which is little larger than a B. S. 2 A plug, has been achieved by departing from the B.S. plug sizes. The distance between the current carrying pins of the new plugs is 0·6875 in.

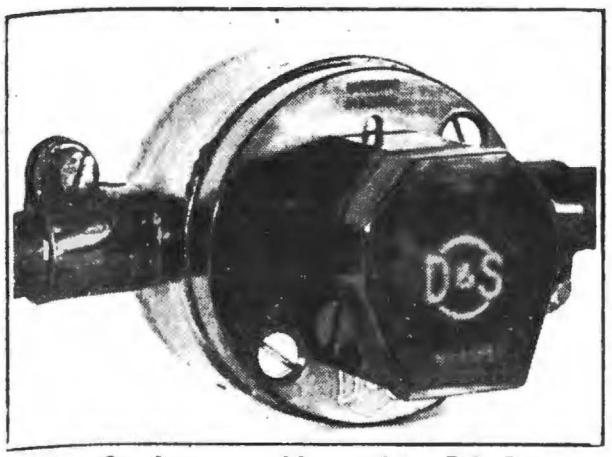


Fig. 2. Accessory Mounted on B.S. Box.

and to the earthing plug 0.609 in., which may be compared with 0.570 in. for both dimensions in the B.S. 2 A plug. The diameters of the pins are only slightly less than the B.S. 15 A plug, being 0·2656 in. for line and 0·3125 for earth, as compared with 0·278 in. and 0·343 in. for the B.S. 15 A and 0·2 in. and 0·278 for B.S. 5 A plugs respectively. The plug pins, of the split non-closing type, are solid with the terminals and may be removed for easy wiring. A feature of convenience is that the same length of tail is required for the earth connection as for the current carrying connection. The cord grip consists of a rubber bush which fits over the cable.

Fuse.—It will be noted from Fig. 1 that one of the plug pins consists of the fuse. This fuse screws into the terminal block against a spring which prevents loose contact. The fuse can thus be renewed without taking off the plug cover. The fuse is housed in a thick glass tube which should withstand considerable rough treatment, particularly as only $\frac{1}{8}$ in. of the glass is exposed, the two ends being protected by $\frac{3}{8}$ in. long brass caps, one of which makes contact in the socket. It is by this means that the fuse has been incorporated within the plug without increasing its dimensions. Fuses are available in sizes of 2, 5, 10 and 13 A, so that the most suitable rating can be chosen for the protection of the appliance to which the plug is attached.

The performance of the fuse under fault conditions is of importance and reports of a number of authoritative tests have been given to us. Amongst these, a test by the N.P.L. was made with a prospective current of 16,500A d.c. and a circuit time constant of 0·006 seconds. The supply was from a 250 V battery and all the eight fuses tested cleared satisfactorily. Similar results were obtained on four fuses tested by the Manchester Corporation and Metropolitan-Vickers Research department with a prospective current of 32,800 A d.c. The performance on alternating current has been tested by the City of Salford at 230 V, 10,800 A and 400 V, 18,800 A. In both cases the fuse cleared with a slight flash but no report. The performance, therefore, appears to be excellent for such small dimensions.

Socket-Outlet.—The socket-outlet for use with the plug is designed to fit a British Standard box. As may be seen from Fig. 3, the principal feature is the method of connection. This is arranged so that by baring a short section of the ring main conductors they may be connected without cutting or doubling back. As mentioned earlier, this is a most desirable feature for ring main wiring. The socket tubes are split and reinforced with a strong spring in accordance with modern practice. A simple shutter, operated by insertion of the earth pin, is provided to cover the current carrying tubes when the plug is withdrawn.

From this description it will be seen that the new plug with its socket-outlet offers many advantages. It provides a straightforward answer to the requirements of the ring main advocates. The main objection to its use is that it does not conform to present British standards, but such a criticism is inherent in any attempt to produce a universal plug capable of meeting

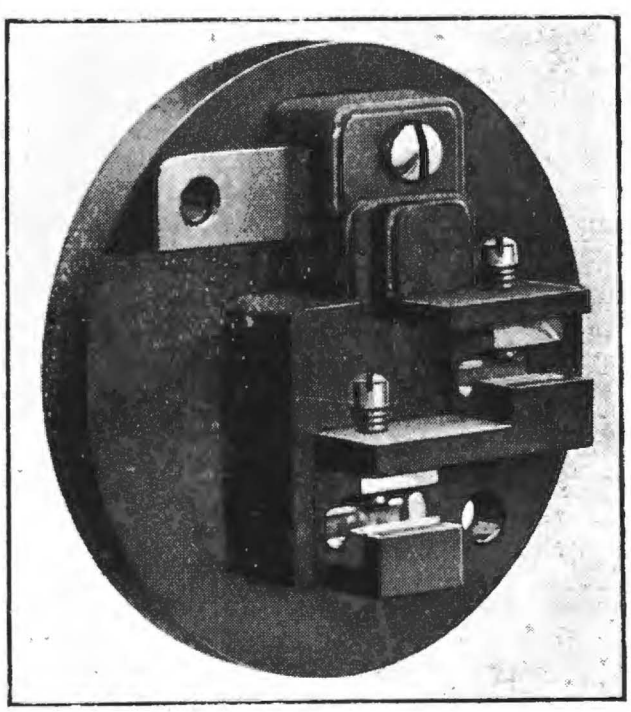


Fig. 3. Back of Socket-Outlet.

all general domestic requirements from 2 A to 3 kW. Finally, it may perhaps be pointed out that the complete stadardisation of plugs is still far from a practical reality. for large numbers of two pin plugs, not to mention flat pin plugs, are still in use.

LIVERPOOL STREET LOUDSPEAKERS

A DEVICE that automatically adjusts the volume of loudspeaker groups in relation to the level of noise in their vicinity is the principal feature of a new public address system just completed at Liverpool Street terminal, to replace that installed in 1937.

The new installation has been specially designed by Central Rediffusion Services, Ltd., in co-operation with the L.N.E.R. Chief Engineer's Department, to overcome acoustic and other problems arising out of the heavy volume of traffic passing through this busy terminal. These problems have been met first by directing beams of sound down each individual platform, so that speech is not audible on adjacent platforms; secondly, by giving a wide angle of diffusion of speech in the circulating areas; and thirdly, by varying the acoustic power fed to each group of loudspeakers, so as to meet changing noise-levels, this being effected by the provision of automatic volume-control circuits of novel design.

The installation contains no less than 123 loudspeakers, of waterproof construction, connected in seven groups. The platforms are serviced mainly by 51 directional horn type loudspeakers, while cabinet speakers are used for the circulating areas and refreshment rooms.

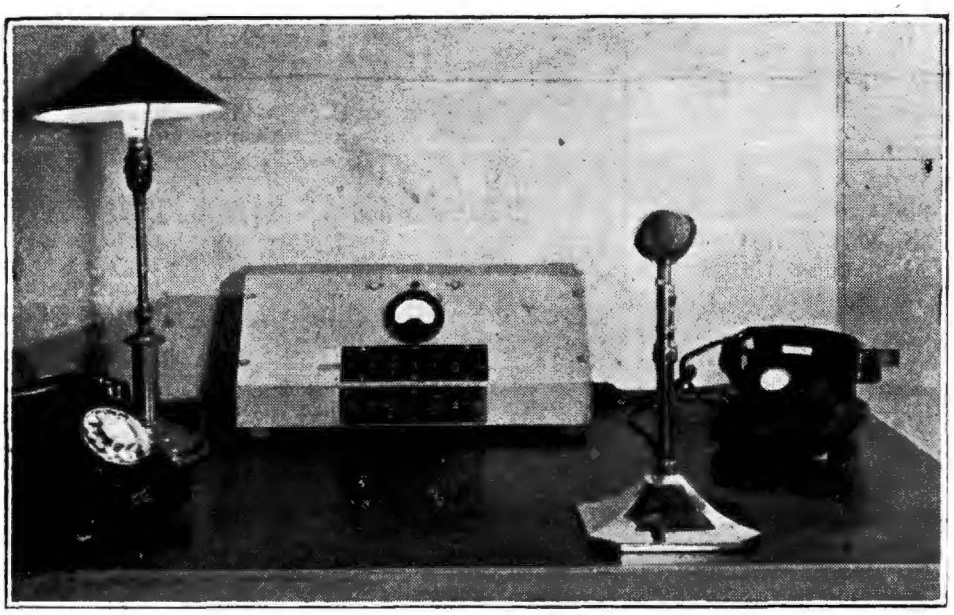
One multi-cell crystal microphone is used for feeding two pre-amplifiers, one working and one spare. A valve voltmeter is included which gives visual indication to the announcer, to assure maintenance of constant level of speech.

The microphone is made alive by the simple depression of any or all of the seven keys associated with the seven loudspeaker groups, and simultaneously the h.t. is switched on the power amplifiers.

The volume of certain loudspeaker groups is adjusted automatically in relation to the noise level in the station. For this purpose one of two noise detector microphones is selected by means of the group keys mentioned above. The input from the noise detector microphone is applied to a special microphone amplifier, by means of which a varying d.c. bias is obtained proportionate to the noise level, which is applied to one of the amplifier valves of the pre-amplifier in use. The volume of loudspeaker groups not subject to automatic volume adjustment is controlled by applying a fixed bias voltage to the pre-amplifier.

RADIO IN WAR

A lecture given to the A.T.C. and members of the Home Guard, Sea Cadets and Civil Defence personnel, by Mr. H. de A. Donisthorpe, of the General Electric Co., Ltd., at Newbury, Berks, on January 21, was entitled "Radio as an Implement of War." The meeting was presided over by the O.C. the Newbury branch of the A.T.C.—Major Tempest, D.S.O.—who, it may be remembered, was responsible for bringing down a Zeppelin airship at Potters Bar in the 1914-18 war. Wireless direction finding played a prominent part on that occasion, and in the course of his address, Mr. Donisthorpe explained how it was employed to find the positions of the raiding Zeppelins and thus successfully to bring about their destruction. Mr. Donisthorpe used lantern slides to illustrate his lecture, and still further to clarify some points, made a number of experiments and demonstrations.



View of Announcer's Control Panel Microphone and Telephones at Liverpool Street Station.

BUSINESS ANNOUNCEMENTS

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

TENDERS INVITED

City of Manchester

ELECTRICITY DEPARTMENT

Tenders are invited for the supply, modification and erection of :—

33 and 6·6-kV SWITCHGEAR (750 and 500-MVA RUPTURING CAPACITY) at GENERATING STATIONS and SUB-STATIONS.

(Specification No. 795.)

Specification, etc., from Mr. H. C. Lamb, Chief Engineer and Manager, Electricity Department, Town Hall, Manchester, 2, on payment of a fee of one guinea, which amount will be refunded on receipt of a bona fide tender.

Tenders to be delivered by ten o'clock a.m. on Friday, 3rd March, 1944.

R. H. ADCOCK,
Town Clerk.

Town Hall,
Manchester, 2.
5th February, 1944.

City and County Borough of Belfast

ELECTRICITY DEPARTMENT

STORES

Tenders are invited for the supply of the undermentioned materials.

Form No.

1. Turbine Oil.
4. Spare Parts for Mechanical Stokers and Ash Conveyors.
6. Refined Bitumen.
9. Feeder and Section Pillars.
10. Armourclad Compound Filled 6,600 Volt Switchgear.
11. Meters and Instrument Transformers.
12. Electricity Maximum Demand Indicators.
14. L.T. Fuse Units, House Service Cut-Outs and House Service Connector Boxes.
15. Static Transformers.
16. V.B. and P.I. Cables and Cast Iron Joint Boxes.
28. Bitite Strip, Prepared Tape and Rubber Tape for Joints and Joint Box Compound.
29. V.I.R. Electric Cables, Wires and Flexibles.
30. Electric Lamps.
31. Oilskin Coats, Tarpaulins, Rubber Jointing, etc.

Note.—Forms Nos. 29, 30 and 31 are in respect of materials which shall be supplied to any Department of the Corporation.

Forms of Tender and further particulars may be obtained from the City Electrical Engineer and General Manager, East Bridge Street, Belfast.

Sealed Tenders, on official forms only, enclosed in the envelope supplied with the Tender Form, endorsed with the name and address of the firm tendering and marked "Tender for Stores, Electricity Department," must be lodged with the undersigned not later than 5 p.m. on Tuesday, 7th March, 1944.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.

APPOINTMENTS VACANT

An important London Company temporarily located Kingston-on-Thames district requires ASSISTANT BUYER having thorough commercial experience in medium and heavy H.T. and L.T. Transformers, Switchgear, Motors, Generators, Distribution Equipment, etc. Essential Works Order. Good Canteen and Club facilities. Write, stating age, full particulars of education, training, experience, present position, and salary required to Box "G. K. L.," c/o 95 Bishopsgate, E.C.2.

Metropolitan Borough of Woolwich

ELECTRICITY DEPARTMENT

CONTROL ROOM ENGINEER

Applications are invited for the appointment of Control Room Engineer for shift duties at the Woolwich Power Station. Candidates, not over 45 years of age, should have had previous experience in a similar position, must have first-class technical qualifications and sound practical experience in the operation of a modern power station. Candidates over 45 years of age may be considered for a temporary appointment.

The salary will be in accordance with Grade 9, Class "H" of the National Joint Board Schedule.

* For Subscription, Official and Prepaid Advertisement Rates, see page 174.

APPOINTMENTS VACANT—*Continued*

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

Applications, stating age, qualifications and experience, together with not more than three testimonials, should be addressed to the :—

Borough Electrical Engineer,
Electric House,
Powis Street,
Woolwich, S.E.18.

to reach him not later than 17th February, 1944.

Canvassing members of the Council either directly or indirectly will be a disqualification.

DAVID JENKINS,
Town Clerk.

Town Hall, Woolwich,
S.E.18.
January, 1944.

SHIFT ENGINEERS wanted for Power Station. Permanent position. Salary in accordance with Grade 8, Class F of N.J.B. Schedule. Reply, giving age and technical training and experience to West Gloucestershire Power Company, Limited, 126 London Road, Gloucester, endorsing envelope "Shift Engineer."

APPOINTMENTS WANTED

GENERAL SALES MANAGER, with 20 years' practical and comprehensive commercial engineering experience, seeks permanent post with an established progressive Firm where first-class salesmanship and organisation are desired for post-war development; proved ability to plan and organise sales department, control staff, branch sales, area managers, representatives, overseas agents, despatching, good practical experience of advertising and sales promotion methods, co-ordinate marketing and production, and post-war market research. Successful records and first-class testimonials. Replies treated in strictest confidence.—Box No. 8183, THE ELECTRICAL TIMES.

ELECTRICAL AND MECHANICAL ENGINEER, used to installations, small power plants and lifts, is willing to give part-time technical services to Electrical Engineers or Architects on War or Post-war work.—Box 8187, THE ELECTRICAL TIMES.

APPOINTMENT FILLED

The following appointment recently advertised in THE ELECTRICAL TIMES has now been filled :—

Bedford Corporation : Relief charge engineer.

AGENCIES

OLD-ESTABLISHED MIDLAND ELECTRICAL WHOLESALERS. EWF., CMA., ASCM., ELMA., are prepared to consider one or two post-war agencies. Stock accommodation. Fully qualified staff of Engineers. Confidence.—Box No. 8179, THE ELECTRICAL TIMES.

Well-known Engineer (A.M.I.E.E.) invites Enquiries from Control, Gear or other Electrical Manufacturers for TECHNICAL SALES AGENCY. Birmingham and Midlands.—Box No. 8185, THE ELECTRICAL TIMES.

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.

PLASTIC MOULDING. Capacity available. —BENDIX & HERBERT, LTD., 231 Plashet Road, London, E.13.

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City of Salford

ELECTRICITY DEPARTMENT

Tenders are invited by first post Thursday, the 24th February, for the purchase of several second-hand 440/460 D.C. MOTORS and STARTERS and sewing machine 220/230 D.C. MOTORS.

Tender Form, giving full particulars, from City Electrical Engineer, Frederick Road, Salford, 6, Lancs.

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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.

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Association of Scientific Workers,

Hanover House, 73 High Holborn, W.C.1. Tel.: CHAncery 5607.

FINANCIAL

LARGE INFLUENTIAL INDUSTRIAL AND FINANCING GROUP prepared to consider co-operating with established British Electrical plant and equipment manufacturers in establishing similar industries in India. Preliminary negotiations in first place in strict confidence to Box No. 8087, THE ELECTRICAL TIMES.

Calendars, Diaries and Almanacs.—Recently to hand from C. A. Parsons & Co., Ltd., Newcastle-on-Tyne, is the firm's wall calendar for 1944. There are three months' dates on each slip, each trio surmounted by a picture of Parsons' industrial activities. The 6d. charged for these calendars goes to war charities.

Rhodes, Brydon & Youatt, Ltd., Stockport, send us a desk-pad diary, replacing that of similar type, whose period of active effectiveness expired at the end of December last. Some few of these are available, we understand.

(*Continued on page* 187)

ELECTRICAL TIMES

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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.*

CONTENTS

BUSINESS ANNOUNCEMENTS

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.

DEVELOPMENT OF RURAL SUPPLY

RURAL electricity supply will take on the mantle of urgency after the war. Its importance has been stressed in all the post-war plans so far put out, not only by those connected with the industry, but in the recommendations of Government committees on development in agriculture, housing, and so forth. The Norwich district was one of the experimental areas to which attention was being paid long prior to the war; this adds therefore additional interest to the proceedings of the Norwich City Council General Purposes Committee recently.

Mr. J. A. Sumner, the city electrical engineer, submitted a scheme, in October last, to the Electricity Committee, for electrifying the rural area of the Corporation's undertaking; the district covered was some 700 sq. miles. The scheme was ultimately passed by the Council's General Purposes Committee and later by the full Council. Its provisions will be brought into operation as soon as conditions permit; it is estimated that the cost will be between £600,000 and £700,000. The details of the scheme are given in the report of Mr. Sumner. He said the Committee would have noted his recommendations upon the need to develop more fully the County area, and would also have noted that a net profit of £6,120 accrued in this area during 1942-43. The post-war load might tend to flow away from the city towards the rural area. He had, therefore, been making a careful investigation to ascertain the effect upon the finances of the undertaking if a complete development of the Rural (County) Area of supply were carried out to permit of supply being made available to all premises upon demand. He was satisfied that such development could be an economic proposition which would secure a continuing profit.

The extensions required to make the supply available to all premises in the rural area would require to be carried out over a period of nine years, and would involve an annual capital expenditure for mains, services and meters amounting to £40,000 in each of the first three years and £60,000 in each of the succeeding years, or about £480,000 in all. There would be, in addition, further capital expenditure on rental wiring and on cookers and similar apparatus, but he hoped to follow a policy, after the war, in which expenditure of this type would be self-supporting and would not involve any charge against revenue.

The annual revenue which would accrue from the rural area could be estimated with reasonable accuracy so far as the minimum revenue was concerned. The results of extensive canvasses made throughout the whole area before the war were available, and a careful analysis had been made to ascertain the revenue which could be expected from each class of consumer and premises, a survey being available which had permitted of each premises being located and identified with regard to classification. If it was assumed that the income from each class of consumer remained only at the pre-war figure, the percentage return of income to capital expenditure for the extended scheme would fall slightly below the present figure of 18·1%. But it was known that there was quite a large potential and normal load in each class of premises (particularly in farm premises), which was not obtained before the war and was even now being obtained only in part. Mr. Sumner estimated that this further load would result in an increase in the normal revenue equal to approximately 30%, and that at the end of the development period (approximately 1953), the total revenue from the Rural Area would be at least £370,000 on a capital expenditure of about £1,600,000: the return would then be about 23%. And this estimate was a conservative one, which took no account of the potential power load existing on the farms, nor of the likely post-war development of industry in the rural areas; this further load was estimated to be worth a further £120,000 per year.

It was anticipated that the approval of the Electricity Commissioners to the necessary loan sanctions would be given as soon as the Government and the Treasury agreed to relax the present financial restrictions. He therefore recommended (*a*) that approval should be given to a scheme of development incorporating the complete electrification of the County Area of supply, the work to be spread over a period of nine years at an estimated cost of £480,000 for substations, mains and services, and (*b*) that work should commence as soon as approval could be obtained from the Electricity Commissioners for the necessary loan sanctions.

CO-ORDINATION WANTED

The Committee of the Derby Society of Engineers recently passed a resolution placing on record its unanimous opinion that there is an urgent necessity for more definite co-ordination between the National engineering institutions, in the matter of: (*a*) Technical Education; (*b*) Fundamental Research; and (*c*) Post-War Planning. The further opinion was expressed that an Engineering National Co-ordinating Committee, comprising, say, two members from each of the 35 National institutions, together with four members to represent the 55 local engineering societies, should be set up forthwith.

NOTES ON WIRING

WHAT WILL BECOME OF THE I.E.E. RULES?

LAST week was a week of Reports, and the one of most interest to the wiring section of the industry was published in abstract on pages 132 and 134 of last week's ELECTRICAL TIMES, in relation to the post-war planning of electricity supply, distribution and installation. There are so many post-war planning committees in existence at the moment that it may be well to examine the position of the one that has drafted this report, and its relation to other committees. It should be made clear at once that the report does not yet, at any rate, indicate the official views of the Institution, although so far as the section on "Installation" is concerned it does not appear improbable that they will implement part of its recommendations.

In order to submit appropriate technical advice to the Government on post-war reconstruction, the Council of the Institution appointed a "Post-War Planning Committee" representative of various sections of the electrical industry. This Committee nominated sub-committees including one to report on Electricity Supply, Distribution and Installation, and it is the report of this Sub-Committee that is before us. It has been adopted "with modifications" by the main Committee, but it is not absolutely clear whether the published report is as originally submitted by the Sub-Committee or includes these modifications. It is reasonable to suppose that the Council has already decided what immediate action should be taken by the I.E.E. on its own initiative and has made the necessary recommendations with the various Government departments concerned.

But it is not quite so simple as this. A decision may have to be even further delayed by the existence of another committee or series of committees, and there is a danger that the volume of reports may be swelled until they produce an almost unwieldy aggregate. The Ministry of Works, realising the desirability of obtaining for themselves the fullest possible up-to-date information and advice to assist them in such building operations as they may be called upon to carry out themselves, and others over which they may have to exercise control, asked for an Electrical Installation (Study) Committee, which was convened by the I.E.E. on behalf of the Directorate of Post-War Building. This, with the assistance of various sub-committees for different classes of buildings, has prepared a report to the Ministry that still awaits publication, together with allied reports on lighting, heating and ventilation. It may be expected to deal with installation work in some detail in relation to post-war planning, and, in order to avoid overlapping, it is not covered by the "Electricity Supply, Distribution and Installation" report now before us.

Nevertheless, this report does make recommendations with regard to a fundamental matter in installation work, namely the I.E.E. Wiring Regulations. After eleven editions and intermediate amendments, these have, in sixty years, become very complicated, and the complication has in recent years become even greater, as it now involves cross-reference to B.S.I. specifications, which are published separately. Moreover, there are War Emergency Amendments and B.S.I. Codes of Practice adopted by the Ministry of Works, which make pie of quite a number of regulations. Some of these changes in practice may perforce have to be retained for a post-war period, or permanently. So the committee recommends, but not quite in these words, "Scrap the Lot," and replace them with essential "Basic Safety Regulations" which could at any time be made compulsory, if not by Act of Parliament, at any rate by people embodying the basic code in their own specifications. Perhaps largely to avoid breaking the hearts of our diligent regulation-drafters, who have done such good work in the past, the proposal is to supplement the Basic Regulations with separate supporting codes of good practice, one of which, in the form of "a code of practical interpretation," is to be prepared (presumably on the existing framework of the existing I.E.E. Wiring Rules) by the I.E.E. Wiring Rules Committee. Now all this will take time, for it must be remembered that the existing B.S.I.-Ministry of Works codes of practice are merely war emergency measures on which one could hardly rely as a framework upon which to build new codes. And, if the Basic Regulations with the supporting Codes of Practice are not ready by the time rebuilding starts in earnest, they would lose much of their value. So I do hope that the policy will be followed of getting ahead with the Basic Safety Regulations without delay, and leaving the detailed interpretations to the supply undertakers' inspectors and the contractors who know their job, assisted when necessary by those consultants who specialise in this class of work. In fact, to simplify procedure, the Basic Safety Code could very well be embodied as part of the Electricity Commissioners' Regulations for the Safety of the Public. They would more or less be an expansion of the technical matter in Regulations 26 to 31 except that

their enforcement should be made obligatory on the supply undertaker and not merely optional. Publication of codes of good practice and detailed explanations of the meaning of the Basic Code could be left, as it largely is now, to the technical journals and the publishers of technical books, until it became necessary to increase the number of inspectors to such an extent that their education by official methods becomes unavoidable.

Lastly, the opinion expressed in the report will, I think, finally dispose of the agitation for legislation to effect the compulsory registration of electrical contractors and wiremen. Infringement of Basic Safety Regulations imposed by the Electricity Commissioners would in itself make the culprit liable for accidents, and the same would apply to supply undertakings guilty of condonation of infringement. **MEGOHM**

CHARGE ENGINEERS' NOTES

EXTINGUISHING ELECTRICAL FIRES

WHATEVER may be done to reduce the fire risk to electrical plant, there is still a remote possibility of such an incident. In that event it should be remembered that if the fire can be localised within the first few minutes, damage can be kept to a minimum. In the past, much has been done to reduce the fire hazards. Control cables now take a different route to the main cables, all serving is removed from indoor cables unless it is fireproof. Transformers have been provided with oil pits and rubble drainage. Automatic fire protection is common, and sectionalisation of switchgear is general practice.

Speaking with experience of a major electric fire, the writer would stress that any obstruction in the passage-ways in the switchrooms should not be tolerated, nor should oily rags be allowed to remain. In a dim smoke-filled room, testing gear left in the passage-way can, to say the least, be most inconvenient, and patches of oil on the floor may cause quite a nasty fall to anyone hurrying along with a fire extinguisher. Part empty oil barrels can be very dangerous if they are near the seat of a fire.

When a fire does occur, the first move is to make sure that the apparatus concerned is dead, and if there is any danger of the control circuits being affected, these also should be cleared. If the extinguishers are automatic, it is possible that the fire may now be out or at a low ebb. In this case all that needs to be done is to make sure that everything is cooling down, and if there is no danger of re-ignition more air can be admitted to remove the smoke and gases.

Extinguishing the Fire.—Where no automatic protection is installed, the fire must be got under control with the extinguishers provided. The door of the room may be left open as a means of retreat, but it must be stressed that a through-draught should be avoided at all costs. Holes in the floor or walls under a fire, where the cables enter, can be sealed with a foam extinguisher, and this, in addition to preventing the air coming through, will prevent the fire travelling backwards. A foam extinguisher can always be laid on the floor and rolled to position by the foot, whilst another extinguisher, of any kind, can be operated by hand to keep the fire down. This combination will soon limit a bad fire and narrow it down until it is out.

When the fire is out, make an examination for hot metal or any smouldering material before admitting more air. Cases have been known of fires which have been put out re-igniting when the ventilators have been opened to get rid of the smoke. The hot metal has ignited imflammable material and the smouldering material has burst into flame again when the air has blown the inert gases away. Ventilators, doors and windows should be opened one at a time, so that the room cools slowly; the smoke that is such a nuisance has played its part in helping to smother the fire.

A Major Outbreak.—When the incident is a major outbreak and the fire service has been summoned, a guide should be posted at the works entrance to take them to the affected room, and the room should have been made safe for firemen to work in. The officer-in-charge will ask for any help or advice he requires, and a responsible official should always be at hand. The queries are generally about the approaches to the room, water supply and the nature of the adjacent rooms and roofs.

If water is used to any great extent, a watch should be kept on the drains; these will rapidly choke with charred debris, which must be swept clear so that as little as possible goes through the grids. Basements under the room and under adjacent rooms should also be kept under observation for flooding or backing up from the drains. If flooding does take place, a request to pump the water out may have to be made to the officer-in-charge.

In basements or near the floor where chemical extinguishers have been used, a watch should be kept for any exceptionally clear atmosphere, this may possibly be a pocket of inert gas and is best avoided.—**W.M.G.**

VACATION WORK FOR SCIENCE STUDENTS

THE Imperial College of Science and Technology, a body formed nearly 40 years ago from an amalgamation of the Royal School of Mines, the City and Guilds Central Technical College and the Royal College of Science, started about a decade ago a scheme to give students at the College an opportunity during their vacation periods of getting first-hand experience of industrial conditions. The scheme is not a training scheme, but provides only for attachment of the students to industrial firms for the purpose stated; when their time comes to enter industry such students at least have rudimentary ideas of conditions such as cannot be gained in any class-rooms.

Registrations.—The ninth annual report of the Vacation Work Committee now before us covers the year to October last. It shows that in the period there were 488 registrations for works experience, including 256 from the City and Guilds College, 101 from the Royal College of Science, 2 from the School of Mines, plus 129 pre-entry students. Firms and others co-operating with the scheme numbered 226; those who glance down the list of these will find in them a very high proportion of concerns interested in electrical manufactures and apparatus for the utilisation of electricity in some direction. A graph showing the progress of the scheme indicates that apart from a slight drop in 1939-40, the trend both of students registering for vacation work and of firms offering it has been steadily upwards. The scheme is officially recognised by the Ministry of Labour, so that direct arrangements can be made with employers. The scheme has proved a useful means of getting students and their future employers acquainted and in these war years some of the students who went for vacation work were retained on permanent staffs of firms. The Committee was able in July, 1943, to meet a request from a firm for assistance during the summer vacation—29 students went and the firm expressed its thanks therefor. The total received in payment in connection with the work of the 488 students on vacation work in 1943 was £5,269.

Conference with Industry.—An innovation was a conference on December 17 with Industrial Representatives—the scheme was discussed and the exchange of views between the educational side and the industrial side will no doubt be found of considerable ultimate benefit to each. A report of the proceedings at this conference is now before us. It is too long to deal with at length here, but one or two points may be noted. **Dr. C. C. Paterson** (G.E.C.) stressed the point that the student gets opportunity to widen his outlook and to get some notion of the purpose of his studies. There was a tendency to find the vacation student a bit of a nuisance, they take up the time of people who would rather be getting on with their jobs, but he hoped industry would be more far-seeing—the training of these future scientists and engineers was of great importance to industry.

Dr. Clarke (Lever & Unilever) accepted the fact that, so many companies having taken such students, they must think it a good scheme. Hence his suggestions were towards the training such students should get. He proposed a period for the student to see the works as a whole, a week or so in the laboratory and then, the important thing, to set the student to work, not to watch. A month of that and a final week of ancillary operations of the industry. As to remuneration, he suggested the appropriate industrial rates for the students' age. And he would not have one student doing a second vacation course at the same works. Though good in war-time, the pre-entry student Dr. Clarke would seem to have less fancy for in normal times—for he had no experience of college or university and there was no urge for early employment provision in his case.

Student Impressions.—Some of the students spoke of their experience of vacation work. They did not find evidence of being regarded as nuisances and generally were appreciative to the full of the opportunity which had been given them. They expressed the view that what the students wanted from the vacation work was experience not pocket money, though a little of the latter was useful. Also they thought it good for the student to get some idea of what they wanted in industry.

After some remarks by **Prof. Levy,** the Chairman of the Vacation Work Committee, the Conference was thrown open to general discussion.

Conclusions.—After quite a frank discussion, **Dr. A. P. M. Fleming** (Metro-Vick) summed up. He agreed that a student should not make two vacation visits to the same firm; the vacation training must be planned to get the best out of it—it was desirable that the student should get down to work and not merely have a "Cook's Tour" of works. The question of lectures was subject for differing opinions, but a good deal of benefit could be obtained from lectures. The vacation course was just an introduction to the student's career—it gives him an appreciation of the relationships in industry and the need for team work. Uniformity of pay for the work was desirable.

ACHIEVEMENTS OF PRIVATE ENTERPRISE

PRIVATE enterprise has found a strong protagonist in Lord McGowan. Speaking to the Glasgow Chamber of Commerce, he raised the veil, to a small extent, on the achievements of the great concern with which he is connected—Imperial Chemical Industries, or, more familiarly, I.C.I. He was, it may be assumed, stung into taking off the gloves by what he termed a wealth of misrepresentation and innuendo designed to create the impression that existing methods of conducting industry and commerce had failed, leading to argument for State control of Industry. Facts being the stubborn things they are, Industry has a strong case for its methods; its fault is that it is too inclined to say too little about itself, leaving the propaganda field open to its opponents. Lord McGowan holds the view that it is Industry's duty to cast away, at least in part, this reticence, and, in modern parlance, to "tell the world." The I.C.I. is an excellent example of Industry which has done things which benefit the nation quite as much as the shareholders. The I.C.I., Lord McGowan points out, is, because of its size, a favourite target for criticism—actually, though large by British standards, it is but of moderate size compared with others in the U.S.A. and on the Continent, particularly Germany—I.C.I. now has 120,000 employees, but normally round about 70,000; the large foreign firms employ upwards of 200,000. I.C.I.'s present position is due, not to a desire for self-inflation, but to natural growth, having built up under one direction a series of interdependent industries whose efficiency in research, production and marketing is increased by their mutual support and the use of the products of the one by the other. Lord McGowan proceeded to deal briefly with aspects of I.C.I.'s work and its war-time importance. The fight, against strong opposition, which it had, to get its plant established for producing petrol from coal and tar. That was in 1935—the Board was accused of gambling with shareholders' money; but it had played a major part in Britain's war effort—providing fuel for the R.A.F. What State Department would, in 1935, have dared to accept the risk in the decision then involved? Private enterprise, however, did take it. That was one landmark; there were others in the I.C.I.'s war effort. In 1937, the building of shadow factories for small arms, the building of Government factories and training of the personnel for them, explosives, foodstuffs, the I.C.I. had made major contributions to the National war effort. The provision of key men, 2,500 of them for Government work, secret weapons, special protective paints, drugs and medicines, self-heating cans of soup, all sorts of things were due to I.C.I. enterprise. A "happy ship," with no major labour dispute in five years of war, the workpeople were loyal and conditions of labour good; £15 million had been invested in pensions schemes for the staff and labour. The Company had placed its research, its patents, its processes and all its knowledge, technical and commercial, at the disposal of the Government and our Allies, without reservation. The Government should back Industry to help it function in the best interests of the community, but this did not mean interference in the administration of Industry.

Plans were already laid for expansion over the next five years—millions of pounds sterling were involved. The Company was well-fitted to help the Government to create a world of plenty, and believed that the method by which its strength had been built up was that which would continue the process in the future. This record of the I.C.I. was not peculiar, he had merely used it as an example—private enterprise to-day should let its light so shine before men that they may know its good works.

ELECTRICITY FOR EVERY WOMAN

SOME time since we described the handing over by the Electrical Association of Women of a photographic exhibition to the A.T.S. Last week the Association gave further evidence of its good work by presenting a somewhat similar exhibition to the W.R.N.S. The Dowager Lady Swaythling presided over a large gathering, which included Miss C. Haslett, Miss Goodenough (Deputy-Director of the W.R.N.S.), Mr. E. E. Hoadley (Chairman E.D.A. Council), Mr. V. Dale (E.D.A.) and a number of Canadian and Norwegian "Wrens."

Lady Swaythling said that in looking forward to the days of peace and reconstruction they thought of the great technical developments of recent years and amongst them electricity was perhaps the greatest. Consequently it would be a very important factor in building up the new world. The Association believed that the story of electricity in all its aspects should be clearly presented to those whom it would vitally affect and this certainly included the Women's Services, whose technical work in the War had amazed the world. It was necessary that scientific development should be seen in its true perspective and that everybody's talents should be fully utilised in carrying out planning projects. The

E.A.W. had therefore been happy to prepare the photographic exhibition for the Women's Royal Naval Service, as it gave a bird's-eye picture of "Electricity for Every Woman."

Miss M. E. Goodenough, in accepting the gift, said that many members of the service had a knowledge of electricity, but the exhibition would be of great interest to those who at present had no such knowledge. There was no doubt that electricity was going to be used more and more in their everyday life and she hoped that in future every girl would leave school trained in domestic economy and also with some training in electricity, which would enable them to understand the appliances they used.

The Exhibition.—This consists of seventy photographs mounted on fourteen panels, each illustrating one of the contributions of electricity to modern living. Art work and letterpress give emphasis and clarity to the photographs. Each panel measures 24in. by 36in. and the whole is easily handled and packed to facilitate transport. Generation of electricity by coal and water power is depicted in striking photographs; a chart shows the house circuit; and electricity is seen at work on a dozen everyday things. There are some beautiful pictures showing how electricity can enhance the comfort of the ordinary home, and others show how it can help to transform slums into decent homes. Modern agriculture is a subject of paramount importance, and electricity is seen at work in producing better crops, more hygienic food, and lightening the burden of the farmer's wife, and withal preserving the beauty of the countryside.

A special nautical note is introduced in photographs which show cooking aboard a submarine; repairing a cable in mid-ocean; shipbuilding; ocean transport in an electrically driven ship. There are photographs also of great electrical engineering projects and domestic amenities in Holland, Poland, Russia, China, the U.S.A. Panels on transport and telecommunications indicate how electricity will help to make the whole world kin. The opportunities which electricity opens up to women to take their places in these wonders of the modern world are shown in panels on "Careers."

NEW LITERATURE

Radio Upkeep and Repairs. *By A. T. Witts. Published by Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Sixth edition, price 7s. 6d.*

To those who require a book on radio repairs that is not too technical yet covers many of the faults met with in practice, this book is commended. The methods advocated require a minimum of equipment, in fact only a milliammeter, for the Author shows how this may be extended to a multi-range ammeter and voltmeter. This book has now run to six editions and in this latest one the principal revision is a new chapter on gramophone pick-ups. The excellence of this work is particularly welcome at the present time when it is so important to keep existing wireless sets in good running order.

Personnel Management. *By W. Tudor Davies. Published by the Engineering Industries Association, Salisbury Square House, E.C. 4, price 3s. 6d.*

The war has focused attention on the important functions of personnel management and more attention than ever before has to be given to labour recruitment welfare work and other allied problems. Particularly difficult problems arise under the Essential Works Order and this book will prove a useful guide to those who are concerned with the Order. But the labour manager has many other difficulties of a legal nature to overcome and for most of these he may look to this book for just that help which he desires.

Fluorescent Lighting. *By A. D. S. Atkinson. Published by George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2, price 12s. 6d. net.*

The advent of the low pressure fluorescent tube has opened a new vista in illuminating engineering, a vista which brings new problems in design and raises new questions in maintenance. When the ban on this type of lighting for other than essential war work is raised there will undoubtedly be a rapid extension of it, particularly in the commercial fields. Hitherto, information has been largely restricted to technical papers, articles and manufacturers' instructions. For this reason the text book is most timely and fills a void in technical literature. The Author's qualification for dealing with the subject are well known; it is indeed dealt with in an exhaustive manner. The basic theory is first outlined and detailed descriptions given of the lamps and their fittings. The questions of design and applications are dealt with at length. A useful feature is that the Author does not hesitate to draw on American sources for illustrations of commercial practice. Neither does he accept that practice unreservedly, but offers useful indication of the lines which post-war development may take. One wishes perhaps that more reference had been made to those other sizes of fluorescent lamps we have been promised after the war, but that does not detract from the great value of the book to all those concerned with modern lighting installation.

MR. F. FORREST RETIRES

AFTER thirty-eight years' service with the City of Birmingham Electricity Department, **Mr. F. Forrest,** M.Inst.C.E., M.I Mech.E., M.I.E.E., retired from the office of chief engineer and manager on February 2, on reaching the superannuation age of 65. In normal times a civic dinner would have appropriately marked the occasion; the war-time substitute was a complimentary luncheon at the Grand Hotel last Friday, attended by the Lord Mayor, the Town Clerk, the Electricity Committee, senior departmental officials and a few leading personalities in the Industry.

Lt.-Col. H. A. Sale, M.C., J.P., chairman of the Electricity Committee, presided. He revealed that Mr. Forrest's immediate plans are a home in the Lyme Regis district and the enjoyment of his well-earned leisure in the pursuit of cultural interests and personal hobbies.

The Lord Mayor (Alderman L. G. H. Alldridge, J.P.), spoke of Mr. Forrest's valued service to the City of Birmingham. The administration of Birmingham would be a credit to any city, and they owed that to their chief officials, of whom the City was proud. They did not like losing Mr. Forrest, but he carried with him into retirement the thanks and sincere good wishes of the Corporation and the citizens of Birmingham.

Sir Johnstone Wright paid special tribute to Mr. Forrest's engineering achievements. Hams Hall B was his especial monument, and one of which he might well be proud. Less evident physically, but nevertheless outstanding as an engineering feat, was the change-over of frequency in the Birmingham area that Mr. Forrest had carried through. It was one of the biggest things ever done in electricity supply, and it had been done very efficiently. Furthermore, the great growth of the Birmingham undertaking was in no small measure due to his enterprise and ability. Sir Johnstone also expressed great appreciation of Mr. Forrest's work for the District Consultative Committee of the C.E.B., of which he was chairman for a number of years, and as a member of the National Consultative Committee.

Mr. F. Forrest, replying, thanked the Electricity Committee for having consistently done their best to make his somewhat difficult job easy. If a chief official was harassed or worried, he could not give of his best. He had not been harassed, he had worked for the Committee and had not been worked by them; having taken a decision, they had always backed his plans fully. Mr. Forrest also expressed appreciation and thanks to his most loyal, efficient and devoted staff; they had been a company of friends, welded into a team in which each did his own especial job. He was proud of Hams B; operating results had worked out within a fraction of 1% of the estimated figures, and it was one of the most efficient generating stations in the country. In the future, however, naturally still more efficient stations would be built, leading up to the gas-turbine. Electricity supply was a great dynamic service, not a mere industry, and post-war developments would be very great indeed. In the domestic field housewives looked forward to the assistance of labour-saving devices; how could we deny the ladies? Their demands would have to be satisfied, if only for the sake of peace in the home. He handed over to Mr. F. W. Lawton, his successor, confident that under his control, and with his loyal staff, the undertaking would continue to expand and prosper.

A happy end to the proceedings was the sincere personal tribute of the Town Clerk, **Sir Frank Wiltshire,** M.C. Mr. Forrest, he said, would be missed both as an able colleague and as a friend.

Councillor Lt.-Col. H. A. Sale, Chairman of the Electricity Committee, presenting Mr. F. Forrest with an illuminated address recording the appreciation of the Electricity Committee of his 38 years' service with the Birmingham Electric Supply Department.

LETTERS TO THE EDITOR

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

The Virtue of the Ring?

SIR,—*Megohm's* remarks in your issue, January 27, although under the above heading, have not expounded any of the "virtues," but rather the "iniquities."* The main virtues of the ring main, as visualised for the small houses and compared with the single main and distribution system, appear to be as follows :—

1. Better equalisation of pressure.
2. 30% saving in copper.
3. Reduced number of fuse-ways.
4. Higher diversity factor.

When the ring main is carrying current, to say that part of it "carries nothing at all" is not correct, as every portion of the main is carrying its quota of current, which varies in accordance with Ohm's law. In some instances this may be infinitesimal, but in the majority of instances it is very appreciable.

With the single main and distribution system, however, very considerable portions of the sub-circuits are supplying no current at all, according to the number and position of the outlet points in actual use. The number of outlet points per room (two as suggested) is inadequate as the paucity of outlet points in the past has been the cause, directly and indirectly, of many of our troubles.

I agree with *Megohm's* remarks, however, as applied to houses of £2,000 value or over, as it will probably be found in the majority of instances that the ring main will not be suitable or even economical.

Feb. 1. G. F. A. NORMAN, M.I.E.E.,
The Berkeley Electrical Engineering Co., Ltd.

*[The writer has apparently not appreciated the significance of t e query mark that follows the title of the notes.—ED.]

SIR,—†Proposals concerning the ring main method of distribution for socket outlets in the domestic installation have been criticised by *Megohm* in his article "The Virtue of the Ring?" published in your issue of January 27.

The article seems to show an inadequate appreciation of the purpose of the ring main and introduces technicalities which do not have a direct bearing on the proposals.

Megohm states firstly that the reasons that have been advanced for the ring main are :—The inability to select positions for the socket-outlets in advance, and the alleged saving in cable. But the positions of socket-outlets can be settled just as easily with the ring main as with any other means of distribution, and no other system has the inherent diversity to enable additional socket-outlets to be added as easily within the margin allowed; in other words, the system is based on the building requirements and not on an academic circuit lay-out.

The liberal provision of outlets that can be made when the ring main system is first installed does away in great part with the need for extensions (amateur or professional) at a later date, while the initial cost is not only kept within reasonable bounds but can be shown to be no more expensive than the circuit system with its lesser facilities.

With regard to the mention of Ohm's and Kirchoff's Laws, has not *Megohm* made a mistake when he suggests that part of the circuit will carry no current at all?

Megohm refers to the use of adaptable casing, but the ring main can, of course, be installed with any of the known systems of wiring. It is misleading to use this argument against the ring main.

The provision of socket-outlets designed to receive cable without cutting them is not an innovation necessitated by the use of the ring main, but is a desirable improvement for any type of accessory whenever looping in is employed.

I cannot understand why it should be thought that, because of the ring main, socket-outlets cannot be installed at any position required; nor can the difficulties suggested in regard to the position and character of the local fuses be considered to have any influence on the choice of the particular system. Apart from the merits of the ring main, is it not better to protect the apparatus than to fuse at the arbitrarily rated capacity of an individual circuit?

Megohm has not indicated whether he agrees with the use of the universal socket and where he refers to two sockets per room does he mean :—

(*a*) One lighting and one heating socket (which is inadequate).
(*b*) Two heating sockets (which, if the ring main is not used, normally requires two 15-ampere circuits per room), or
(*c*) Some other system to which no reference is made?

In the interests of the industry one asks *Megohm* to use his great influence and authority to have further consideration given to this attempt to provide improved installation methods without which the full benefit of electricity may not quickly become apparent to the domestic user.

January 31. T. DUNWOODY.
12 Lime Grove, Eastcote, Ruislip, Mdx.

†[Owing to considerations of space it has been necessary to abbreviate Mr. Dunwoody's letter.—ED.]

Conduit Joints

SIR,—The letter from Mr. Forbes Jackson in your issue of January 27 raises again the old-time question "Screwed Barrel versus Grip Conduit". This letter points out that the E.R.A. report shows that, as far

as continuity is concerned, there is little to choose between the two systems. This point must be admitted by all, but that does not mean that in actual practical cases results will be the same.

A screwed barrel installation will, with reasonable workmen, give a result that can be estimated and which will maintain the same figure for continuity over a large number of years. On the other hand, a grip conduit system is, as far as continuity is concerned, an unknown quantity. This statement is the result of many years experience, both as a contractor and later as a consultant.

It is very difficult, even employing the best labour, to be sure that the grub screws are tightened and the ends of the conduit cleaned, not to mention the inside of the fittings. A resistance test with good fitting conduit will at times not show a loose screw, but time will show up the fault. Naturally, in most cases such a fault would be indicated.

Some supply companies test for continuity by a flash test at mains voltage through a 30 W lamp.

Furthermore, a grip installation may be left in excellent condition, both as regards finish and continuity, but a few years later after visits from builders or decorators, it may be far from the perfect job. Very often, as regards continuity, the work is entirely destroyed. On more than one occasion the writer has returned to the work only to find fittings and conduit hanging on the wires like so many bracelets.

Lest the decorators and builders may take affront at these words, in one case the fault, or faults to be more exact, was due to the jobbing electrician, who had used the grip system to extend the installation. He had slipped the tubing from the fittings in order to loop in at several points.

The writer would welcome any non-metallic casing, as then it is quite clear when and how an earth is to be used, but with grip conduit there are so many cases where failure may be found that it is really of doubtful safety.

Jan. 31. F. PEAKE SEXTON, A.M.I.E.E.
182 Elgar Avenue, Tolworth, Surrey.

Newport Appointment

SIR,—In the published recommendations of the Electricity and Transport Committee of Newport my name appears as a short-listed candidate for the appointment of Electrical Engineer and Manager at a salary which is now stated to be £1,350 per annum. When applications were invited for this appointment candidates were requested to state salary required. I, and, I understand, other qualified applicants stipulated the minimum of £1,650 per annum in accordance with Clause 10 of the Schedule to the Agreemented dated July 9, 1941, of the Joint Committee of Local Authorities and Chief Engineers.

A. C. THIRTLE, A.M.I.C.E., A.M.I.E.E.,
Deputy Engineer and Manager,
Electricity Dept., Swansea.
The Guildhall, Swansea.

PERSONAL

The Council of the Institution of Electrical Engineers has elected **Sir Ernest Thomas Fisk** to be an honorary member of the Institution. This distinction has been conferred upon him in appreciation of the services he has rendered in Australasia in the field of radio-communications. Sir Ernest, who is a past-president of the Institution of Radio Engineers (Australia), was managing director from 1917, and has been chairman from 1937, of Amalgamated Wireless (Australia) and also chairman of several other companies concerned with wireless. Originally a member of the Marconi Company, he joined a special mission to the Arctic in 1909. He has generally pioneered radio in Australia, including direct wireless communication with Great Britain, having received the first direct wireless message from England to Australia in 1918. In 1940 Sir Ernest was appointed secretary of the Economic Cabinet in Australia, and Director of Economic Co-ordination.

The twenty-second award of the Faraday Medal has been made by the Council of the Institution of Electrical Engineers to **Dr. Irving Langmuir,** for outstanding contributions to electrical science. Dr. Langmuir's investigations have ranged over an extremely wide field. His work on hard vacuum valves, thyratrons and gas-filled incandescent lamps is well known. He has also worked on atomic hydrogen welding and carried out fundamental researches on oil films. Dr. Langmuir is a foreign member of the Royal Society and holds the position of associate-director of the Research Laboratory of the General Electric Company in Schenectady, N.Y.

In connection with the luncheon, mentioned elsewhere, given to honour **Mr. Frank Forrest** on the occasion of his retirement from the office of city electrical engineer and manager of Birmingham, it may be noted that he is a native of Old Charlton, Kent. He served his apprenticeship with Siemens Bros. & Co., Woolwich. After passing through that firm's various departments he took an appointment on the engine-room staff of the Belgian royal yacht *Alberta*. Becoming a landsman again he

went to the Tynemouth Corporation as chief assistant electrical engineer. Following that he spent some 4½ years with the Charing Cross and Strand Electricity Co., in London. He went to Birmingham in 1906, being appointed to take charge of the substation department and the power station plant and switchgear. He later became chief assistant engineer of the whole undertaking and succeeded Mr. R. A. Chattock as city electrical engineer in 1930. As will be gathered from the remarks at the luncheon last week, he has no cause for other than pride in his achievements. What is a happy circumstance is that Birmingham, city brimful of business brains, is appreciative of his worth.

Mr. Stanley Gough, assistant mains engineer in Cardiff Corporation Electricity Department, has been elected National president of the Electrical Power Engineers' Association. Mr. Gough has been a member of No. 4 Area District Joint Board Electricity Supply since 1934, and is vice-chairman of the National Joint Board. He is a vice-president of the Cardiff Electricity Department Social Club, and assistant general secretary of Cardiff Municipal Musical Society.

The short list of candidates for the position of chief electrical engineer and manager at Newport included: **Mr. R. Golding** (deputy borough electrical engineer, Great Yarmouth). **Mr. A. C. Thirtle** (deputy borough electrical engineer and manager, Swansea), **Mr. D. R. Williams** (technical assistant and constructional engineer, West Midlands Joint Electricity Authority), and **Mr. T. H. Wood** (technical assistant, Newport). The Electricity and Transport Committee recommended that Mr. Wood be appointed, at £1,350 per annum.

A very efficient and popular official of the Brighton Corporation, **Mr. George Claughton,** power station engineer in the Brighton Corporation electricity undertaking, retires this month after nearly 39 years' service. North-countryman, Mr. Claughton was apprenticed to a firm of marine engineers at Tyneside. After a short service afloat he returned to the staff of the same firm and was engaged on trial trips of a variety of vessels. Before going to Brighton he was with the British Westinghouse Co., Ltd., and was with that firm when it installed machinery at Brighton in the early days of the undertaking.

Mr. H. A. C. Ridsdale, a power engineer with the North-Eastern Electric Supply Co., Ltd., has been adopted as Common Wealth candidate for the Newcastle-on-Tyne North Parliamentary Division.

Mr. W. A. May, A.C.I.S., M.I.Ex., representative of Berry's Electric, Ltd., before the war, has been invalided out of the R.A.F. and has now returned to Berry's, where he has been appointed manager of the Export Department of the Company.

Mr. C. C. Roloff has recently joined Thorn Electrical Industries and has been appointed sales manager of the Atlas Lamp Division of the firm's Northern Branch. Prior to joining Thorn Electrical Industries, Mr. Roloff was for some years sales manager of the A.E.G. Electric Co., Ltd., and had considerable experience in the technique of lamp manufacture and sales, both on the Continent and in this country. On the outbreak of war he transferred his activities to Metropolitan-Vickers Electrical Co., Ltd., when he was in charge of the sales side of their Projector and Floodlighting Department.

Mr. C. C. Roloff.

The board of the Philco Radio and Television Corporation of Great Britain has been enlarged by the appointment of **Mr. E. M. Benjamin** and **Mr. R. W. Cotton.** Mr. Benjamin has been with the company for many years and now becomes assistant managing director. Mr. Cotton is chairman of British Rola. He has a long and intimate experience of the Radio Trade in this country and the U.S.A. **Mr. L. D. Bennett,** chairman of the Philco Company, has been appointed to the board of Aero Engines, Ltd.

The Chester Corporation has accepted the resignation of **Mr. S. C. Harling,** the deputy city electrical engineer, lately appointed borough electrical engineer and manager at Leigh, Lancs.; but, in existing circumstances, is unable to release him until March 17.

The Association of Scientific Workers announces that **Professor P. M. S. Blackett, F.R.S.,** has been appointed president of the Association, as from February 1. Professor Blackett is Langworthy Professor of Physics at Manchester University, and during the war is working for the Admiralty. Prior to his Manchester appointment, he was Professor of Physics at Birkbeck College, London University. He is widely known for his work on nuclear physics and cosmic rays. He was educated at R.N. Colleges, Osborne and Dartmouth, and served with the Royal Navy during the last war. An active member of the A.Sc.W. since 1927, he has helped to build up the Association, which at present has a membership of nearly 15,000.

Mr. Alan P. Good, in pursuance of a policy of concentrating his activities, has, as already announced, resigned from the boards of a number of Heenan & Froude subsidiaries. Last year he also resigned from the boards of Messier Aircraft Equipment, Ltd., and B. W. Parsons, Ltd., and has recently resigned from the boards of Toledo Woodhead Springs, Ltd., and Darwins Toledo Overseas, Ltd.

In the recent New Year Honours, **Alderman R. Tortington, J.P.,** the deputy-chairman of the Leeds Corporation Electricity Committee, was awarded the M.B.E. The alderman has been a member of the City Council for over 19 years, and has throughout that period served on the Electricity Committee. He was chairman in 1928 and 1929, vice-chairman in 1930-31-32, again chairman in 1933-34, and deputy-chairman from 1935 to the present time. He is also deputy-chairman of the Gas Committee and a member of the Transport Committee.

The retirement of **Mr. W. J. Cusack** (Rugby), and **Mr. F. Hughes-Caley** (Birmingham), from the staff of the British Thomson-Houston Co.—after many years of service, is announced. We hope to give further details next week. Meanwhile it may be noted that the new manager of the Birmingham office of the Company is **Mr. S. Nichols, M.C.,** for the past ten years manager of the Sheffield office.

Mr. C. W. Reeve, C.B.E., having reached pensionable age, has resigned the appointment of managing director of the Associated Equipment Company, Ltd. Mr. Reeve, who remains a director of the Company, was re-elected chairman at a recent meeting of the Board. No new appointment of managing director is being made.

ELECTRIC SUPPLY NEWS

West Ham.—Last month, Mr. J. Townley, the borough electrical engineer and manager, reported to the Electricity Committee as to the post-war development of the Corporation's generating station. As things are at present a good deal of the plant installed is obsolete and, but for the 1926 Act, would have been replaced in stages since 1930 and the capacity increased to meet the requirements of to-day. The Council has had a direction to prepare a scheme for extending the general plant by installation of a 30,000 kW set, with ancillary plant—providing that the actual work should not be commenced until the termination of the war with Germany and for the plant to be in operation as soon as possible thereafter.

Mr. Townley, however, says that the position is that no piecemeal addition to the generating station would satisfy engineering or economic requirements, as all the plant, with the exception of the turbo-alternator, boilers, etc., installed in 1930, would be due for replacement by 1947—some earlier—and the 1930 set by 1950, by which latter date the whole of the outstanding debt on the generating station will have been paid off. The present distribution system—2-phase—is non-standard, and sooner or later would want replacing by standard 3-phase. The matter, it appears, has been consulted and has asked that a scheme be prepared for the ultimate maximum use of the area available for generation at Canning Town and, further, that no proposals should be put forward for the first section of the extensions now proposed until the ultimate development plans have been prepared. This, in short, means the preparation of a scheme for a new generating station which, preliminary investigations indicate, can have a capacity of about 180,000 kW and involves ultimate replacement of the whole of the existing plant, in stages. Though no precise estimate of the cost can at present be given, it is likely to be between £3,000,000 and £4,000,000. Until the plans for this long-term scheme have been prepared, no satisfactory proposals can be put forward for the first section to be commenced immediately after the war, the cost of which would amount to about £500,000. So, in view of the magnitude of the proposed development and the existing war conditions, Mr. Townley considers the Committee should engage consultants to co-operate with him in the preparation of the scheme, and for the carrying out of the first section. The C.E.B. fully approves such an arrangement, and, further, is prepared to accept the expenditure on engineering fees as part of the capital cost of works. It is stressed that the work outlined and the costs involved are for the purposes of the South-East England Electricity Scheme, and not only for supply in West Ham; although the Council will be required to raise loans for meeting the necessary capital expenditure from time to time, the whole of the annual capital charges will be met by the Board, only such part of the charges as are applicable to the electricity used in the West Ham undertaking will be recharged to the Council. Mr. Townley has discussed terms and conditions with representatives of Messrs. Merz & McLellan for the carrying out of the engineering work, in co-operation with himself and the engineering staff of the undertaking, and they are prepared to enter into an agreement with the Council for this purpose.

Kingston-on-Thames.—An echo of the disastrous fire which occurred at the Corporation's electricity works in December, 1938, is found in the recent minutes of the Electricity Committee. The Town Clerk has reported that a final settlement has now been made by the Central Electricity Board and the G.E.C., the joint defendants in the action brought by the Corporation. Between them the defendants made a payment of £28,737, plus certain interest and taxed costs. The Insurance Company's rights in any legal process taken by the Corporation against the joint defendants had been subrogated and in the outcome the sum paid to the Corporation under the policy was £19,000 odd; which sum had been repaid to the Insurance Company from the £28,737. The Insurance Company had repaid to the Corporation its share of legal costs, etc. Application is to be made to the Electricity Commissioners for sanction to borrow £500 for the purchase of domestic apparatus for hire purposes.

Scotland.—The Ross-shire Electrical Supply Company has announced that the price of electricity for lighting purposes in its area is to be reduced from 9d. to 6d. per unit. Consumers of the Grampian Company are to have a reduction from 8d. to 6d. Meter rentals are to be reduced from the present rates, ranging from 1s. 3d. to 7s. 6d. of a flat rate of 9d. per quarter.

NOTES AND NOTICES

Philips Red Cross Ball

The Victoria Rooms, the largest ballroom in Bristol, was crowded to capacity for the "Philips Red Cross Ball," which attracted large numbers of people connected with the electrical and allied trades, together with their friends; there were many in uniform and some visitors from Allied Forces. The atmosphere was that of one big party, and the right atmosphere was created right from the start. Two military bands provided dance music. The control of the large assembly was excellently carried out, which was, without doubt, one of the main reasons why everybody had such an enjoyable time. Several spot-dances were arranged, for which suitable prizes were awarded. An air-raid alert midway through the function—the first alert in Bristol for some months—had no effect whatever on the spirit of the dancers; that show went on, with "spotters" to give ample warning of any untoward developments. At 11 o'clock, owing to regulations, the party had to break up; from the comments, it must have been one of the most successful dances held in Bristol this year. And, the proof of the pudding being in the eating, it may be noted that the Red Cross and St. John P.O.W. Fund will benefit to the extent of some £70.

E.T.C.T.A.

The annual luncheon of the Electrical Trades Commercial Travellers' Association is fixed for February 18, at the Connaught Rooms, Kingsway, W.C. Mr. Johnson, the secretary, tells us that this promises to be a bumper occasion—all the seating accommodation has been taken.

Electricity Supply, Distribution and Installation

The attention of members of the Institution is drawn to the fact that the Report on the above subject, the publication of which has been approved by the Council, will appear in the March number of Part I of the Institution *Journal*. A limited supply of copies of the report are available on application to the Secretary for members who do not receive this Part of the *Journal* or who particularly require a separate copy.

War-Time Disabled

Not all disabled ex-Servicemen are incapable of doing a real job. The British Legion points out that American records, based on a questionnaire to American employers, show that of many persons with physical impairments employed, the bulk are as able to produce as the ordinary able-bodied persons. The percentages of production capacity by the handicapped is: above the able-bodied, 23·8%; equal to able-bodied, 65·7%; below able-bodied standard, 10·5%. The Legion suggests a similar questionnaire for this country; it would produce interesting and instructive data for those concerned with industrial efficiency.

Electrical Association for Women

Further evidence of the popularity of the Association was forthcoming at the South West Essex Technical College last week when the South-West Essex branch was inaugurated. Dr. H. Lowery (Principal of the College) presided over a gathering of some three hundred persons. Miss Caroline Haslett (Director) outlined the aims and objects of the Association, and dealt with the work accomplished, and Mr. E. S. Riley (borough electrical engineer) warmly supported the project of forming a branch. It was decided to inaugurate the branch with Mrs. L. A. Brazier (head of the Women's Department of the College) as chairman; Mrs. E. S. Riley, vice-chairman; Mrs. Avery (hon. secretary), and Miss Bennett (hon. treasurer). An exhibition of electrical apparatus lent by the College, the Walthamstow Electricity Department, and the Ilford Electricity Department, and stands arranged by the British Thomson-Houston Co., Philips Lamps, Ltd., Edison Swan Electric Co., and the E.A.W., was viewed with interest. Mrs. E. Elmitt Edwards is the area organiser.

CASES IN COURT

Illegal Consumption

A fine of £40, with £4 2s. 6d. costs, was imposed at Stoke Stipendiary Court, on February 4, on Matthew Kelly, electrician, Harriseahead, for fraudulently consuming electricity, the property of the North-West Midlands Joint Electricity Authority. The defendant pleaded "Not Guilty." For the Electricity Authority, it was stated that when a mains assistant visited defendant's house to change a meter, on December 7, he found a 1 kW fire being fed by leads arranged to by-pass the meter. When seen later by the police, defendant said he had tried to rectify a fault, and probably the wire had been left there by a relative testing the wiring. On that particular day the workman found the door of the defendant's home unlocked, and on inquiry of a neighbour was told that defendant's wife had gone out and had left the door open for him to proceed with his job. Defendant denied all knowledge of the wire, and alleged that the house was locked at the time, and that the workman entered without his permission. It was stated that defendant had several previous convictions, and in 1942 was sentenced to a total of 12 months' imprisonment on a series of theft charges.

Canteen Electricity Account

At Shoreditch County Court recently, Stepney Borough Council sued Mrs. Follett, of St. John's Wood, N.W., for £18 8s. 4d., charge for electricity supplied to a canteen at the People's Palace, Mile End Road, in 1941 and 1942. Defendant did not appear. The solicitor for the Council, said defendant ran the canteen at the time of the "blitzes." It was stated by the Town Clerk of Stepney, that defendant entered into a verbal arrangement with him to pay for the electricity supplied to the canteen. She was one of the social workers attached to the W.V.S., and took control of the canteen, which catered for the Pioneer Corps, the administrative staff of the Council and members of the Civil Defence during the period of the "blitzes." She had the control from a period in 1941 up to April, 1942. Registrar Hicks gave judgment for the Council for the amount claimed, and costs.

BUSINESS ANNOUNCEMENTS

Continued from page 142

COMMERCIAL INTELLIGENCE

LONDON GAZETTE

Intended Dividends

Torquay.—Peacock, Arthur Furnival, 15 Bank Street, Teignmouth, radio engineer. Last day for receiving proofs, February 22. Trustee, Mr. H. Wheeler, 26 Baldwin Street, Bristol, Official receiver.

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.

Feb. 14.—**Birkenhead T.C.**: Electric lamps, one year. Borough electrical engineer, Craven St., Birkenhead. Advertised January 27 issue.

Feb. 14.—**Keighley T.C.**: Electric light and power installation at filter attendant's house, Oldfield, for T.C. Mr. A. Boothman, waterworks engineer, Devonshire Street, Keighley.

Feb. 15.—**Leeds T.C.**: Electrical repairs and maintenance to school buildings, three months. Director of education, Education Offices, Leeds.

Feb. 16.—**Belfast T.C.**: Electric lighting installation at gas cleansing station. City surveyor, City Hall, Belfast.

Mar. 3.—**Manchester T.C.**: 33 and 6.6 k·V switchgear at generating stations and substations. Mr. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall, Manchester. Deposit £1 1s. Advertised this week.

Mar. 4.—**Glasgow T.C.**: Replacement or conversion of hydraulic pumps at hydraulic pumping station, High Street. General manager, Electricity Department, 75 Waterloo Street, Glasgow. Deposit £1 1s.

Mar. 7.—**Belfast T.C.**: Stores for Electricity Department, City electrical engineer and general manager, East Bridge Street, Belfast. Advertised this week.

PATENT SPECIFICATIONS

Arrow Electric Switches, Ltd. "Electric circuit-breakers having automatic tripping means." 488/43. Jan. 13, 1942 (558,579).

Asea Electric, Ltd., and Fitch, S. "Welding helmet." 371. Jan. 8, 1943 (558,577).

British Thomson-Houston Co., Ltd. "Electric discharge lamps." 9393/42. July 11, 1941 (558,565); "Synthetic resinous moulding compositions." 554/42. Jan. 16, 1941 (558,652); "Production of modified phenol-aldehyde resinous condensates and compositions comprising said condensates." 4992/42. April 17, 1941 (558,654); "Electric gas-blast circuit-breakers." 8142/42. June 17, 1941 (558,668).

Bruno Patents, Inc. "Combined pipe coupling and electric connecting device." Sept. 3, 1941 (558,705).

Burch, C. R., and Metropolitan-Vickers Electrical Co., Ltd. "Lenses." 6282. May 8, 1942 (558,657).

English Electric Co., Ltd., Blandford, A. R., and Rowland, F. G. "Electric circuit-breakers of the gas-blast type." 4504. April 3, 1942 (558,559).

Hunt, Ltd., A. H., and Reinhardt, E. "Means

for adjusting the capacity of electrical condensers." 11537. Aug. 17, 1942 (558,693).

Hunt, Ltd., A. H., Grouse, R. A., and Rogers, J. "Electrical condensers made from metallised paper." 9729. July 13, 1942 (558,686); "Manufacture of electrical condensers." 9730. July 13, 1942 (558,687); "Metallised paper electrical condensers." 9731. July 13, 1942 (558,688).

O'Brien, J. F. "Feed unit for electric wiring system." 7182/42. June 26, 1941 (558,681).

Philco Radio & Television Corporation "Electro-acoustic transducer." 5893/42. June 13, 1941 (558,680); "Radio-phonograph combinations." 16610/43. June 13, 1941 (558,704).

Rediffusion, Ltd., and Adorjan, P. "Electric measuring, indicating, recording or controlling apparatus." 5892. May 1, 1942 (558,614).

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.)

AIR MINISTRY.—Tenders for electrical work accepted in week ending January 22: **Shropshire, Worcester & Staffs Electric Power Co.** for electrical work of over £500 accepted in week ending January 29: **East Anglian Electric Supply Co.** and **Phœnix Electrical Co.**

WAR DEPARTMENT.—Contracts for electrical work placed in week ending January 15: **Bective Electrical Co.,** London.

WALTHAMSTOW.—Accepted by Electricity Committee: **Fuller Electrical & Manufacturing Co.,** transformers, £452 and £115.

SHEFFIELD.—Accepted by Transport Committee: **Dorman Long & Co.,** 300 tons steel tramway rails; **Hadfields, Ltd.,** junctions, £2,211; **Edgar Allen & Co.,** junctions £1,826; **Titan Trackwork Co.,** junctions £2,619.

SOUTHPORT.—Accepted by Gas Committee: **Electric Construction Co.,** armature for generator, £250.

MANCHESTER.—Accepted by Electricity Committee: **John Thompson Water Tube Boilers, Ltd.,** boiler plant automatic combustion control equipment; **Walter Kidde Co.,** fire extinguishing equipment; **W. J. Jenkins & Co.,** ash disposal system extensions; **J. Howden & Co.,** renewal work on boiler air preheater; **Standard Telephones & Cables, Ltd.,** extension of central control facilities.

GLOUCESTER.—Accepted by Electricity Committee: **Ediswan Cables, Ltd.,** r.i. cables, one year.

HULL.—Accepted by Telephones Committee: **British Insulated Cables, Ltd.,** cable £343 and copper wire £517 11s. 3d.

LIVERPOOL.—Accepted by Electric Power Committee: **Babcock & Wilcox,** material for retubing two air heaters, £10,940.

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.

(13292) **"Lemco" condensers,** name of makers? C.A.C.—London Electrical Manufacturing Co., Ltd., 462 Fulham Road, S.W.6.

(13293) **Radio components,** name of makers? J.A.S.—(1) "J.B." Jackson Bros. (London), Ltd., Kings Way, Waddon, Croydon, and Joad Bros., Hazlett House, Southampton Buildings, W.C.1; (2) "Clix," British Mechanical Productions, Ltd., 1 Church Road, Leatherhead, Surrey; (3) "Polar" Radio Communication Co., Ltd., Electra House, Victoria Embankment, W.C.2, and Wingrove and Rogers, Ltd., Mill Lane, Old Swan, Liverpool.

(13294) **"Mopump" packings for pump,** makers' name? B.—Rhodes, Brydon & Youatt, Ltd., Waterloo Engineering Works, Stockport.

(13295) **"Kimolabord" wallboard,** makers' address? J.H.L.—Cellactite & British Uralite Ltd., 52 Grosvenor Gardens, S.W.1.

(13296) **"Dexine" Products,** makers' name? B.F.—Dexine, Ltd., Abbey Lane, Stratford, E.15.

(13297) **"Centec" electric super grinder,** makers of? F.S.—The Central Tool and Equipment Co., Ltd., Central House, Upper Woburn Place, W.C.1.

MEETINGS TO NOTE

Feb. 10.—I.E.E., London.—Installations Section—"Thermoplastic Cables," H. Barron, J. N. Dean and T. R. Scott.—I.E.E. Building, Savoy Place, W.C.2.—5.30 p.m.

Feb. 10.—Association of Mining, Electrical and Mechanical Engineers (London Branch).—"Mica and Micanite" (with film), A. Collins.—Junior Institution of Engineers, 39 Victoria Street, S.W.1.—4.30 p.m.

Feb. 11.—I.E.E., Bristol Students—Students' Lecture.—"Electrical Engineering Research." H. W. H. Warren (B.T.H. Co.). Merchant Venturers' Technical College, Bristol.—7.15 p.m.

Feb. 12.—Association of Supervising Electrical Engineers.—"Remote Control Equipment and Operation." A. T. Crawford.—E.L.M.A. Lighting Service Bureau, Savoy Hill, W.C.2.—2.15 p.m.

Feb. 12.—I.E.E., North-Mid. Students.—"Music Channels in Telephone Cables," A. C. Holmes.—Griffin Hotel, Leeds.

Feb. 12.—Association of Mining, Electrical and Mechanical Engineers.—Yorkshire N.W. Branc Mechanical Engineers. — Yorkshire N.W. Branch.—"The Chemist in the Boiler House," B. Slater.—Stafford Arms," Wakefield.—3 p.m.

Feb., 14.—Derby Society of Engineers.—"Plastics," M. Apley.—School of Arts Theatre, Derby.—6.30 p.m.

Feb. 14.—North London Supervisors' Discussion Group (Enfield Centre).—"Selling Safety in Industry," W. H. Page (Safety Engineer, Hoover, Ltd.).—Enfield Technical College, Queensway, Enfield.—7 p.m.

Feb. 14.—I.E.E., Western Section.—It should be noted that this meeting is to be held at Bristol, not Cardiff, as wrongly stated in our last issue. The Paper will be "Standard Performance of Generating Plant," by Messrs. Biles and Maxfield.

Feb. 15.—I.E.E., Wireless Section.—Discussion, "Recording and Reproduction of Sound."—I.E.E. Building, Savoy Place, W.C.2.—5.30 p.m.

Feb. 16.—British Institution of Radio Engineers.—Special meeting to consider "Television Standards."—Institution of Structural Engineers, 11 Upper Belgrave Street, S.W.1.—6.30 p.m.