

# ELECTRICAL TIMES

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## I.M.E.A. Selected-Station Owners

At a special meeting on Wednesday of last week representatives of municipal electricity undertakings owning selected-stations considered the I.M.E.A. "Ownership" Report. The recommendations were rejected by a 4½ to 1 majority, and a small committee was appointed to watch developments. Alderman A. Critchley, M.P., Chairman of the Liverpool Electricity Committee, is the chairman. Thus fulfilment of our recent prediction, that the I.M.E.A. "Ownership" Report was likely to provoke a lively discussion when it is presented for consideration at a full meeting of the Association later this month, seems all too probable. If nothing more than an acrimonious debate ensues, no great harm will be done; the functioning of democratic organisations needs such safety-valves occasionally. But if there is any truth in the suggestion that selected-station owners might break away from the I.M.E.A. and form an Association of their own, it is to be deplored. The consequences of such action could be disastrous for the supply industry.

## Selected-Station "Consumers"

The statement in the I.M.E.A. "Ownership" Report, discussed in our issue Jan. 17, that selected-station owners have not benefited financially from the operation of the 1926 Act, gave us a jolt when we first read it. However, in a limited sense it is true, such undertakings in general do not pay less (or more) to the C.E.B. for their supplies than the price at which they could generate themselves. (There are notable disputed exceptions, but it is not our purpose to discuss them on this occasion.) On the other hand, the keen competition to become selected-station owners that has been evident in the past is not wholly a psychological reaction. Substantial benefits do accrue, in general, to undertakings owning selected stations, in that they can incorporate improvements in plant and generating

methods in their actual or hypothetical stations, and so reap the advantage of continuous up-to-date efficiency; and, with the station on the spot, there are no bulk transmission charges to pay. These "favourable circumstances," where they obtain, naturally influence the prosperity of the undertaking, and therefore of all associated with it. The fact that we would stress, however, is that the principal financial beneficiaries are the selected-station "consumers" who receive a cheaper supply or a better service, or both, than would otherwise be the case. They enjoy a privileged position among consumers.

## Standardisation of Forms

Is there justification for the widely varying systems of office administration operated by supply undertakings? Could not a standard method be adopted by all? Mr. F. O. Harber asks this latter question elsewhere in this issue, and he answers it in the affirmative. Certainly it is true that, to a great extent, all authorised undertakings are governed by the same or similar Acts, Regulations and Orders, and therefore *prima facie* are susceptible to a common form of administration. And, just as obviously, reduction of the multiplicity of printed forms and sheets, which may amount to more than 130 in a single undertaking, would be generally advantageous. But whether the office administration system Mr. Harber outlines would be appropriate as a standard remains to be considered. It at least offers a basis for discussion; points such as, for instance, that large undertakings might need different types of mechanical office aids are, of course, only incidental to system form.

## Public Utilities Rehabilitation

About the turn of the year the Ministry of Production announced the appointment of a Public Utilities Committee charged with the task of assembling all pertinent facts, and of making recommendations; concerning requirements,

supplies and production of equipment to re-establish electric, gas and water services in liberated and conquered areas. Details of personnel, and the relationship of the Committee to the Combined Production and Resources Board and U.N.R.R.A., were given in these Notes of January 6. In its issue of January 1, *Electrical World* discussed the appointment of the Public Utilities Committee and problems of the restoration of utilities in liberated areas. It will be well to take note of what American interests are thinking in this connection. The principal points in the article are summarised in the following two paragraphs.

### What America Thinks

First, the announced policy governing United Nations rehabilitation work is to limit it to minimum service needs. It is considered the main emphasis will be on water and electric utilities, gas and communications receiving relatively small attention. The view is expressed that American power utilities, both public and private, which have been on short rations of equipment for some years, may object to going further on short commons while the wanted equipment goes overseas. Certainly, it is stated, if Congress were to get the idea that the United States were to continue on a war-time basis while TVA's were erected on every sizable European river, a dispute which could cripple the programme might arise. On the other hand, it is felt that with careful management there will be ample manufacturing capacity to supply both the rehabilitation programme and a reasonably prompt return to normal operation of the American power industry.

### The Problem of Competition

The British, it is stated, are known to have a list of minimum service standards already drawn up, but it is not known to what extent these conform to American ideas of what is needed and feasible. The stocks of equipment built up as a war precaution by American Utilities, and British "blitz" stores, will, probably, depending upon circumstances, be primary sources of reconstruction material. Financing of rehabilitation must be business-like, the recipients of relief paying either by means of existing exchange balances or on easy credit terms.

The rehabilitation programme, it is emphasised, presents an opportunity for American producers to get business of which they have not heretofore taken a major share. Competition between British and U.S. firms for this business will almost certainly arise, and the resolution of that competition will rest with the new committee.

### An International State Cartel?

These American views on rehabilitation policy are valuable; only if there is agreement on principles between Great Britain and the U.S.A., and mutual trust and co-operation in putting them into practice, will re-establishment of the essential utility services in freed Europe and other countries work smoothly. And if we cannot work together in harmony in this sphere, what hope is there for the wider co-operation essential to the rehabilitation of international trade and the building of a better world? Fortunately, there is nothing in the American standpoint that suggests any intractable difficulty. Provision of minimum service needs is a good basis to work on, and payment for goods supplied whenever practicable an equally sound principle. A major difficulty for each country will be to determine how to apportion production resources between home demand and rehabilitation requirements. As we pointed out last week, this country will need several million kilowatts of new generating capacity in the next few years if reconstruction is not to be baulked. We are glad to note that the Electricity Commission is now taking a census of immediate post-war requirements (see page 254). In respect of competition, it seems that the Public Utilities Committee will be forced to function as an international State Cartel—which has its whimsically humorous aspect.

### International Trade Policy

Perusal of the F.B.I. International Trade Policy Committee's Report, published last week, leaves no doubt, if any existed, that the problems of peace far transcend in complexity those of war. And in the absence of an overriding unifying factor, such as the need to win Victory, international, national, industrial and individual statesmanship will be strained to the uttermost to secure and

maintain friendly collaboration. Indeed, without the touchstone of a common purpose for all nations, how will it be possible to co-ordinate the many conflicting interests and work out co-operative policies? It seems, then, that fundamental thinking concerning the future of mankind is a desirable, or rather an essential, prelude to concrete plans to guide and regulate international relations and activities. What is it the peoples of the world really want? Can it be expressed in the terms of a common objective?

### Full Employment the Objective

Our own view, in so far as concerns only the material side of life, is that "full employment" is of first importance among post-war world aims. International trade policy should be shaped to contribute to this objective before all else. We have in mind, of course, a free-will, not a slave economy post-war. Without full employment no nation can enjoy the maximum measure of prosperity possible to it; some assets and resources would remain unutilised. Also, no one nation could permanently ensure full employment for its own nationals at the expense of under-employment among other peoples. Again, balanced trade between two countries is limited to the level of the one having the lower standard of development; maximum trade is only possible between two, or more, participants of equal wealth or prosperity. With these considerations in mind, and taking full employment in all countries as the criterion, there is much that is good in the F.B.I. Committee's proposals for securing an orderly post-war world economy. These recommendations are reviewed in our later pages; they will repay study.

### Commercial Refrigeration

A year ago it was announced that the Commercial Electric Refrigeration Association had been reconstituted so as to embrace all sections of the refrigeration industry. Evidence of the ever-growing importance and strength of this branch of engineering was forthcoming at the first annual luncheon held last week. Speakers had little to say on the past, but addressed themselves to the future; they were full of confidence as to the part that refrigeration will play in the

post-war world. Professor Sir Jack Drummond pointed out that, if we are to improve the general nutritional position of the population, we have to see that suitable foods in a proper condition are available. In the solution of this problem refrigeration would be vitally concerned. As chief scientific adviser to the Ministry of Food, he speaks with authority. Mr. E. G. Batt, the chairman, was more concerned with the future from the commercial angle; he also had something to say on Government control of industry. That a certain degree of control will be essential is generally admitted, if only for regulating the demands of the home and export markets, but as special conditions disappear, then the case for Government control dwindles. Broadly, the need in the future, as far as refrigeration is concerned, is the creation of a practical system of joint co-operation between the Government and the industry.

### Quality Essential

Post-war control must not be viewed with a war-time mind. During the war the Government tells an industry what it wants, and gets it. In peace-time an industry is faced with the varying demands of all sorts of would-be purchasers. Hence it is incumbent on manufacturers to keep not merely abreast but ahead of requirements. Great Britain must, in Mr. Batt's opinion, build her export strength on goods she can make better than others, and on new goods that she can be the first to make. Standardisation must not be carried to a degree which will limit the scope and ingenuity of the designer. Mr. E. E. Hoadley uttered a word of warning on the domestic refrigeration side, emphasising that no good purpose will be served if the hundreds of thousands of housewives clamouring for refrigerators are supplied with machines too small to meet requirements. The British engineering industry has a proud tradition for sound workmanship, and has never really lent itself to the production of inferior products. There is no reason to suppose that it will depart from the high standard of the past, but it has every right to look to future Governments to protect the home market from being flooded with cheap foreign-made goods.

**METEOR**

# RESTRIKING VOLTAGES

## Part I.—Ideal Conditions

By J. R. Mortlock, B.Sc.(Eng.), A.M.I.E.E.\*

SOME few years ago tests on an h.v. oil circuit-breaker were being carried out on a system in the U.S.A., and for the same current and voltage conditions very variable performances were obtained. It was established that the major factor causing the variations was the connection to or isolation from the supply side of the test circuit of a transmission line. When in circuit the

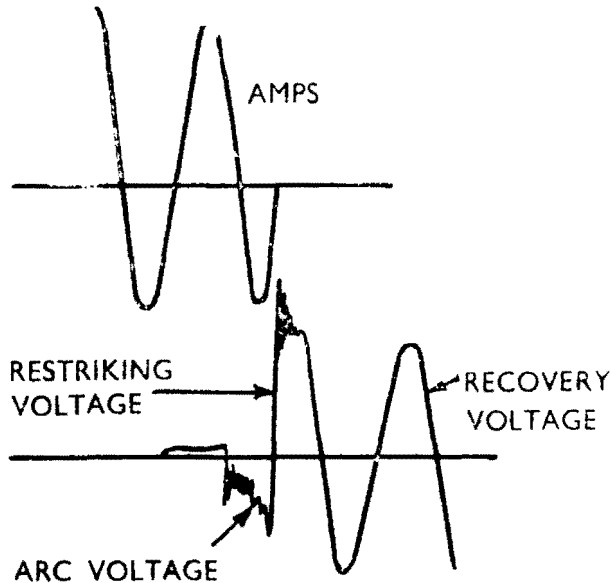


Fig. 1.—Definition of Terms.

performances were good, but when absent the breaker showed signs of distress, suggesting a material difference between the severity conditions in the two cases.

Subsequent investigations resulted in the conception of "restriking" and "recovery" voltages. Unfortunately, some confusion exists between these terms, due, in part, to American and English terminology differing. B.S. 116 defines "recovery voltage" as "the normal frequency r.m.s. voltage that reappears between the poles of a circuit-breaker after final arc-extinction" and "restriking voltage" as "the high frequency transient voltage that exists at, or in close proximity to, each zero current pause during the arcing time; the important attributes being the amplitude and rate-of-rise (expressed in volts per micro-second) at the time of final arc-extinction." In American literature the term "recovery voltage" covers the complete voltage phenomena at interruption, and therefore embraces both B.S. definitions. In this article the English terms will be used as defined and as illustrated in Fig. 1, which shows reproductions of oscillograms taken on a circuit-breaker when interrupting 50 cycle current.

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**Basic Characteristics.**—In Fig. 2a, let  $G$  represent a voltage source devoid of impedance,  $L$  and  $C$  the total inductance and capacity of a circuit,  $S$  a switch in the closed position, and  $I$  the current in the switch circuit. Now assume that the switch starts to open mechanically, and that eventually the circuit is interrupted, i.e. current ceases to flow through  $S$ . When this occurs the voltage across  $S$  rises from zero to eventually the recovery voltage value. The same ultimate physical condition—zero current in  $S$ —would be obtained if, instead of opening mechanically, the moving parts were replaced by a second voltage source devoid of impedance,  $G_1$  (see Fig. 2b)—which caused a current  $I$  to flow in the opposite sense in the switch circuit. The conditions at the switch are then represented by the resultant actions of the two sources, i.e. by the superposition of their effects. Source  $G$  results in a current  $I$  through the switch and zero volts across it, whereas source  $G_1$  results in a current  $-I$  through the switch and across it, the voltage required to give  $-I$ . The combined effect, therefore, gives zero current in  $S$  and across  $S$  a voltage associated with this condition. Consequently, the voltage across  $S$  immediately subsequent to a current zero, i.e. the restriking voltage, can be found by determining the voltage required from  $G_1$  to cause a current  $-I$  to flow in the switch circuit. This can be carried out mathematically or experimentally by finding the voltage time characteristic across  $S$  when a current  $-I$  is injected into the circuit at  $S$ ; its form will be governed by the constants of the circuit as viewed from the switch terminals.

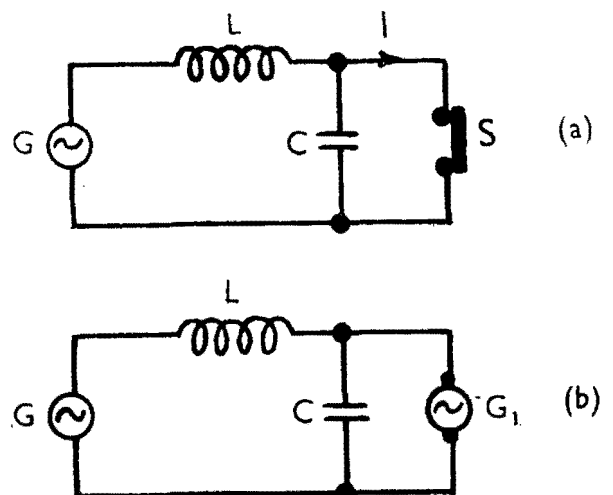


Fig. 2.—Representative Circuits.

**Interrupting Conditions.**—Two basic interrupting conditions are of interest:—

(1) *Ideal.*—The current ceases at a normal frequency zero, and consequently the injected current, Fig. 3a, would have to be of normal sine form, if  $t=0$  at the instant of injection,

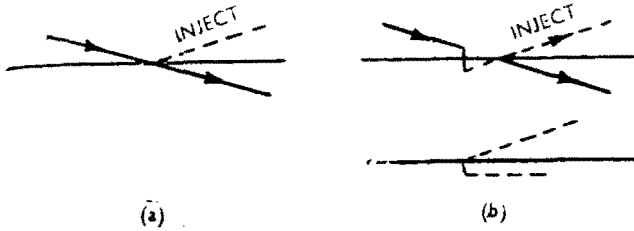


Fig. 3.—Types of Current Injection.

and of normal cosine form if  $t=0.005$  sec., i.e. if  $t=0$  a quarter-cycle earlier.

(2) *Current Suppression.*—The current is forced to its zero before the normal frequency zero, and consequently the injected current must have the form shown in Fig. 3b, i.e. a direct current of opposite polarity is superposed on the current form of Fig. 3a.

The effects of such current injections can be determined mathematically or experimentally by injecting periodically currents of small value of the desired forms. The voltage response can then be viewed as a static image on a cathode ray oscillograph (4). Methods are available for application to live or dead circuits.

In practical circuits the restriking transients damp out to a negligible magnitude in less than one milli-second. For such short times a current of the form of Fig. 3a can be assumed as linearly proportional to time. This results in a simplification in analytical work, and it is usually done.

**Ideal Interruption.**—The application of the injection method for ideal interruption will be considered for the simple non-oscillatory circuits of Fig. 4. The voltage source is assumed as having neither inductance nor capacity. In the case of Fig. 4a, a circuit of pure resistance, the injection of a current of the form of Fig. 3a will produce a voltage directly proportional to the current, and both current and voltage will rise together, i.e. the restriking voltage "e" is identical with the normal voltage.

Fig. 4b shows the normal frequency current and voltage in the case of a pure reactor, and if at a current zero a current of the form of Fig. 3a is injected, then the restriking voltage "e" must rise immediately to the peak normal frequency voltage value. For, if the applied voltage is  $E \sin \omega t$ , the current is  $-I \cos \omega t$ , and the rate of change of current is  $I\omega \sin \omega t$ ; this is also the rate of change of the injected current, and consequently the voltage across the reactor is

$$(Inductance \times I\omega \sin \omega t) = I\omega L = E$$

as  $\sin \omega t = 1$  (see Fig. 4b). The case of Fig. 4c, mixed inductance and resistance, is intermediate between those of Fig. 4a and Fig. 4b, and the rate of rise of the restriking voltage e is materially lessened, as compared with Fig. 4b.

Capacitors, as shown in Fig. 4d, present some novel features, as at a current zero the capacitor is left charged to the full peak voltage. Consequently, as will be apparent from inspection, the voltage across the break is zero, and rises in accordance with a  $(1 - \sin \omega t)$  law. The same result would have been obtained if a current of the form of Fig. 3a had been injected at a current zero, for if the applied voltage is  $E \sin \omega t$ , the current is  $I \cos \omega t$ , and, if the charge on the capacitor is neglected, the resultant voltage is

$$\frac{1}{C} \int I \cos \omega t . dt,$$

i.e.,  $I \sin \omega t / \omega C$  or  $E \sin \omega t$ . Therefore, allowing for the capacitor voltage E, the

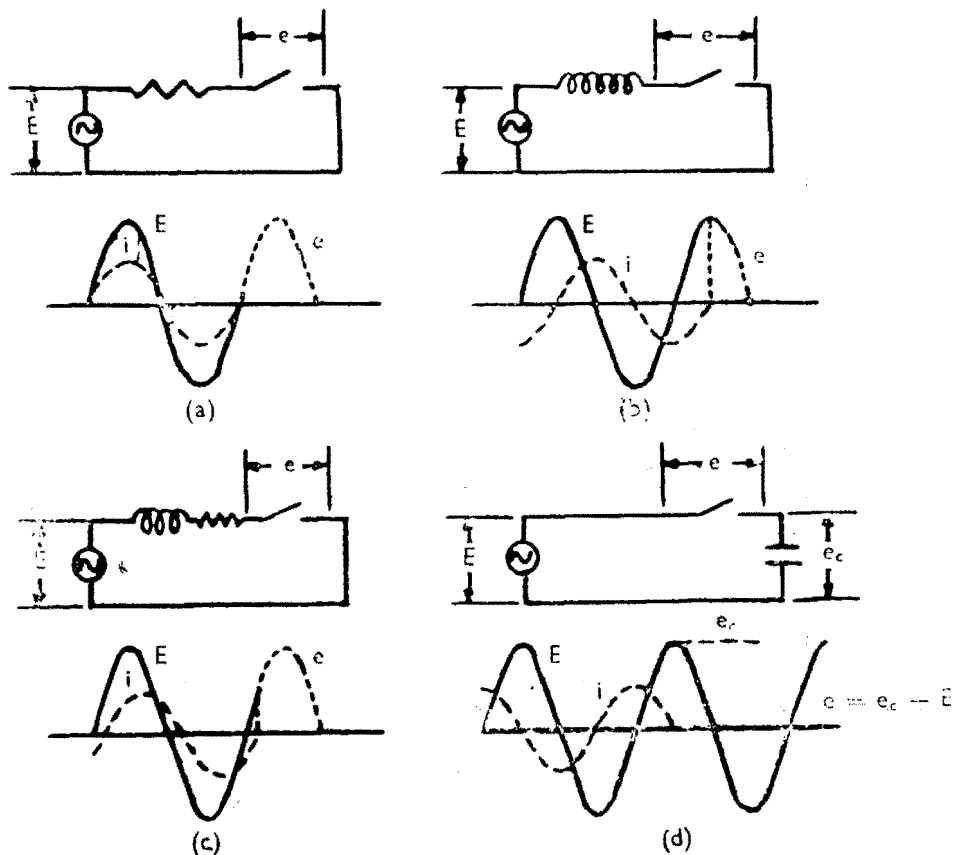


Fig. 4.—Simple Cases of Non-Oscillatory Circuits.

restriking voltage  $e$  is  $E(1 - \sin \omega t)$ . A half-cycle after the interruption the voltage across the break is  $2E$ , and this may be sufficient to cause a restrike of the arc. Phenomena of this type form the basis of many "arcing ground" theories, but space prohibits their further consideration.

The conclusions to be derived are that when the circuit power factor is unity or leading, the restriking voltage rate of rise is low, and that circuits with power factors approaching zero lag impose the most onerous interrupting conditions.

**Typical Cases.**—In practice, circuits are usually complex, and consequently the restriking voltage characteristic is seldom simple. Consideration will now be given to a few typical cases assuming ideal interruption. Fig. 5 shows the effect of capacity and inductance combined; such circuits are oscillatory. In comparison with the conditions of Fig. 4b, two features are apparent: first, the rate of rise of the restriking voltage is reduced; secondly, the maximum value of the restriking voltage is doubled. Consequently, we can conclude that with an ideal interruption of current, the restriking voltage can reach twice the peak value of the recovery voltage.

The circuit arrangement shown in Fig. 6 approximates more nearly to system conditions. The values of inductance,  $L_1$ , and capacity,  $C_1$ , used are as for Fig. 5, with the addition of, e.g., a current limiting reactor and its local capacity. With ideal interruption of current, the restriking voltage characteristic is as shown by the full line curve. In this case, the transient is the

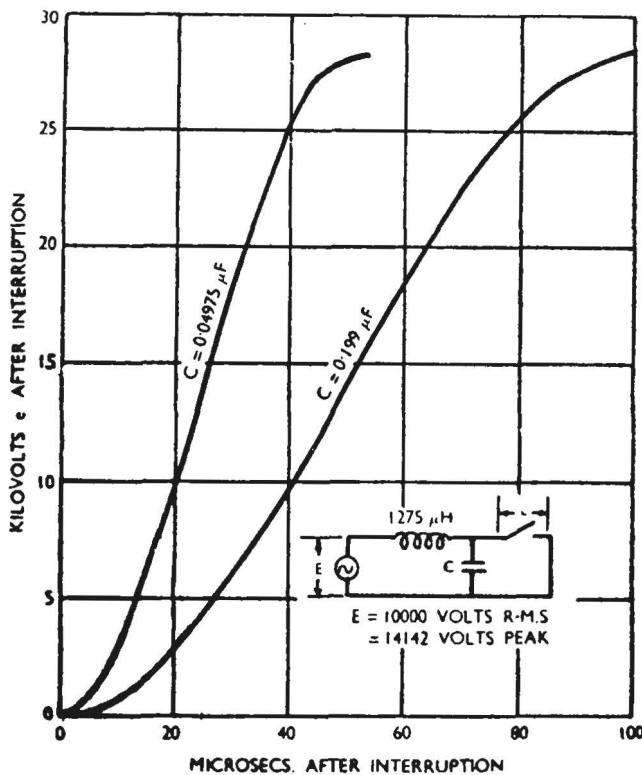


Fig. 5.—Performance of Simple Oscillatory Circuit.

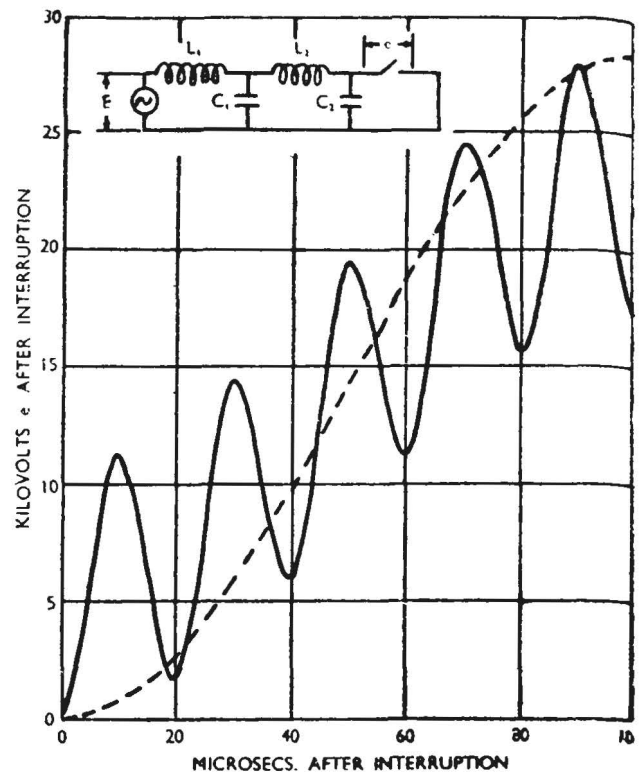


Fig. 6.—More Complex Oscillatory Circuit.

sum of two oscillations, one of high frequency, due to  $L_2, C_2$  oscillating, and the other of lower frequency, due to  $L_1, C_1$  oscillating. For comparison the corresponding characteristic for the main inductance,  $L_1$ , and capacity  $C_1$ , alone is reproduced from Fig. 5 as a dashed curve. The conclusion to be derived is that the rate of rise of the restriking voltage is governed largely by the inductance and capacity in the immediate neighbourhood of the point of interruption, but that the maximum value of restriking voltage is governed by the main inductance and capacity remote from the point of interruption.

- (1) "The Determination of Circuit Recovery Rates," E. W. Boehne, *Electrical Engineering*, May, 1935.
- (2) "System Recovery Voltage Determination by Analytical and A.C. Calculating Board," R. D. Evans and A. C. Monteith, *Electrical Engineering*, June, 1937.
- (3) "The Oscillographic Equipment of the Switchgear Testing Co.," *Engineering*, Vol. 140, 1935, pp. 385-8.
- (4) "Recurrent Surge Oscillographs and their Application to Short-time Transient Phenomena," K. J. K. Wilkinson, *J.I.E.E.*, November, 1938.

(To be concluded)

**BRITISH STANDARD SPECIFICATION**

**B.S. No. 1100, Pt. 10, Office Organisation and Practice (price 2s. 6d. net).**—This booklet has been produced with the approval of the Minister of Production. It may be regarded as an elementary text-book on the subject. First of all, office organisation, together with filing, bookkeeping and other branches, is dealt with. The personnel organisation is discussed, in fact nearly all branches of general office work are outlined.

# SUPPLY UNDERTAKING RECORDS

## A Standard System Advocated

By F. O. Harber,\* A.M.I.E.E.

**O**FFICE organisation, with the use of modern office aids, is of first importance to the efficient running of an undertaking. It embraces both the engineering and commercial sides, and ensures that the whole functions as a unit.

Now, terms of supply and conditions of working of all authorised undertakings are, to a great extent, governed by the same or similar Acts, Regulations and Orders. There appears no reason, therefore, why a standard method of office administration could not be adopted throughout the industry. Here is common ground on which undertakings, both municipal and company, could meet and agree on a common procedure. One great advantage would be that printed forms, sheets, etc., of which there may be as many as 134 in a single undertaking, could be reduced and standardised to apply to all undertakings.

The present time—not despite the limitations of staff and materials, but because of them, together with the war-time halt in development—seems opportune for bringing present methods of administration up to the highest state of efficiency.

Most undertakings were well established before the small acceleration in development of some years ago, and in general the original office administration and methods are still retained, with little or no modification.

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Notwithstanding past development, however, only the fringe of domestic electrical requirements has been touched hitherto. There are obvious indications that after the termination of hostilities, housewives will insist on modern methods, requiring the minimum of labour and giving the best results; this applies particularly to the electric cooker, with better nutrition and the cleaner and healthier conditions resulting.

The introduction of any new or modified office system must, therefore, be flexible and capable of handling future large-scale developments. It must fit in as far as possible, but not to its detriment, with existing methods, so that the elimination of obsolete methods is progressive and accompanied with as little disturbance as possible to the continuous smooth running of the organisation.

**General Requirements.**—Unlike the majority of general office methods used in other businesses, that required for the supply industry calls for the specialised knowledge of the engineer. The problem resolves itself into one of choosing and applying the best office aids to provide and record in the simplest manner all the information, both technical and commercial, appertaining to each individual consumer and service, and each department, as well as the undertaking as a whole.

The introduction of new office aids should be framed, therefore, with a view to satisfying the following conditions:—

1. There should be a master record system.
2. This must be simple and easily understood by all members of the staff.
3. It must be easily kept up to date and require the minimum of time for posting changes.
4. The master record file should tie up by cross references all departments of the undertaking.
5. It should provide a rapid method of reference giving all necessary information in the shortest possible time.



Fig. 1. Consulting the Consumers' Record File.

6. It should be compact, well-placed and lighted for ease of working, thus giving pleasure to the office staff, who will consequently take a pride in keeping the system up to date.

**Application Form Procedure.**—The receipt of an Application Form is the commencement of recording operations. When received it should be classified into one of three groups, viz.:—

1. New service (i.e., application for supply into premises where there was no previous supply).

2. Change of consumer (i.e., where there is a supply, but disconnected).

3. Extension (i.e., additional wiring or installations to existing supplies).

A system of numbering naturally forms the basis of most systems, and it is suggested that each service be given a number and that the consumer takes the number of the service used.

On acceptance of the application form for a new service, it is entered into the service book, which gives the next available service number. The office issue an instruction sheet to the works section, which is the authority for drawing the necessary material from the stores. A similar procedure is adopted for the issue of meters, except that the meter department decides the type and size of meter or meters required. The store-keeper and meter department make the necessary entries in their own ledger after issue.

On completion of the work, the foreman or other responsible person completes the reverse side of the instruction sheet, giving all particulars of the work carried out, meters and apparatus

installed, together with date, service sketch and other particulars and returns it to the office. The office then post these particulars to the consumers' master record file.

A similar method is used in the case of Change of Consumer or Extensions, except that as the service number and records already exist, the office only have to make the necessary changes.

The service number is used as the reference on all correspondence, instructions, orders, etc., and filing is carried out in this numerical service order. The general procedure is illustrated in the accompanying diagram.

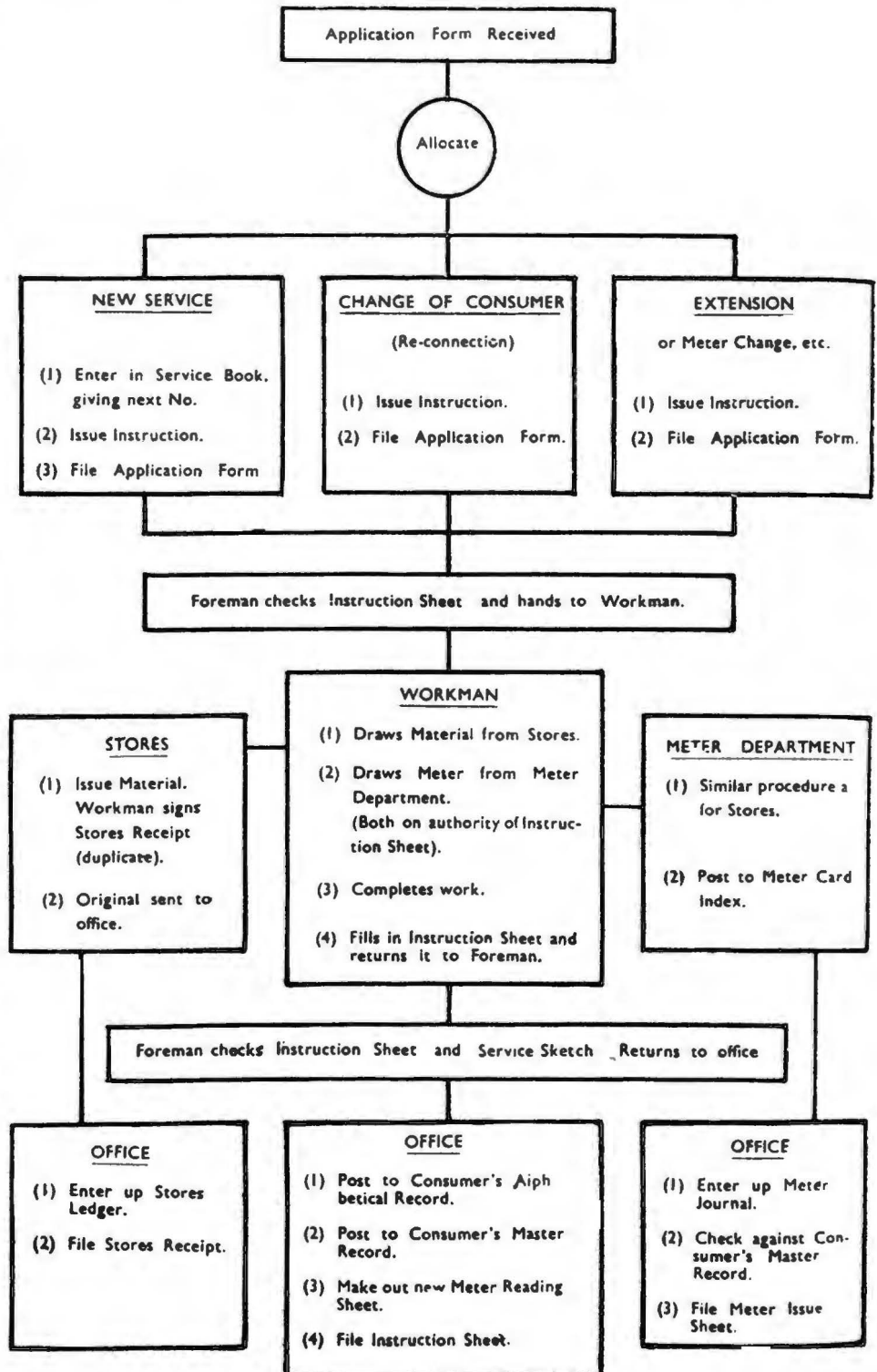


Fig. 2. Procedure for Handling Application Forms set out Diagrammatically.

**Master Record System.**—The consumers' master record is the principal record to which all other office aids are subsidiary, and provides a complete record of each consumer's installation, apparatus, etc., and the service. The actual set-up may be in loose-leaf form, card index, etc.

One method is to use a white master card for the service giving permanent features and also the consumer's name, followed by additional cards (which may be in colour) for each piece of apparatus installed. For simple hire transactions the consumer can be issued with a double card for signature, one part being retained by the consumer and the counterpart being filed in the card index behind the white master card. The cards are filed in the order best suited to the distribution side, that is, in alphabetical street order, followed by numerical house numbers. This has the advantage of forming a quick reference to the loading of the mains and substations, and the office staff find it as easy to work as any alternative.

This method, together with the employment of visible signals to indicate the type of apparatus installed, has a high commercial value, as there is always a ready indication of the development possibilities of new apparatus of any type in any particular street or district. It also ties up with the technical side and forms an indication of the loading on the mains.

**Coloured Signals.**—The method preferred by the writer is one employing horizontally filed cards, where the upper card folds down over the lower card, leaving about  $\frac{3}{8}$  in. of the lower card visible. This visible edge gives the address of the service, and by the employment of different coloured cellophane signals, a visible indication can be arranged to give the most important particulars.

A set of spaces is provided on the left-hand side of the visible edge for such a signal, its colour indicating the type of consumer (business, domestic, etc.), and its position, the type of tariff, and whether prepayment or quarterly. On the right-hand side is a further set of spaces for apparatus signals, the colour indicating whether purchase or on hire-purchase or simple hire, and the position indicating the type of apparatus.

On lifting the card immediately over the visible edge, full information is available appertaining to this address posted on the two cards exposed to view. The upper card gives service particulars, sketch, date and result of tests, nearest substation and particulars of meters and annual consumption. The lower card gives particulars of installed apparatus, and their charges, also the amount of the fixed charge, if on a two-part tariff.

**Distribution Details.**—It is the writer's practice to provide services with a minimum of three cores to facilitate balancing, as the

additional cost over a twin service is small under normal conditions. The phases brought in and the phase connected are indicated on the upper card, and progressive balancing down each distributor is greatly facilitated during load development, by changing over individual consumer's phases, resulting in an improvement in voltage regulation and reduction in losses and a better utilisation of copper. This is not possible by measurement on normal distributors, as balanced conditions may exist at feeder points due to, say, a heavy balancing load on one phase near the point of measurement.

**Apparatus Installed.**—The lower card provides particulars of the installed apparatus. It will be appreciated that to obtain the

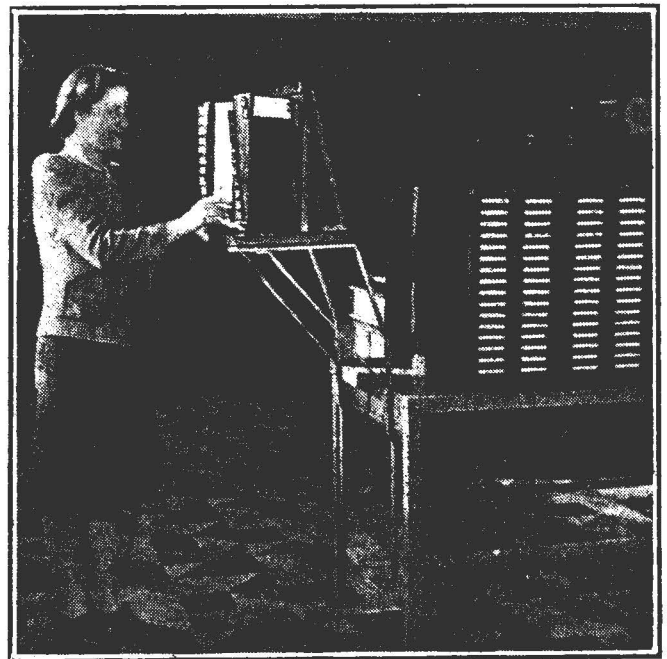


Fig. 3. The Master Record File.

highest load factor amongst a group of domestic consumers, it is necessary to maintain a certain ratio between the different types of installed apparatus. For example, the maximum demand for cookers will generally occur in the following order of magnitude, Christmas Day, Sunday and weekdays (except Mondays) all at about noon. In cases where the cooking load is likely to predominate it would be necessary to concentrate on, say, the development of the wash boiler load, where their maximum demand occurs on Mondays only.

Although the relationship between two types of apparatus only has been given as an example, it is necessary to take all types into consideration, in addition to the diversity between the same type of apparatus used by various classes of consumers whose habits are different.

**Tariff Information and Meters.**—An immediate reference to all running charges is incorporated by a vertical column on both

cards, so that the quarterly charges can be inserted against meters, and apparatus with provision for the amount of the quarterly fixed charge which are cast and entered in a second column on the right, thus giving the exact total quarterly charge for each consumer. A third column is provided for the total weekly charge, used only in the case of prepayment fixed charge meters.

To eliminate the written entry of different types and ratings of meters, thus achieving speed and simplicity, and eliminating office errors, the first two digits (from left to right) of the meter numbers indicate the type, the second two digits indicate the rating and the remaining figures the actual meter number, the whole of the digits forming the complete meter number. With this method office staffs are not confused by having to enter descriptions of the more involved types and the indexing of meter records is simplified.

**Installation Tests.**—Provision is made on the master index cards for a record of periodical installation tests, and it is suggested that, in view of the almost complete lack of any system of periodical testing

and maintenance of consumers' installations, that a system be introduced by all authorised undertakings for the periodical inspection, testing and maintenance of consumers' installations for a nominal annual charge based on, say, the annual fixed charge applicable to the premises concerned.

**Standardisation Urged.**—It is submitted that the above suggestions deal with one of the most important aspects of the supply industry, and that it is common to both public and company undertakings. It is, therefore, strongly urged that those who are concerned with the future of the supply industry should give immediate consideration to the formation of a committee, representative of both public and company authorities, to work out an acceptable common system of office records. Such a committee could also become the nucleus for consideration of questions of general policy, a vital necessity if the possibility of outside control and organisation being imposed on the industry, as a consequence of the present regrettable division in its own ranks, is to be avoided.

## COMMISSIONERS' MEMORANDA

**I**N recent communications to electricity undertakings the Electricity Commissioners mention the following matters:—

**Fuel Economy.**—The Commissioners have been asked by the Ministry of Fuel and Power to invite the continued assistance of Electricity Undertakers by taking every opportunity to emphasise to consumers the need for the utmost economy in the consumption of electricity owing, *inter alia*, to the increasingly serious coal situation. The Commissioners are aware of the National Advertising Campaign on economy undertaken by the B.E.D.A., but hope that Undertakers will supplement this by individual action.

**Post-War Works or Schemes.**—The Electricity Commissioners have under consideration the position which may arise on the termination of the war when undertakers will desire to proceed, as soon as possible, with the carrying out of works or schemes which have hitherto been precluded under war conditions. Such proposals would be of varying degrees of necessity and urgency. The Commissioners say it is not possible at this stage to indicate to what extent there may be a shortage of labour or of particular materials or how far it may be necessary to continue to impose restrictions on capital expenditure in the period following the end of the war, but there may well be a transition period during which both labour and materials will be in short supply compared with the demand, and in consequence recommendations may have to be made as to the par-

ticular works which can be allowed to proceed from time to time. The respective urgency of such works or schemes will necessarily vary with the circumstances of individual undertakings, but a general order of priority would to some extent be indicated by the year under which the expenditure is entered on the questionnaire. Undertakers should draw attention to works regarded as of special urgency. The Commissioners desire to be furnished with particulars of any works electricity undertakers may have in contemplation for commencement at the end of the war, together with estimates of cost under various main headings. A questionnaire in this connection is being sent to undertakers to be returned by May 31. A uniform basis of cost should be adopted and the estimates (except land) should be based on a hypothetical figure of pre-war costs plus 33½%. Information is not required of estimated expenditure on the provision or extension of selected steam generating stations or the provision of new hydro-electric works; this information is being obtained separately from the Central Electricity Board and the North of Scotland Hydro-Electric Board. Estimates should be given, however, of expenditure on deferred maintenance and repairs of generating stations or plant, etc. The Electricity Supply Associations have been consulted on as to this communication and effect has been given to the more important suggestions made by them.

## FIRE FIGHTING ON H.V. EQUIPMENT

THE possibility of shock to personnel when playing a jet of water from a fire hose and branch pipe on high-voltage equipment was investigated at Croydon in 1933.\* It was found that there was little danger when playing on 132 kV overhead lines. Nevertheless, from questions asked from time to time, it was felt by the authorities at Birkenhead that a practical demonstration would be of value. This would be of special interest to those who have no knowledge of electrotechnics, but who desire to be reassured as to their safety when fire-fighting in premises in which electrical apparatus is installed. It was also felt that an extension of such demonstration to other fire-fighting equipment of the portable type would be useful.

Mr. F. W. Brecknell, the borough electrical engineer of Birkenhead, therefore, arranged for exploratory tests to be undertaken by his staff. These tests followed the example of those at Croydon and Bedford, but the target was an iron plate 12 in. by 15 in. supported on post insulators, voltage being applied between the plate and the earthed foot of the insulator support. A  $\frac{5}{8}$  in. straight branch pipe, fed from a water main at 60/80 lb. per sq. in., was suitably supported and directed at the plate, which was made alive at 30,000 V from a testing transformer, and the voltage on the branch pipe was measured. No voltage could be discerned on the branch pipe until the distance between nozzle and plate was reduced to 12 ft., the reading then being 0.4 V only. A further

reduction in the distance to 7 ft. resulted in momentary kicks up to 30 V. Similar tests were made employing a stirrup pump with the nozzle adjusted to give a jet, but no discernible voltage could be read on the voltmeter connected between nozzle and earth.

The next step in the tests was to hold the branch pipe and later the stirrup pump nozzle in the hand and gradually raise voltage on the plate to 30,000 V, repeating the tests for varying distances between nozzle and plate, down to 20 ft. in the case of the branch pipe and 7 ft. for the stirrup pump. The operator wore leather shoes which were damp from standing on the wet concrete surface and which had steel-tipped heels, but no shock was felt, even when he touched earthed metal with his free hand.

Similar tests on various portable fire extinguishers were then carried out without experiencing any shock. In the case of soda acid and foam extinguishers, arcing occurred owing to the conducting nature of the extinguishing media. The tests were so satisfactory that a demonstration was arranged. It was later repeated for the N.F.S. ranks and the Electricity Department's fire brigade, opportunity being afforded to all who wished to handle the equipment.

The conclusions stated were that with a  $\frac{5}{8}$  in. branch pipe with water at 60-80 lb./sq. in. no shock was felt when played on the plate at 30,000 V from a distance of 20 ft. For chemical extinguishers the corresponding safe distance was 15 ft. and for a stirrup pump using the jet, 10 ft.

\* THE ELECTRICAL TIMES, p. 679, May 25, 1933.

## PARLIAMENTARY

**Second-hand Electrical Machinery.**—In the House of Commons, on February 22, Mr. Higgs asked the President of the Board of Trade if he was aware of the high prices being charged for second-hand electrical machinery and equipment; and did he propose to take any action in the matter? Was he aware that some of the second-hand dealers doubled the prices of machinery of the same character; and would he take action, if particulars were given? Mr. Dalton said if particulars were sent he would be glad to look into them to see what could be done.

**Research.**—Viscount Hinchinbrooke asked the Lord President of the Council whether consideration was now being given to the application of the benefits of war time scientific research to the re-equipment of the capital goods industries after the war. Mr. Attlee, in reply, said preliminary consideration had already been given to the

possibility of making available the results of Government sponsored war-time scientific research for the benefit of industry after the war. It was proposed that more detailed consideration of this matter would shortly be undertaken; it would be fully considered in the light of the varying circumstances of particular industries, which were themselves generally alive to the post-war value of war-time inventions. He would bear in mind, dealing with the subject in greater detail in the forthcoming debate on scientific research.

**Scientific Advisers.**—In a written answer Sir W. Jowitt (Minister without Portfolio) informed Mr. Salt that it was not intended that the Minister for Reconstruction should have a scientific adviser or scientific advisory staff. It would be wasteful to duplicate the scientific staff of the departments concerned.

**Copper.**—The Minister of Supply, on

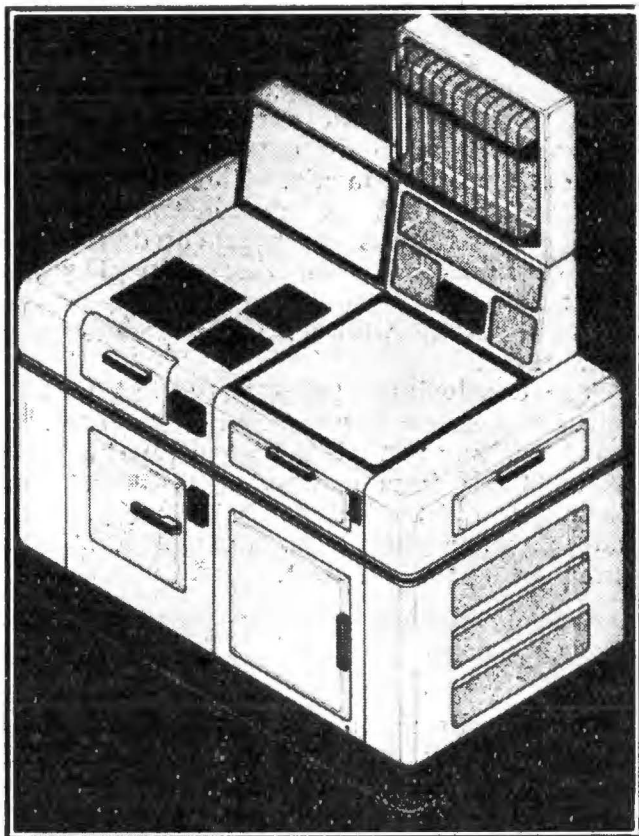
February 23, was asked by Sir H. Williams what percentage of the copper supplies of the U.K. were drawn in 1943 from Empire countries, and the estimated percentage in 1944. The reply was 62% in 1943 and estimated from 70% to 73% in 1944.

**Scientific Information Exchange.**—Answering a question by Capt. Plugge whether

satisfactory progress had been made in exchanging scientific information between Great Britain and the Soviet Union, Mr. Law said medical missions had visited the Soviet Union, and the question of further contact to the exchange of scientific information between this country and the Soviet Union was being pursued.

## THE POST-WAR ELECTRIC KITCHEN

**W**HATEVER differences of opinion may prevail as to the design of and the materials to be employed in the building of the millions of post-war houses there is general agreement as to the importance of the kitchen and the necessity for its proper planning, and a great deal of attention has



**A Nine-Unit Assembly.**

been focused on its equipment. From Mr. James Peers, of 93 Milford Road, Bath, we have received a specification and illustrations of an Unit System Kitchen Console, which has points of interest. It provides a flexible and adaptable method of furnishing the major portion of the essential components of kitchen equipment in the form of prefabricated units fitted together on installation to provide one piece assemblies. The twelve basic units provide electric oven, hotplates, hot cupboards, ventilation system and lights, and can be assembled in combination with plumbing, splash plate, plate rack, sink and draining board units to form complete facilities for food preparation, and, addition-

ally, with end and front cupboards, airing cupboard and vegetable bin units to give storage accommodation.

**A Complete Assembly.**—Our illustration shows a nine-unit assembly of oven hotplate, hot cupboard, front cupboard, vegetable bin, end cupboard, splash plate, shelf and plate rack units, but it is stated that from twelve all-steel units over one hundred different combinations and arrangements of equipment may be planned and fitted. Each unit is compact and light, and can be assembled by a patent form of interlocking fitting quickly and easily with all electrical connections made through quickly attachable armoured interconnectors. Each assembly of three units or more is complete in itself and can be added to as and when finances permit. Such items as cupboards, sink, plumbing unit, and so on can be located to left or right-hand as convenient to suit the lay-out of the rest of the kitchen, the location of doors and windows and similar variables.

**The Electrical Units.**—Each electrical unit, such as oven, hotplate, hot cupboard and ventilation system is complete in itself and self-contained with own control switches and fuses, being connected together by a system of flexible interconnectors quickly connected at the rear of the unit to a main junction box at the hotplate, which constitutes the basic unit. That considerable economy could be effected by the mass production of such equipment goes without saying, and we are informed that arrangements for development and production of the non-electrical units are in hand and well advanced. The designer would, however, welcome opportunities of discussing the similar development of the electrical units with electrical manufacturing concerns.

### A WESSEX EXHIBITION

Yesterday an interesting exhibition was inaugurated at Henley-on-Thames by the Wessex Electricity Co. For some time its showrooms have been used for the furtherance of various national movements, but now they will, to some extent, resume their proper functions, which are, of course, to assist the activities of the Company. There are several items of more than local interest to be seen which we hope to mention at greater length next week.

# BUSINESS ANNOUNCEMENTS

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

## TENDERS INVITED

### City of Manchester

The Electricity Committee invites tenders for the supply and delivery during a period of twelve months, of its requirements of the following :—

Specification No. 796—SERVICE CUT-OUTS.

Specification No. 797—CABLES.

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 for each specification, which amount will be refunded on receipt of a bona-fide tender.

Tenders to be delivered by 10.0 a.m. on Wednesday, 22nd March, 1944.

R. H. ADCOCK,  
Town Clerk.

Town Hall,  
Manchester, 2.  
24th February, 1944.

### North West Midlands Joint Electricity Authority

- TENDERS FOR
- (a) PIPING EQUIPMENT
  - (b) OVERHEAD ELECTRIC TRAVELLING CRANES

The North West Midlands Joint Electricity Authority invite tenders for the supply, delivery and erection of :—

- (a) Piping Equipment (Form of Tender N.436).
- (b) 65 Ton and 12 Ton Overhead Electric Travelling Cranes. (Form of Tender N.435).

One copy of each of the Specifications may be obtained from the Consulting Engineers, Messrs. Merz & McLellan, 32 Victoria Street, London, S.W.1, on or after March 1st, 1944, on payment of a fee of £5 5s. for each Specification.

Additional copies of each of the Specifications may be obtained from the Consulting Engineers on payment of £2 2s. for each additional copy.

Sums paid on any number of copies up to four will be refunded on receipt of a bona fide tender.

Sealed tenders with all relative documents endorsed with the appropriate title of the Specification must be delivered in triplicate in a plain envelope with no mark disclosing the

identity of the sender to the Clerk to the North West Midlands Joint Electricity Authority, Town Hall, Stoke-on-Trent, not later than Wednesday, May 10th, 1944.

The Authority does not bind itself to accept the lowest or any tender.

Prospective tenderers are requested to note that it is the intention of the North West Midlands Joint Electricity Authority to place Contracts for the equipment covered by the above Specifications as soon as possible so that design and drawing office work can be completed which will enable manufacture to be commenced as soon as the British Government Control Authorities decide that manufacturing capacity is available.

## APPOINTMENTS VACANT

*Amended Advertisement*

### County Borough of Warrington

ELECTRICITY DEPARTMENT

#### APPOINTMENT OF DEPUTY BOROUGH ELECTRICAL ENGINEER

Applications are invited for the above appointment from persons with experience of the operation and maintenance of a modern Selected Generating Station and of an underground and overhead high and low tension distribution system, with modern substation equipment. Some sales, development and commercial experience is also desirable.

Preference will be given to corporate members of the I.E.E.

The appointment will be subject to the provisions of the Agreement of the National Joint Board of Employers and Members of Staff for the Electricity Supply Industry being in Grade I, Class G, in the Schedule to that Agreement. The basic salary will be £708 per annum for two years, £726 per annum for the third and fourth years, rising to £745 per annum after the fourth year; the present value of the salary according to the cost of living adjustments provided for in the above-mentioned Agreement is £761 per annum for two years, £779 per annum for the third and fourth years, rising to £798 per annum after the fourth year.

The appointment will be subject to satisfactory medical examination by the Council's Medical Officer, to the provisions of the Local Government Superannuation

**APPOINTMENTS VACANT—Continued**

Act, 1937, and to determination by one month's notice on either side.

Forms of application will not be issued, but candidates should give particulars of age, the present position and duties, particulars of past service, and all other essential information, including the candidate's position with regard to liability for National Service.

Candidates must disclose in writing whether to their knowledge they are related to any member of the Council or any co-opted member of a Committee or any officer of the Council. Failure to do so will lead to disqualification.

Applications must be accompanied by copies of not more than three recent testimonials and must be addressed to the undersigned and delivered in sealed envelopes endorsed "Application for Deputy Borough Electrical Engineer" not later than 12 noon on Friday, March 24th, 1944.

Canvassing, either directly or indirectly, will disqualify.

NORMAN T. SMITH, M.I.E.E.,  
Borough Electrical Engineer.

Electricity Works,  
Warrington.

**Battersea Borough Council****ELECTRICITY DEPARTMENT**

Applications are invited for the position of ASSISTANT GENERATING ENGINEER at the Council's Lombard Road Generating Station, the present capacity of which is 50,000 kW and is a "Selected" Station.

Applicants must have had a sound training in mechanical and electrical engineering and recent experience in a senior capacity of the operation of a modern generating station equipped with large turbines and boilers.

The salary will be on the N.J.B. scale, Class G, Grade 5, at present £533 8s. 0d. per annum, subject to deduction for superannuation. The selected applicant will be required to pass a medical examination.

Applications must be in writing and should give full particulars of age, education, training, experience, present appointment, with details of responsibilities and position under the National Service Acts. Copies of not more than three recent testimonials should be attached. Applications must be sent not later than Saturday, 18th March, 1944, to Mr. H. F. J. Thompson, M.I.E.E., General Manager and Engineer, "Electric House, 204 Lavender Hill, Battersea, London, S.W.11.

**MAINTENANCE FOREMAN.**

WANTED, for modern municipal Power Station in West of England, Working Charge Hand or Foreman Fitter. To handle repairs

and maintenance of turbo-alternators, water tube boilers, coal handling plant, etc. D.J.I.C. conditions of employment. Zone "B." Wages 2s. 2d. to 2s. 7d. per hour, according to qualifications and experience. Permanent, pensionable post for suitable man. Full particulars, age and copies of references required. Also state position regarding release if engaged on scheduled work.—Box No. 8189, THE ELECTRICAL TIMES.

A DISTRIBUTION ASSISTANT required at Chesterfield. Salary £350 p.a. approx. Applicants must have a sound technical knowledge and good practical experience of the organisation and management of the distribution branch of an electricity supply undertaking, including meter repairing and testing, the installation and maintenance of equipment, street lighting and tariffs; and some knowledge of mains work and records will be advantageous. The appointment is subject to the provisions of the Local Government and Other Officers' Superannuation Act, and the successful applicant will be required to pass a satisfactory medical examination.—Write to Ministry of Labour and National Service (Technical and Scientific Register), Advertising Section, Alexandra House, Kingsway, London, W.C.2, for necessary application forms, which should be returned completed on or before 17th March, 1944. The reference number D.770XA must be quoted.

**WANTED****Borough of Nuneaton**

The Electricity Undertaking wishes to purchase a second-hand 1,000 kW or 1,500 kW MOTOR CONVERTOR, ROTARY CONVERTOR, MOTOR GENERATOR or MERCURY ARC RECTIFIER for 6,600 volt, 3-phase, 50 cycles input, with 230/460 volt 3-wire D.C. output and a voltage range between outputs of 460/500 or 520 volts.

Full details should be addressed to:—

J. LIGHTBOWN,  
Borough Electrical Engineer  
and Manager,

The Council House,  
Nuneaton.

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

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

Wanted.—A copy of the book "SYMMETRICAL COMPONENTS," by Wagner and Evans.—Box No. 8193, THE ELECTRICAL TIMES.

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

**ALTERNATOR.** Protected type, wanted. One or two Bearings, Sole or Bed Plate. Free Shaft End. With Exciter and Exciter Regulator. 30/40 KVA., 25 KW, 415 V., 50 cy. 3 ph. 750, 1,000, 1,500 r.p.m.—**C. S., LTD.,** Staffa Works, Leyton, E.10.

**SCRAP ACCUMULATOR PLATES** and Sediment wanted, any quantities. Also Storage Batteries purchased and dismantled. 'Phone or write **ELTON LEVY Co., LTD.,** 18 St. Thomas Street, London Bridge. 'Phone: HOP 2825-6.

### WORK WANTED

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

**VACUUM CLEANER** armatures and field coils rewind. Quick service.—**ANDERSON'S,** "The New Inn" Yard, St. Aldate's, Oxford.

**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.

### FOR SALE

#### Rothesay Corporation

#### ELECTRICITY DEPARTMENT

170 K.W. 250 R.P.M. REVERSIBLE MOTOR GENERATOR SET

The Rothesay Corporation invite offers for the above unit, which may be seen in operation at their generating station by arrangement with the undersigned. The equipment comprises:—

#### D.C. SIDE

170 K.W. generator (alternatively 230 B.H.P. motor) by Metropolitan-Vickers, 460/500 volts, with slip-rings and static

balancer to give 460-230/500-250 volts three wire when used as a generator.

1—Field Rheostat.

1—1,000 ampere 500 volt D.C. Brookhirst Starting panel.

1—Slate control panel with circuit-breaker, isolating switch, voltmeter, ammeters and K.W.H. meters.

#### A.C. SIDE

200 K.V.A. Crompton alternator (alternatively 265 B.H.P. synchronous motor) 400/440 volts, 3 phase, 50 cycles.

1—Field Rheostat.

A.C. Switchgear and instruments are also available if required.

The two machines are direct coupled, with a centre pedestal bearing. If desired either machine is suitable for direct coupling to a 250 R.P.M. Diesel.

**A. EARLS, B.Sc., M.I.E.E.,**

Burgh Electrical Engineer.

Ladeside Street, Rothesay.

### London Power Co., Ltd.

#### WILLESDEN GENERATING STATION

The Company invite offers for the purchase of the following plant:—

(1) One Bank of 3 single phase, 50 cycles, 2,700 KVA Transformers, ratio 6,300/12,400, with 3 Regulating Transformers for above, 135 KVA, complete with motor operated tap changing gear.

(2) Two 3 phase, 50 cycles, 200 KVA Oil-Cooled Transformers, 3,000/415 ratio.

The above can be viewed by arrangement with the Station Superintendent, Willesden Generating Station, Acton Lane, Harlesden, N.W. Telephone Willesden 4160.

### Borough of Nuneaton

The Electricity Undertaking has for disposal the following redundant generating station plant:—

1—7,000 lbs./hr., 1—8,000 lbs./hr., 2—12,000 lbs./hr. and 1—20,000 lbs./hr.

WATER TUBE BOILERS, 180 lbs. sq. in. pressure, complete with superheaters, coal elevator and conveyor, feed pumps and all auxiliaries.

1—500 KW TURBO-GENERATOR, 2,700 R.P.M., 460/480 volts D.C.

2—750 KW geared TURBO-GENERATORS, 3,250/600 R.P.M., 460/480 volts D.C.

Full details will be supplied on request and the plant can be seen in operation by appointment.

**J. LIGHTBOWN,**

Borough Electrical Engineer and Manager.

The Council House, Nuneaton.

**FOR SALE—Continued**

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

Motorised  $\frac{1}{2}$  in. BENCH DRILLING MACHINE, 13 speeds, £11 11s.—JOHN E. T. STEEL, Clyde Mills, Bingley. 'Phone 1066.

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

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

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

The following INSULATION MATERIAL is available from Collingridge & Co., Ltd., Ignition and Insulation Factors, Riverside Works, Watford (Tel. 5963):—

Large Sizes Varnished Sleeving.  
Rubber Grommets assorted.  
Bakelite Sheets  $\frac{1}{8}$ " 1' sq.  
Egyptian Cotton Tape  $\frac{1}{2}$ " &  $\frac{3}{4}$ ".  
Leatheroid Sheet.  
Cards of Hair Dryer Brushes.  
Cards of Vacuum Cleaner Brushes.  
Twin Screw Solderless Battery Terminals.

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

**MOTOR GENERATOR SETS**

Built to customers' requirements of new and used plant. Many in stock at Wembley—inspection invited. Please send us your enquiries—we can help you to save time.

OVER A THOUSAND MACHINES  
ALWAYS IN STOCK

DYNAMO & MOTOR REPAIRS, LTD.,  
Wembley Park, Middlesex  
Telephone: Wembley 3121 (4 lines)  
Also at Phoenix Works, Belgrave Terrace,  
Soho Road, Birmingham.  
Telephone No.: Northern 0898.

(Continued on page 272)

**ELECTRICAL TIMES**

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

Prepaid Advertisements (set solid). Agencies; Partnerships; Second-hand Goods; etc., 3d. per word. Situations\* Vacant and Wanted, 3d. per word. Minimum 2/-. Prepayment essential. Box Number\* and our Address count as five words.

CLOSING TIME for receipt is 10 a.m. WEDNESDAYS

**COMMUNICATIONS AND REMITTANCES**

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

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

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

NOTES ON WIRING**REVISED 11<sup>TH</sup> ED. I.E.E. REGULATIONS**

**S**INCE the issue of the Eleventh Edition of the I.E.E. Regulations for the Electrical Equipment of Buildings in 1939, a few months before outbreak of war, a number of amendments have been made. In addition to these permanent amendments, special "War Emergency Relaxations" have been officially published by the Institution, and there have been further relaxations contained in "War Emergency British Standard Codes of Practice," in the preparation of which the I.E.E. took a leading part. These Codes, however (B.S. 1062 to 1066 inclusive) were issued not by the Institution itself but by the B.S.I., under the ægis of the Ministry of Works. Some of these alterations were interrelated, and on September 23 Mr. F. C. Raphael summarised the whole of them in one article published in THE ELECTRICAL TIMES on pp. 360-1. The Institution has now on sale (1s. net or 1s. 3d. post free) a revised edition of the 11th Edition of the Regulations, as they now stand amended, and with the alterations clearly indicated by a marginal line. In the same volume they have included, on coloured paper, the various War Emergency Relaxations directly issued by the Institution.

**Sizes of Conductors.**—It is of some importance to draw attention to the fact that the higher rating now allowed for conductors is not one of the permanent amendments, but is merely a Recommended War Emergency Relaxation. No guidance has been given as to how long after the war these relaxations are to endure, so we have to use our own discretion in the matter. The easiest way to look at it is that if we are putting in installations that are to be permanent, the old ratings should be adhered to.

On the other hand, the temporarily increased ratings should be followed for further war-time extensions such as in factories in which re-arrangements are in any case likely to be necessary under peace output conditions. Particularly should this be the case in which, by permitting the increased ratings, existing circuits can be used and simply extended for increased loads without re-cabling. For instance, the permission to allow a maximum of 10 A on a 3/0-029 in. cable is very useful, and it will be interesting to see whether it will be continued when the "basic" I.E.E. regulations come to be issued. Meantime, I do not consider that this rating can be held to contravene the Commissioners' Regulations, so it is doubtful whether connection to a post-war house so wired could be refused.

**Single-Pole Fusing.**—The adoption of this in the great majority of two-wire circuits and sub-circuits, on the other hand, is

definitely required by the amended 11th Edition of the Regulations, and is not merely a war expedient. It will apply on all two-wire circuits and sub-circuits connected to the now normal three-phase four-wire distribution networks, and to those connected to three-wire d.c. or a.c. networks in which the neutral is earthed. I shall be dealing once more with the application of this Regulation (No. 112) next week.

**Relation of Fuses to Cable Sizes.**—This is unaltered except that, under war emergency conditions only, the size of the fuses may accord with the increased ratings of the cables. The rating of flexes is *not* increased, even under the war-emergency relaxations, except in so far that under the latter a 5 A fuse is deemed to be sufficient to protect a 40/0-0076 in. or 16/0-012 in. flex, and a 10 A fuse to protect a 70/0-0076 in. or 28/0-012 in. flex. Any sub-circuit on which there is 14/0-0076 in. or 23/0-0076 in. flex or their equivalents, must still be protected by a fuse rated for a carrying capacity of not more than 3 A. The advocates of the ring main for socket-outlets in new house installations should note that the Regulations as they stand do not permit a 7/0-029 in. cable being connected up through a 30 A fuse, even if there be local fuses in the plug tops or in the socket-outlets. Also there has been no amendment yet allowing fuses to be placed in socket-outlets.

**Core-colours.**—Since the summary of war-time amendments published last September, a new decision has been arrived at regarding the colouring of the earth-continuity conductor. This was dealt with in my notes on December 2. The chief thing to remember is that the covering of the earth-continuity conductor is in future to be green instead of brown, and that the live conductor will still be red. Black is now reserved for the neutral conductor, and black cable must no longer be used for the live wire.

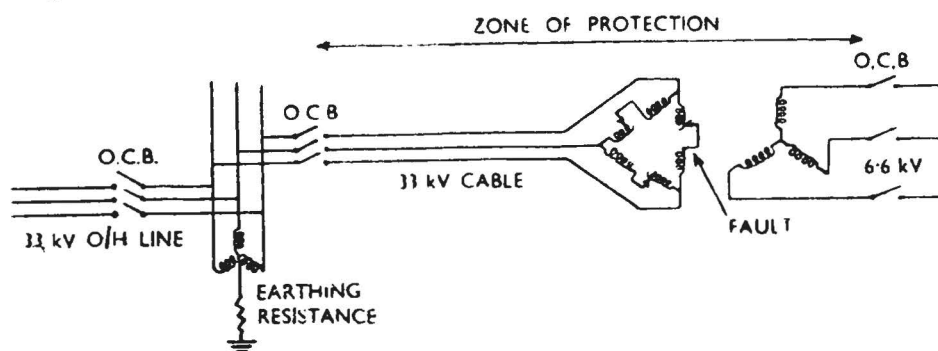
Needless to say, it will hardly be possible to make these two rules retrospective, although this is not specifically stated. That some confusion is bound to occur seems inevitable, and installers will be well-advised to test out all wired-up portable appliances before connecting on the plug-tops.

**Inset Fires.**—The Regulation as to these has been slightly altered. A wall switch or socket-outlet is still required in addition to the switches on the appliance itself, but the switch may now be anywhere in the same room, although "preferably" within easy reach of a person standing beside the appliance. **MEGOHM**

## CHARGE ENGINEERS' NOTES

### FAULT ON TAP-CHANGE SWITCH

THE way in which two faults on a transmission system may lead to some unusual results was demonstrated in an interesting manner by events which recently occurred on a medium-sized undertaking. The parts of the system concerned in the fault were a 33 kV overhead line supplying a rural area and about two miles of 33 kV cable to a 33/6.6 kV outdoor transformer feeding an entirely separate urban area. This transformer has on-load tap-change switches in the centre of each leg of the 33 kV delta winding. The lay-out is shown in the diagram.



The first sign of trouble was during a thunderstorm, when the overhead line was damaged and tripped out. Simultaneously the earth fault element of the Translay protection operated and tripped out the cable and transformer. (As there is no circuit-breaker between the cable and transformer, both are protected as one unit.) The cable and transformer were immediately restored to circuit and continued to work satisfactorily until about a month later, when a fault occurred on the overhead line, and the transformer again tripped out.

A wrong connection in the pilot and relay circuit cables was at first suspected, but a thorough check-up showed everything to be in order. A pressure test was then made on the transformer, and this broke down when 20,000 V to earth was applied on the primary side. The fault was traced to a flash-over between the tap-change switches and the tank, owing to dampness in the insulating material used for lining the tank causing it to buckle and reduce the clearance.

The reason why this weakness only revealed itself when a fault occurred on the overhead line may be explained by the fact that the tap-change switches are connected in the centre part of the delta winding, where the pressure to earth is normally just below 10,000 V. During a fault on the overhead line, one phase of the system would fall to near earth potential and cause the tap-change switches on the electrically

opposite phase to be raised to about 28,000 V above earth. This would cause a flash-over to the tank and the earth fault protection to operate.—E.M.

### RECTIFIERS AND ROTARIES

WHEN a rotary converter substation is extended with rectifiers, often trouble is encountered in ensuring proper load sharing between the two types. This difficulty is usually confined to rotaries having the field compound wound either for traction or large industrial works, for the supply to cranes, telpheages or other fluctuating demands. At

one works this trouble was experienced both in substations in which the two types of plant worked together or when a single automatic rotary fed into the same d.c. ring main as a rectifier no less than a mile away. When the rotary was set to do a reasonable proportion of the peak

load it would often trip on overload. With the rheostat adjusted to avoid this, its share of the all-day load was so poor that it tended to cut out on reverse. Dropping the rectifier transformer tapping one point permitted the rotary to take more of the load, but at a lowered voltage for the system.

Consideration of the matter showed that as long as the rotary had a series field this nuisance must exist. The two types of plant must have similar characteristics if they are to work together properly. Whilst this point was self-evident, it was not certain that at full load the rotary would give sparkless commutation without its series field. Naturally, some hesitation existed before altering the working conditions of machines which had done excellent work for many years. Trial was made in one substation, the series field of the rotary being removed and the commutating field left unaltered. The two types then worked in complete harmony, and it was possible to raise the transformer tapping on the rectifier and maintain a higher pressure throughout the d.c. ring main. A month's successful operation led to three other similar alterations on different types of rotary and rectifier. Both rotary and rectifier have falling or shunt characteristics when the rotary is shunt wound; that of the rectifier being a little more pronounced. This keeps the rotary steady, and makes the more sluggish rectifier take its fair share of load variations.—J.T.

# INTERNATIONAL TRADE

**I**N collaboration with the Empire Executive Committee, and after consultation with the trade association members of its own body, the Federation of British Industries International Trade Policy Committee has reported, and its report has been considered and adopted by the F.B.I. Grand Council. The report, now published, says the justification for private enterprise lies in its efficiency and its contribution to the community's welfare—individual incentive requires a maximum of free play to ensure future success.

**Post-War Policy.**—The main objective of post-war trade policy should be, first, relief to devastated countries by providing necessities of life and work; and, second, to frame a system of world trade aiming at the maximum of prosperity for all peoples. World prosperity is made up of the individual prosperity of the nations of the world. Were Britain, greatest of all purchasing markets, unable to continue to import at least on its pre-war scale, the reaction on other nations would be serious; also it would affect the British standard of living and proposals for increasing social security.

**A Debtor Nation.**—Britain will be a debtor nation after the war, with a lower income from foreign investments and services. To import, even on a pre-war scale, this country must increase its visible exports by 40 or 50% above the pre-war level; there is also the problem of hundreds of millions of pounds blocked sterling credits. The choice is between unrestricted international competition in trade or planning to secure general world prosperity. Economic problems of the future cannot be solved by chance.

**What to Do.**—How will it be possible to attain the objectives already enunciated? The F.B.I. Committee says in rehabilitating devastated countries, powers able to do so must help by very long-term loans, or by lease-lend. U.N.R.R.A. would also contribute to the solution. Some Government controls must be continued after the war to avoid inflation and a scramble for available resources and to safeguard the balance of payments, restrictions must exist during the transition period, but control should be relaxed and abandoned as soon as possible.

**Currency.**—The Committee strongly supports the British Treasury proposals for an international clearing union, but insists that successful operation of any international currency and exchange scheme is bound up with proper functioning of world trade machinery. No commitments on international exchange problems should be permitted to conflict with a policy of full employment. There should be a policy of long-term

investment in countries in need of development.

**Commercial Policy.**—The action of Governments should be limited to general guidance to avoid anti-social, wasteful and chaotic conditions, and to stimulate industry on a basis of private enterprise rather than to stress discipline.

**World Trading.**—Conscious direction is required—an International Economic Council must be formed, to estimate the needs and possibility of supplying the different countries with principal commodities, to guide world trade to its most useful channels, and to act as a co-ordinating body to assist countries whose living standard should be raised, or whose industrial or commercial activities should be extended.

The prosperity of all countries is the background for prosperous world economy; no one country should be able to force its products on another so as to upset its national economy. Within such framework there would be room for all nations, great and small, to trade freely.

**Production and Consumption.**—Orderly and progressive increase in consumption and production should be aimed at, and problems of raw materials should be examined internationally.

**Imports.**—Uncontrolled imports cannot be permitted, but regulation of imports should not be allowed to freeze industry at any given level of production, efficiency, consumption or price, nor exclude new or improved commodities not produced here. Special treatment should be accorded to key industries concerned with national security. Licensing, in general, is preferable to tariffs for import regulation.

**Bulk Buying and Selling.**—Government buying and selling should not be continued after the special need has ceased.

**Agriculture.**—Early decision should be reached as to this country's agricultural policy—artificial stimulation of those branches most affecting the country's cost of living could only result in our competitive position being prejudiced.

**Empire Problems.**—A co-ordinating body is necessary for the United Kingdom to enable the various Government Departments to speak with one voice on Empire matters. Decisions on the part Empire policy must play in promoting world prosperity must depend on joint consultation between Empire countries.

**Thermoplastic Cables.**—In our report of Mr. Veit's contribution to the discussion on the paper on this subject, he referred to polyisobutylene and polythene, not polystyrene as mentioned.

# COMMERCIAL REFRIGERATION

ON Wednesday in last week the Commercial Electric Refrigeration Association held its first annual luncheon at the Connaught Rooms, when Mr. E. G. Batt presided over a large company, which included representatives of the various branches of the electrical industry.

**Professor Sir Jack Drummond** (chief scientific adviser to the Ministry of Food), in proposing the toast of the Association, said that in regard to food technology and its problems, refrigeration was going to be one of the biggest developments after the war. If the general nutritional position of the population was to be improved, they must see that the consumption of protective foods was increased, and to bring this about much greater facilities for refrigeration must be provided. Whether this was to be brought about by each house having its refrigerator, or by a central system or by something like the refrigerating units in America to serve villages or blocks of flats, was a problem for the industry to deal with. The speaker strongly urged the importance of research in the industry.

**The Chairman**, in reply, said that as soon as world conditions allowed, industry would be expected to bring into effect forthwith its previously planned scheme of industrial reconstruction, and if, as in their case, it was both a home and export industry, to do everything possible to re-establish itself in the export markets. It would be generally agreed that in the immediate post-war period at any rate a certain degree of control would be essential, but it must be remembered that during war controls were instituted to co-ordinate and give maximum requirements to one customer—the Government. In peace-time the public replaced the Government, not with a unified demand, but with vast diversified-tastes and requirements for all kinds of consumer goods. It was, therefore, essential that any form of control must not be with the mentality of war-time. As soon as special conditions disappeared, the case for Government control disappeared. Opinions had been expressed on the subject of price agreements amongst manufacturers, but to argue that all minimum price agreements must invariably be contrary to the national interest was fallacious. With the question of price was wrapped up the matter of bulk buying. If the principle of bulk buying by Government departments was to be part of the post-war scheme of things, then the greatest care should be taken to see that the rightful interests of the ordinary distributor and retailer were not in any way unfairly encroached upon. In their own industry

there was no necessity whatever for any interference with the business of the firms scattered all over the country and well able to take care of the distribution and servicing of commercial refrigerators.

With regard to exports, at no time before had there been a greater responsibility on manufacturers and merchants to make an intensive study of their job and to keep not merely abreast but ahead of market requirements. Great Britain must build her export strength on goods she could make better than others and on new goods which she could be the first to make. Manufacturers should be represented overseas by properly trained and qualified individuals. Research must have a front place in any programme for the future. Further standardisation required careful study and encouragement, but they must be careful to see it was not carried to a degree which would in any way limit the scope and ingenuity of the designer. On the other hand, where it was possible to arrange interchangeability of equipment or parts of equipment, it should be done. Broadly, the need for the future was for the creation of a practical system with co-operation between the Government and industry.

**Mr. E. E. Hoadley** (chairman, E.D.A.), replying to the toast of "The Guests," proposed by Mr. R. Searle, said he thought the electrical industry could be termed a sort of junior partner in the refrigeration industry. As the result of his experience of domestic refrigerators, he suggested they should not try to push a refrigerator which was too small for its job. As to commercial refrigeration, he agreed there was a very great future for its activities, and in regard to domestic refrigeration he was sure there was a great market in front of them. He was certain the electrical industry could be of the greatest assistance in the servicing and maintenance of the plant supplied.

**The Annual Report.**—From Mr. Felix A. Rogers (secretary) we have received the annual report of the Association, which shows that the membership now numbers 208, comprising the vast majority of the established firms in the commercial refrigeration industry. Agreement had been reached with the Inland Revenue Authorities whereby all membership subscriptions will be allowed as trade expenses in individual assessment for income tax. Reference is made to the various activities during the year concerning the rationalisation of service facilities, the setting up of area committees, form of indenture for apprenticeship, a fair trading code, Government bulk buying, material bulk allocations, etc.

## LIFTING MAGNET FOR RECLAMATION WORK

**I**N the construction of the new Waterloo Bridge and the demolition of the old one, with the adjoining temporary bridge, it was inevitable that numerous hand-tools should



Result of the First Sweep.

be inadvertently dropped into the river together with a considerable amount of material forming part of the bridge structures. It has been estimated that of the million steel bolts used on the temporary bridge, some thousands were accidentally dropped "overboard."

Under present conditions the recovery of such material was most desirable. To this end a watertight Witton Kramer 26 in. lifting magnet was used by the contractors, Messrs. Peter Lind & Co., Ltd., in collaboration with the General Electric Co., Ltd. The magnet was specially designed for under-water salvage work, being based on experience with magnets for deep-water working. The loading was 2 kW when operating on a 220 V d.c. supply. The magnet was controlled in the usual manner by means of a crank-handle-operated drum-controller, complete with the necessary parallel non-inductive resistance and series economy resistance. By means of the latter, the magnet can be energised to its maximum loading when in contact with the load, after which the current is reduced without affecting the safety of the attachment to the magnet.

The first sweeps were carried out with the magnet suspended from the hook of a travelling jib crane on the bridge roadway, and the recovery obtained was extremely satisfactory. It is expected that the magnet gear will be installed on a suitable craft to allow of systematic searching of the river bed, and much valuable material should be recovered.

## THE BUYERS' COLUMN

### Fluorescent Lighting Fitting

A new trough reflector has been developed by Crompton Parkinson, Ltd., Electra House, Victoria Embankment, W.C.2. This has a number of special features and is provided with a slot running the length of the top to allow a small proportion of light to be directed upwards, this relieving the "tunnel" effect. The upper edges are turned back to provide wiring channels which are particularly useful in continuous trough arrangements.

Conduit or chain suspension can be adopted, and the control gear is either mounted adjacent to the unit or suspended in the chain. The starter unit, housed in the wiring compartment at the end of the fitting, is easily accessible. Its action may be viewed through a slot in the base. It is of the glow type and this enables the cause of end-of-life failures to be determined without any dismantling. Wiring of the terminals

is straightforward and lamps can be easily replaced, one of the lampholders being arranged to slide.

### Static Condensers

A well-produced brochure has been issued recently by Bryce Electric Construction Co., Ltd., Kelvin Works, Hackbridge, Surrey, dealing with their static condensers for power factor correction and other purposes. The design is manufactured under licence from the Swiss patentees, and has been in use for seventeen years. The construction uses aluminium foil separated by fine tissue impregnated with mineral oil. The condensers can be obtained with individual steel containers which may be built up into larger units, or the condensers may be assembled together and then immersed in an oil-filled tank. Full particulars are given in the brochure, which also contains a specification, technical notes and a guide with a selection of condensers.

## PERSONAL

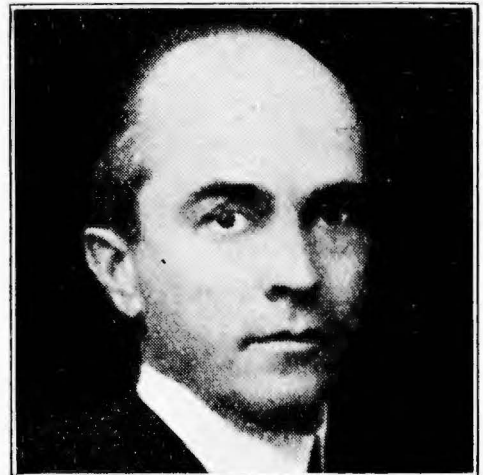
**Mr. J. Henderson, M.C., M.I.E.E.**, who has been the Central Electricity Board's technical engineer for Scotland for the past 16 years, will shortly take up an appointment as deputy engineer and manager of the Ayrshire Electricity Board. Born at Dunning, Perthshire, in 1894, Mr. Henderson was educated at Perth Academy and Stirling High School; he took his engineering course at the Royal Technical College, Glasgow. From 1915 till 1919 he held a commission in the Argyll and Sutherland Highlanders and the Royal Tank Corps. After the war he was for five years with Glasgow Corporation Electricity Department and thereafter for four years with the Electricity Department of the Edinburgh Corporation. Mr. Henderson's service with the Central Electricity Board, which he joined in 1928, covered the period of the construction of the Grid in Scotland, and he was responsible, under the district manager, for carrying through the large frequency change programme required under the scheme for the Central Scotland Area.

**Col. Harold Gordon Fraser, M.C., T.D., M.I.E.E.**, City Electrical Engineer of Oxford, has had conferred upon him by Oxford University an M.A. degree (*honoris causa*). Col. Fraser is a Yorkshireman, though educated at Sevenoaks School, Kent. He gained his early training at Stockport electricity undertaking and the Manchester School of Technology. He held appointments with Leigh, Blackburn and Wakefield electricity undertakings. Commissioned in the 4th Bn. K.O.Y.L.I., he went to France in April, 1915. He served throughout the war with the K.O.Y.L.I., the Manchester Regt., the Border Regt., and the Somerset Light Infantry; also on a War Material Commission in the Army of Occupation in Cologne. He gained the M.C. on the Somme in 1916. Returning to Wakefield in May, 1919, he was appointed city electrical engineer and manager in June, 1920; he was responsible for the Wakefield undertaking until appointed to Oxford in a similar capacity in 1931. He is a member of the Central Electricity Board Consultative Committee for South-West England and South Wales.

**Obituary.—Dr. Leo Hendrik Baekeland**, scientist and inventor of "Bakelite," died in New York on February 23. He was born in Ghent in 1863, graduated as a Doctor of Science at Ghent University in 1884. He emigrated to America, and in 1893 founded the Newara Chemical Society, manufacturing the photographic papers which he invented. This Company he sold to the Eastman Kodak Company, and thereafter devoted his time to chemical research. He began his work as

one of the pioneers of plastics when he became president of the Bakelite Corporation in 1910.

We much regret to note the death, on February 25, following an operation, of **Mr. William Clardy Lusk**, deputy chairman and managing director of Associated Electrical Industries and chairman of the British Thomson-Houston Co., Ltd. Mr. Lusk was born at Nashville, Tennessee, U.S.A., in 1875, and educated at Yale, gaining a science degree. He had electrical training with the G.E.C. (of New York), which selected him, in 1901, to represent the organisation in India. He returned to America in 1904, and then came to England to join the London staff of the American G.E.C. His first connection with the B.T.-H. Co., was in 1910, when he was appointed manager of the Export Department; in the same year he was elected a director, to become managing director in 1922. In 1928 he took a leading part in the development of the Associated Electrical Industries, Ltd., under Mr. H. C. Levis, then chairman of the B.T.-H. Co.



**Mr. W. C. Lusk.**

In 1929 Mr. Levis retired, being succeeded as chairman by Sir Felix Pole, and Mr. Lusk became deputy chairman of A.E.I., Ltd., and Chairman of the B.T.-H. Co. He was also, at the time of his death, chairman of Ferguson, Pailin, Ltd., deputy chairman of the Metropolitan-Vicker's Electrical Co., Ltd., and of the Edison Swan Electric Co., Ltd., and Edison Swan Cables, Ltd. A director also of the Lancashire Electric Power Co., of Power Securities Corporation, Ltd., and of Westland Aircraft, Ltd. He was an indefatigable worker, a fine administrator, imbued with the importance of research, and highly esteemed in commercial and social circles. A memorial service is to be held at 11.45 a.m. on March 8 at St. Michael's Church, Cornhill, E.C.

## ELECTRIC SUPPLY NEWS

**Croydon.**—The Electricity Committee has reported to the Corporation on the Memoranda issued jointly by the I.M.E.A., the L.E.S.A., the P.E.S.A. and some Power Companies, as to the future of Electricity Distribution ("White" report), and Ownership of Power Stations ("Brown" report). So far as the "White" report goes, the Committee is not so seriously concerned about its proposals as with those of the "Brown" report. The former deals with distribution matters, and there is, in the main, common agreement among the electricity supply associations. The "Brown" report, on the other hand, the Committee says, sets out the independent views of the I.M.E.A. The discussion in the Council must be *in camera*, but it is indicated that this "Brown" report has proposals to which the Committee is unanimously opposed, and it is urged that Croydon representatives attending the I.M.E.A. meeting, which is to consider the document, should seek to get the proposals rejected.

**Kendal.**—Application is to be made to the Electricity Commissioners by the Corporation for sanction to borrow £10,470, estimated cost of replacing certain obsolete cables, and other works.

**Nottingham.**—The jubilee of Nottingham municipal electricity department is to be

commemorated on September 18, but the Electricity Committee of the Corporation is trying to work out what form the celebrations should take. The Committee has, so far, agreed there should be some celebration. The most appropriate thing, of course, would be special illuminations, and if the European war were to end in September, this course would be adopted. But if, as does not seem improbable, the war will even then be continuing, the Committee thinks that it might consider the introduction of modified street lighting in the city centre as some sort of mark of the attainment of 50 years of service by the undertaking.

**West Ham.**—The Memoranda issued by the I.M.E.A., dealing with post-war development of the Electricity Supply Industry ("White" and "Brown" respectively, concerned with supply in general and ownership of power stations), have been before the Corporation's Electricity Committee, which has had also a joint report on the memoranda from the town clerk, the borough treasurer and the borough electrical engineer. The Committee recommended that the proposals contained in the memoranda be accepted in principle, subject to suitable protection for the Council on lines suggested by its officers.

## ABERDEEN'S JUBILEE

**ABERDEEN** has, in its long history, had many a great day; not the least of them was February 27, 1894, when the wife of Lord Provost Stewart switched on current, to start up arc lamps in Union Street and Castle Street; a week later the first private consumers, less than two score of them, got their supply. A small beginning, but expansion began from the first and soon gathered momentum. In 1907 the supply area was considerably extended, and at January 1, 1908, the Corporation took over the Deeside & District Elec Supply Company's undertaking. Donside districts were provided with a supply in June, 1909; and other extensions of area have since been made, until now Aberdeen supplies over almost 100 square miles.

**The Beginnings.**—The first generating station, in Cotton Street, contained five non-condensing engines driving d.c. dynamos—the total capacity 257 h.p. Supply was at 110 and 220 V, the mains copper strip culverts under the footways; supply pressure was raised to 220/440 V in 1897. In 1899 the horse-tramway system (or part of it) was converted to electric. At that time the generating plant totalled 1,580 h.p.

—there were 480 consumers and the connected load 2,000 h.p.

**A New Station**—It was obviously an uncomfortable position, with a power station site at its limit of development. So the Corporation, being in possession of the Dee village site, decided to put down a new generating station there; the site was a good size, near the railway and with ample water facilities for condensing. A temporary station was erected and brought into use in November, 1901, the permanent buildings were opened officially in March, 1903. The plant was still d.c., with reciprocating engines; small motor alternators supplied a.c., which was required in added areas. The first steam turbine plant was put in in 1911, driving a 1,000 kW d.c. generator; in 1912 a 1,000 kW turbo-alternator was installed, and turbo-alternator plant has since been the rule, much larger units latterly, of course. Likewise with the boiler-house plant. The original small boilers operated at 160 lb. pressure; in 1924 boilers were commissioned which were designed to operate at 250 lb. In 1935 the boiler-house was remodelled and most modern boiler plant installed—with room for more. There

followed in 1936 approval of generating plant extension; the boiler plant was completed in 1938, and the generating plant and other works in 1939. The distribution network has, of course, grown with the generating plant.

**Cheap Electricity.**—This has always been the policy of the Aberdeen Corporation; it has set itself out to provide all possible facilities for the consumer. Thus it abolished meter rents as long since as 1897; it began to exhibit domestic electrical apparatus in 1899—at the Gas Stove Depot, by the way. In 1899 also it began to hire out motors; one of the first authorities in the country to do so, and some of these motors are still in service. The two-part tariff (1925) and assisted wiring scheme (1926) are electrical landmarks in Aberdeen. The first electrical showrooms opened in 1909, the first portion of the present one in 1929. Like so many others, the undertaking was at first run by

a joint Gas and Electricity Committee, but 1907 saw the end of that, and the Electricity Committee has functioned separately and most efficiently ever since—the gas engineer, in whose charge the undertaking was at first placed, ceased to have charge of the Electricity Department in 1903.

**The Chiefs.**—The first engineer was Mr. E. T. Ruthven Murray (1893-1895); he was succeeded by Mr. A. S. Blackman (1895-1898), and then Mr. J. A. Bell held the reins for 38 years until his retirement in 1936. The present city electrical engineer, Mr. A. Gardner, was appointed in 1937. In the fifty years the staff has grown from five employees to some 410. At the end of May, 1939, there were 41,886 consumers; 100,700 kW of connected load; in 1938-39 there were 78½ million units sold, the average revenue being 0·90d. per unit—the latter figure comparing with 6d. for the year ended December, 1894.

## CASES IN COURT

### Hair Drier Repair

In York County Court, on February 8, G. W. Stride, electrical engineer, York, was sued by Mrs. M. Robinson, hair-dresser, for the return of a hair drier or its value—£16 16s. She was awarded £10 damages for its detention, with costs. In March, 1942, Stride had delivered to him two hair driers for repair, and as they were not returned within a reasonable time he was asked to send them back, whether repaired or not. One was recently returned repaired; the other had not yet been returned. The defence was that as hair-dressing was a luxury trade it had not been possible to obtain parts for the repairs. The defendant said his former premises were damaged in an air raid, and after he had moved to his present address he was closed down for six months because he had not obtained a new licence.

Giving judgment, the deputy judge, Mr. Raymond Hinchcliffe, said he could have understood the defence if such a long time had not elapsed since the driers were handed to defendant, and the present time. There was a duty, at any rate from September, 1942, when the premises were closed down, to have informed Mrs. Robinson that he was unable to carry out the repairs.

### Negligence Fatality Claim

In the King's Bench Division on February 23, Mr. Justice Humphreys gave judgment in favour of Hammersmith Metropolitan Borough Council in an action brought by Mr. W. H. A. Walder under the Fatal Accidents Act and the Law Reform (Miscellaneous Provisions) Act, 1934, for damages for the death of his son, Leonard Walder, 11 years of age, the allegation being that it was due to the negligence of the defendants.

The plaintiff's case was that on January 19, 1943, following two air raids, the gate in a fence round an air raid shelter at Shepherd's Bush Green had been left open. The boy went into the shelter, and with a pair of clippers was endeavouring to cut through an electric wire lying on the ground, which supplied current to a ventilating fan in the shelter, when he received an electric shock from which he died. The plaintiff alleged that leaving open the palisade of the shelter in a place where children were accustomed to play constituted an allurement to the children which rendered the Council liable.

The defendants said that 49 shelters in its district required repairs after the raids and there had not been time to finish all the repairs when the accident occurred. It was also urged that the deceased boy was trespassing and that every reasonable precaution had been taken to prevent people from going into the shelter.

His Lordship said that in his opinion the boy was a trespasser, and he was quite satisfied, on the evidence, that the defendants had not been in the least degree negligent in trying to prevent children from trespassing.

### BIG RAIL EXPANSION

The South African Minister of Transport has given details in Parliament of a big post-war railway expansion programme—the expenditure is put at £30,000,000. The work includes electrification of the main line from Cape Town to the Touws River; doubling the line between Bloemfontein and Kroonstadt; and between Maritzburg and Lady-smith. Also new mechanical workshops. A new technical department has been established and is progressing well.

## NOTES AND NOTICES

### I.E.E. Scottish Centre

The Committee of the Scottish Centre of the I.E.E. has made the following nominations for vacancies which will occur on the Committee on September 30 next:—*Chairman*, **Col. H. Carter, T.D.** (Deputy Regional Director, Scottish Region, G.P.O.); *Vice-Chairmen*, **Mr. R. I. Kinnear** (John Brown & Co.), **Mr. P. Philip** (City Electrical Engineer, Dundee); *Hon. Secretary*, **Mr. R. B. Mitchell**, 154 West George Street, Glasgow; *Hon. Assistant Secretary*, **Mr. H. V. Henniker**, 172 Craighleith Road, Edinburgh; and five names for members of the Committee.

### I.E.E.—North Midland Centre

Nominations have been made by the Committee of the North Midland Centre of the I.E.E. for the vacancies arising on September 30 include: *Chairman*, **Mr. E. Lunn** (Huddersfield E.S. Undertaking); *Vice-Chairmen*, **Mr. A. Kelso** (Harrogate Corporation E.D.), **Mr. E. S. Ritter** (Harrogate P.O. Engineering Department) *Hon. Secretary*, **Mr. K. C. Coop**, (Y.E.P.); *Hon. Treasurer*, **Mr. W. E. French** (Leeds University); and five committee nominations.

### Underground Fires

A lecture on "Underground Fires" is to be given by A. J. G. Coulshed (Central Rescue Station, Co. Durham) before the North-Western Branch of the Association of Mining Electrical and Mechanical Engineers on March 27 at the Wigan and District Mining and Technical College, commencing at 7 p.m.

### Nickel

The *Nickel Bulletin* for January contains abstracts dealing with the chemical analysis of metals, reclamation of worn parts, tin-nickel alloy coatings in food preservation, weld bead hardness tests, stress-corrosion cracking of stainless steel in chloride solutions and "design-strengthening" of aircraft materials. Copies of the *Nickel Bulletin* may be obtained, free of charge, by those specially interested, from the Mond Nickel Company, Ltd., Grosvenor House, Park Lane, W.1.

### Women's Engineering Society

At a meeting of the Manchester Branch of the Women's Engineering Society, on February 17, Mr. A. Owen, secretary of the Manchester branch of the Illuminating Engineering Society, gave an address on "Light and Lamps." He opened with a short history of artificial lighting; the importance of the use of soft, natural colours with but slight brightness contrast was stressed. Flood-lighting would render visible the beauties of parks and fine buildings at

night. He described the various types of fluorescent lamps, and compared their efficiency with tungsten filament lamps. Their possibilities were great and he hoped that they would be standardised. Mr. Owen considered lamp quality and life and the operation of a tungsten filament lamp on a voltage other than that at which it was rated; this last point evoked much discussion among the audience.

### I.S.P.H.

At a recent meeting of the I.S.P.H. (Industrial and Scientific Provision of Housing) Committee, it was unanimously decided that the Committee should be dissolved since its work had been completed by the production of its two reports, and by the foundation of the Housing Production Society, the non-commercial research development and enquiry organisation suggested by the Committee's first report. The governing body of the Housing Production Society is being strengthened on the broad-based lines indicated in the Committee's Reports, and a detailed announcement concerning the organisation and future work of the Society is shortly to be issued.

### Thermostatic Control of Boilers

A paper on "Temperature Control" was delivered by Mr. J. R. Smith, M.I.E.E., to an audience of boiler house operatives and administrative personnel at Cambridge, on February 15. The object of the paper was to bring to the notice of fuel users the advantages of thermostatic control. Mr. Smith is district engineer for George Ellison, Ltd., and a member of the Ministry of Fuel and Power, Eastern Region, Fuel Efficiency Committee.

### Rehabilitation

The Secretary to the Electrical Industries Benevolent Institution calls attention to the publication by the Ministry of Health of a memorandum on the Organisation of a Hospital Rehabilitation Department. This, he says, is a reminder that the Electrical Industry has a body—the E.I.B.A.—which has long preached and acted upon a principle fundamental to all constructive social work, and now officially blessed, that social work should be rehabilitative. A sick man should not alone be made well, but if disabled should have the use of modern science to assist him, despite disability, to take his place again as a useful member of the community. The E.I.B.A. has been among the pioneers of social service as opposed to mere charitable unimaginative doling out of funds.

## ELECTRICAL COMPANIES

**Dividends.**—*Bruce Peebles & Co.*—Dividend of 5%, plus bonus of 3%, making 8%.

*Lancashire Electric Light & Power Co.*—Final dividend of 5%, making 7½%.

*Llanelly & District Electric Supply Co.*—Dividend of 6% less tax.

*Oliver Pell Control.*—Dividend of 3% on 6% participating preference for half-year to June 30, 1941.

*Mersey Railway Co.*—Dividend of 2½% on consolidated ordinary.

*Richmond (Surrey) Electric Light & Power Co.*—Dividend of 6%.

*South London Electric Supply Corporation.*—Dividend of 7%.

*British Power & Light Corporation.*—Final dividend on ordinary stock of 5%, making 7%. (Net profits for 1943, £335,483.)

*North Wales Power Co.*—Dividend of 5½% for 1943.

*North-Eastern Electric Supply Co.*—Final dividend of 4½% on ordinary stock, making 7%, less tax, for 1943.

*Electrical Distribution of Yorkshire.*—Final dividend of 4½%, making 9%.

*Yorktown (Camberley) & District Gas & Electricity Co.*—Final dividend of 2¾%, making 5½%.

**Lancashire Dynamo & Crypto.**—Last spring 200,000 £1 ordinary shares were created; 2,160 have been allotted, credited fully paid, as part of the purchase consideration of 7,501 £1 ordinary shares in the Nevelin Electrical Company. When the capital increase was proposed the shareholders were informed that it was the directors' policy to extend the activities and interests of the company in the electrical industry when suitable opportunities arose, and the additional capital might be required for this. The Nevelin company was registered as a private company in March, 1936; issued share capital is £30,000 in £1 shares.

**Radio Rentals.**—At this meeting Mr. H. F. Hunt said the trading profit was £112,658 against £76,590 in the previous year; after taxation there was a distributable profit of £23,116, compared with £13,400. The difference was due largely to an agreement with tax authorities as to a revised basis, which was retrospective, of writing down the value of the radio sets for taxation purposes. The dividend it was proposed to raise to 20% for the year; taking less than half of the profit available, carrying forward £44,027. The company was in a strong financial position. The resolutions to increase the authorised share capital (from £250,000 to £350,000 by creation of 400,000 additional ordinary 5s. shares) were part of planning for post-war years—it was not proposed to issue any of the new shares at present.

## ENGLISH ELECTRIC COMPANY

### The Napier Interest

The twenty-fifth annual general meeting of the English Electric Co., Ltd., was held in London on February 24.

Sir George H. Nelson, M.I.Mech.E., M.I.E.E. (chairman and managing director), in the course of his speech said:—The increase of £41,972 in the issued ordinary stock is a result of the completion of the exchange of shares with the holders of ordinary shares in D. Napier & Son, Ltd. Creditors and reserves are up by £402,427; this is largely due to additions to our reserves for taxation, which fully cover all taxation liabilities on the profits up to the date of the accounts under review. Our liquid assets amount to £2,987,603, which is slightly in excess of last year and is fast approaching the £3,000,000 mark. The general reserve has been increased by a further £100,000 and now stands at £900,000. Fixed assets are practically the same as last year after applying the depreciation of £100,000 shown in the profit and loss account.

The profit carried to the balance sheet is £11,786 greater than in the previous year. Once again we have only been able to place £100,000 to general reserve. The present incidence of taxation prevents any further allocation.

Your directors felt that I should take the opportunity afforded me in addressing the stockholders of the English Electric Company to make some reference to Napier's. To enable you to obtain a general picture, we have included Napier's latest balance sheet with your directors' report.

The only item in the Napier balance sheet which I think calls for any explanation is the bank overdraft of £1,714,798. This is caused by an increase in the volume of business, and is self-liquidating, when volume of business falls from war to normal level. Furthermore, a sum of £750,000 will be paid to that company by the Government for certain fixed assets as soon as details are settled.

As to the activities of Messrs. Napier's I cannot speak, any more than I can of our own activities; but I can say that the great manufacturing facilities, engineering resources and accumulated managerial experience of your company, have played their part in the development, production and the successful operation of the Sabre engine which is fitted to the Typhoon aircraft which no doubt you have seen referred to in the national press, where its sorties are almost a daily feature of the official communiqués. We congratulate all concerned.

In conclusion, on behalf of the stockholders, he conveyed their sincere thanks to the staff and workpeople.

The report was adopted and a dividend of 10% was declared on the ordinary shares.

# BUSINESS ANNOUNCEMENTS

Continued from page 260

## 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.

Mar. 3.—**Manchester T.C.**: 33 and 6.6 k.V switch-gear at generating stations and substations. Mr. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall, Manchester. Deposit £1 Is. Advertised Feb. 10 issue.

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 Is.

Mar. 7.—**Belfast T.C.**: Stores for Electricity Department, City electrical engineer and general manager, East Bridge Street, Belfast. Advertised February 10 issue.

Mar. 7.—**Londonderry T.C.**: Electrical accessories, transformers, cables, etc., for Electricity Department. Mr. J. C. Donnell, town clerk, Londonderry.

Mar. 8.—**Westhoughton U.D.C.**: Electric lamps, one year. Mr. F. H. Walker, surveyor, Town Hall, Westhoughton.

Mar. 15.—**Stockport T.C.**: Electric lamps for Education Committee for six months. Mr. G. Holgate, director of education, Stockport.

Mar. 22.—**Manchester T.C.**: Service cut-outs and cables, one year. Mr. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall, Manchester. Deposit £1 Is. each. Advertised this week.

Mar. 31.—**Wortley U.D.C.**: Electrically motor driven borehole pumping unit. Mr. J. Morton, clerk, Council Offices, Grenoside, near Sheffield.

May 10.—**North-West Midlands Joint Authority**: (a) Piping equipment; (b) overhead electric travelling cranes. Messrs. Merz & McLellan, 32 Victoria Street, S.W. Deposit £5 5s. each. Advertised this issue.

## 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.)

**PRESTON**.—Accepted by Ribble Committee: **Stothert & Pitt**, four electric level luffing cranes.

**SOUTHEND-ON-SEA**.—Accepted by Transport Committee: **Sunbeam Motors, Ltd.**, three trolley vehicle chassis. Accepted by Education Committee: **Dictograph Telephones, Ltd.**, internal telephone system at Education Office.

**BETHNAL GREEN**.—Accepted by Works Committee: **General Electric Co.**, lamps of various wattages for street-lighting purposes.

**LEWISHAM**.—Accepted by B.C.: **J. H. Plant, Ltd.**, electric light installation, nursery, Ladywell Park, £159.

**GLASGOW**.—Accepted by T.C.: **Babcock & Wilcox, Ltd.**, repairs to coal-handling plant, £5,000; **Vector X-Ray Corporation**, electro-medical equipment, £213.

**WALTHAMSTOW**.—Accepted by Electricity Committee: **British Thomson-Houston Co.**, e.h.t. ring-main unit, £495 2s.

**DURHAM**.—Accepted by County Council: **Falconer Cross & Co.**, Newcastle-on-Tyne, reconditioning batteries at Richard Murray Hospital, £334.

## 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.

(13321) "**Irv-o-slot**" insulation material, makers of? W.—Irvington Varnish & Insulator Co., Irvington, N.J. Agents, J. O'Hara Murray & Co., 20 Holborn, E.C.1.

(13322) **Wm. Sanders & Co. (Wednesbury), Ltd.**, London address? T.M. & N.R.—78 Neal Street (off Shaftesbury Avenue), W.C.2.

(13323) "**Chronostop**" time switch, makers of? T.C.—Orel Micro Electric, Ltd., 39 Berners Street, W.1. Enquiries should be addressed to F. Siegrist, Ltd., at same address.

(13324) "**Orion**" vacuum cleaner, makers of? R.B.—This, we understand, is foreign made. Agents: The British Electrical & Manufacturing Co., Ltd., 13 Charlotte Street, W.1.

(13325) "**Drive-All**" reduction unit, makers of? E.—Made in U.S.A. Representative: Broadway Engineering Co., Ltd., Otterspool Way, Watford By-Pass, Watford, Herts.

(13326) "**Wylex**" plug, makers' name? D.L.R.E.—G. H. Scholes & Co., Ltd., Wylex Works, Wythenshawe, Manchester.

(13327) "**Thorlux**" reflectors, makers of? L.M. & S.—F. W. Thorpe, Ltd., Welby Road, Hall Green, Birmingham, 28.

(13328) **Hart Manufacturing Co.**, address of? G.S.P.—Cleveland, U.S.A. London agents: Walworth, Ltd., 90-96 Union Street, Southwark, S.E.1.

(13329) "**Pyrobit**" electric soldering iron, makers of? S.—Acru Electric Tool Manufacturing Co., Ltd., 123 Hyde Road, Ardwick, Manchester. London agents: Ougree Steel Trading Co., Ltd., Stone House, Bishopsgate, E.C.2.

## MEETINGS TO NOTE

Mar. 3.—I.E.E., Bristol Students.—"An I.E.E. Student Sees the U.S.A.," R. W. Adams, Pump Room, Bath.—7.15 p.m.

Mar. 3.—Engineer Surveyors' Assoc.—"The Principles and Operation of Radio Telephony," F. M. Inglis. County Hotel, Newcastle-on-Tyne.—7 p.m.

Mar. 4.—Engineer Surveyors' Assoc.—"Safety Devices for Hydraulic Lifts," G. Lawson. Onward Buildings, Deansgate, Manchester.—3.0 p.m.

Mar. 6.—Engineer Surveyors' Assoc.—"Wire Ropes in General," P. Woodhead. Y.M.C.A., Leeds, 1.

Mar. 6.—Illuminating Engineering Society, Bath and Bristol.—Address by Mr. H. Buckley. Grand Hotel, Bristol.—7 p.m.

Mar. 8.—I.E.E., Transmission Section.—"Reinforced Concrete Line Supports," E. C. Neate and W. F. Bowling.—I.E.E. Building, Savoy Place, W.C.2.—5.30 p.m.

Mar. 9.—I.E.E., London.—Installations Section.—"Design of Electrical Installation Equipment," H. Drake.—I.E.E. Building, Savoy Place, W.C.2.—5.30 p.m.

## BUSINESS NOTICE

**Branch Office.**—The Rheostatic Co., Lt. l., Slough, has now opened an office and showroom at 43 King Street, Manchester, 3, Telephone "Blackfriars 8526." The new office will permit considerable extension to the technical service rendered to customers in the North of England. Mr. S. G. Ward, who has operated as resident engineer for the Company in the area for a number of years, working from his private address in Wilmslow, is in charge of the new office.

(Advs continued from page 260)

### FOR SALE. Continued

A LARGEST Stock Surplus enamelled cotton and silk instrument and Resistance Wires, Ebonite, Fibre, T.R.S. Cables, etc., Searchlights (sale or hire), Mirrors, Carbon Rods, etc.—LONDON ELECTRIC FIRM, Croydon.

### 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.

### PATENTS

The Proprietor of British Patent No. 530,538 for "IMPROVEMENTS IN AND RELATING TO CABLE FOR USE IN ALARM SYSTEMS," desires to enter into negotiations with a Firm or Firms for the sale of the Patent or for the grant of licences thereunder.—Further particulars may be obtained from MARKS & CLERK, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

The Proprietor of British Patent No. 528,626 for "AUTOMATIC REGULATOR FOR ARC FURNACES," desires to enter into negotiations with a Firm or Firms for the sale of the Patent, or for the grant of licences thereunder.—Further particulars may be obtained from MARKS & CLERK, 57 and 58 Lincoln's Inn Fields, London, W.C.2.

The Proprietors of British Patent No. 527,976 for "IMPROVEMENTS IN SYNCHRONOUS DYNAMO-ELECTRIC RECEIVERS AND TRANSMITTERS," desire to enter into negotiations with a Firm or Firms, for the sale of the Patent, or for the grant of licences thereunder. Further particulars may be obtained from MARKS & CLERK, 57 and 58 Lincoln's Inn Fields, London, W.C.2.

## MISCELLANEOUS

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

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