ELECTRICAL TIMES

Vol. 106 THURSDAY, DECEMBER 7, 1944 No. 2772

The Premier Industry

A few years ago electricity was classed fourth or fifth on the list of the major industries of the country. Today it has strong claims to be ranked first in order of importance. We feel that way about the matter following the E.D.A. 25th Anniversary Dinner last Thursday, and in the light of the summary of progress over the last quarter of a century, reproduced on page 652. In its own sphere this progress report is as staggering as the recently published account of Britain's total war effort. In 1919 there were 700,000 consumers, capital expenditure was a little more than £100 million, and the annual revenue some £14 million. Since that year consumers have multiplied more than fifteenfold, to 11,000,000, capital expenditure has increased seven times to nearly £790 million, and revenue ninefold, to £125 million. It is not, however, on figures such as these, outstanding as they are, nor on the rapidity of expansion, that the claim of premiership for the electrical industry is based. The plain fact is that there is not an industry in the country, nor any social or commercial activity, that could be carried on at its present level of efficiency without the aid of electricity. In the mines, in the factories, in commercial offices, in transport and in the home, electricity today is vital and indispensable. Next to the basic requirements of maintaining life, it is the premier need.

More Pocket Money for E.D.A.?

The temptation to speculate on what the next twenty-five years may hold is strong, but we will not fall to it, other than to comment that the all-electric era now in sight transcends by far everything yet achieved, and is beyond the wildest dreams of even the far-sighted founders of the E.D.A. Rather our immediate concern is with the past and the present. No one would, of course, suggest that all the progress of the last two-and-a-half decades is due to the activities of E.D.A. Equally, we imagine, no one would deny that the Association has contributed much to the rapid expansion of the electrical industry. As for status, the presence of a pride of Government lions—five Ministers, headed by the Deputy Prime Minister—at the Silver Jubilee celebration is itself a hall-mark of the present-day importance of the Association, and of the mature respectability of the industry. In view of past achievements, and in anticipation of things to come, we feel the time is appropriate for giving E.D.A. a well deserved increase of pocket money. The Association's income, of the order of £130,000-£135,000 in a normal year, is a meagre advertisement appropriation for an industry with an annual income of £125,000,000, a mere one-tenth of one per cent. The allocation should be nearer £1 million.

Town and Country Planning

The conception of town and country planning has greatly changed during the war years. It has become more extensive in its applications and more grandiose in its treatment. No doubt this urge towards better planning has been stimulated by the need for redevelopment of areas of extensive war damage. Never before has the nation been presented with such opportunities for planning on the grand scale. Fresh open spaces will appear, new building lines will be decreed, new roads planned, and old ones obliterated. In all this work Statutory Undertakings will play their part, the cities of the future will call for maximum utilisation of engineering services. In the communal ideal some loss of prerogative by Statutory Undertakings may be involved, and the extent of that loss may be seen in the Town and Country Planning Act which received the Royal Assent last month.

Compulsory Land Purchase

The new Act relates to areas of extensive war damage, land for the relocation of population and industry, and slum areas. In such cases Statutory Undertakings must give up the privileged position they hold under Section 41 of the 1932 Town and Country Planning Act.

Official and Prepaid Advts. in Central Pages. For Subscription and Prepaid Ad. Rates and List of Contents see page 660.

Their land may now be subject to compulsory purchase, their cables may have to be dug up, and their overhead lines and substations dismantled. Safeguards of the Undertakings' interests are, however, included in the Act. Compulsory Orders are made jointly by the Minister of Town and Country Planning, and the Minister of Fuel and Power, and such Orders must be confirmed by Parliament unless all objections to the Order are withdrawn. Compensation is made to all Statutory Undertakings for the purchase of their land, for the removal of their apparatus, on or under the land, and for the estimated loss in net receipts. In assessing this compensation consideration will be given to the scrap value of the apparatus removed, and any increase n net receipts. More details of these revisions are given on page 651, and although they appear to give far-reaching powers for planning, it must be remembered that they are confined to areas where replanning is an obvious necessity.

Antiquated Colliery Installations

The following is an authentic account of the electrical installation of an important group of collieries, as it existed at the time, just before the war, when it was decided modernisation could no longer be postponed. The distribution system was a hotch-potch of lines put up and added to at various times, as expediency made necessary. Substations were a miscellany of plant of different types and make, much of the equipment having been bought cheap second-hand. The rupturing capacity of the control switches was an unknown quantity, possibly adequate when they were first installed, but not under modern conditions of Grid power behind a fault. The whole installation was unsafe. Is this case exceptional? While the description may not be typical, it could, we regret to say, apply to far too many colliery electrical installations today. One reason for this is that in the past colliery electrical engineers have not, as a rule, had the status and authority necessary for them to secure adequate expenditure on the electrical plant and its maintenance. They have been expected to keep things going somehow, and, unfortunately perhaps, have succeeded too well. The remedy for this unsatisfactory state of affairs does not lie only with modernisation of plant, equipment and installation. To effect permanent improvement, the root cause also must be eradicated.

The "Magic Eye" or "Gen Box"

Another of Great Britain's major scientific contributions to the fast maturing Allied Nation's Victory is the "Magic Eye," or "Gen Box," as the R.A.F. have dubbed it, general particulars of which have just been released for publication. The use of this device by Bomber Command has been a jealously guarded secret for two years; and when American Fortress crews found themselves hampered by bad weather some of them were given the apparatus and trained in its use. The principle of operation is that high frequency electric waves are "sprayed" on to the ground below the aircraft and their reflections are picked up by a receiver, amplified and adapted to produce a silhouette picture of the landscape on a fluorescent screen. In other words, the Gen Box is the electrical counterpart of the familiar Kelvin sounder, used to explore the sea bed by sound waves. Experimental work on the device was being carried out before the war. At the present time its use permits accurate bombing of area targets invisible through cloud or mist. In peace time it will be an important factor in making blind flying, and fog navigation, completely safe. And its origin is British.

Journalistic Luminescence

If this should catch the eye of a penny paper editor he will learn something to his advantage if he consults the *Evening Standard* of November 29th. Therein he will find a short article with the inviting title: "This Light throws no Shadows." The subject is luminescent tubular lamps. Now one of the weakest points in our popular penny paper press is its treatment of scientific topics. For one thing it seldom mentions them; for another it entrusts the writing, as a rule, to a lay journalist who almost invariably makes up for his lack of expert knowledge by misleading analogies and a lavish use of superlatives. Seldom, indeed, does it allot the job to a scientific man who can write lucidly in language easily understood by the common reader. Hence the

public are either suspicious or puzzled, and they are starved of much interesting information of direct bearing on their lives. In this case the writer is Dr. C. C. Paterson, F.R.S., and his article is a shining example of how the thing should be done. He catches the reader's attention at once, he uses simple language, he is concise, and he is, of course, accurate. We feel that most readers finished the article with a hope that Dr. Paterson will minister to them again. They enjoyed the jam and could have sworn there was no pill in it. In other words, Dr. Paterson enlightened without casting a shadow.

"Father of the Electric Range"

The American propensity for claiming that practically every notable advance in modern science and engineering was initiated by, or originated with, a national of the U.S.A. is a familiar phenomenon, and is not to be taken too seriously. When in error, it probably derives more from natural exuberance than wilful mendacity, and on occasion the claims of indigenous American citizens are contested as hotly as ever the merits of international rivals. But when, as in its September 16th issue, the *Electrical World* claims the late George Alexander Hughes as the father of the electric range, we feel that at least a mild protest is called for. Whatever may be Mr. Hughes' rightful place of honour in the American range hierarchy, we must point out that in the introduction and development of electric cooking the New World lagged nearly a quarter of a century behind the Old.

Col. Crompton's Pioneer Work

The claim made by our trans-Atlantic contemporary is that at the N.E.L.A. exhibition in St Louis in 1910 "the first electric ranges were shown to the electrical industry. There were five of them —the complete stock of the manufacturer. That was the introduction of electric cooking to an industry that knew it wouldn't work." To correct this misapprehension, we cite history. At the Crystal Palace Electrical Exhibition in 1891, Mr. H. J. Dowsing had a stand on which was shown electric cookers and heaters, manufactured by Messrs. Crompton. And on Friday, June 15, 1894, a seven course banquet, cooked entirely by electricity, was served at a special function attended by the Lord Mayor, at the Cannon Street Hotel, London, England. Again, in 1895 Colonel R. E. Crompton read a paper before the Society of Arts on "The Use of Electricity for Cooking Purposes," and a large variety of cooking appliances was then shown. The year 1890 may be taken as the date when the first practical attempt was made to introduce electrically heated cooking apparatus. Colonel R. E. Crompton probably has the best international claim to the title of "Father of the Electric Cooker."

Electric Cooking Here and in U.S.A.

While on the subject of electric cookers it will be appropriate to clear up what is a very common misunderstanding concerning the relative popularity of electric cooking here and in the U.S.A. So far from America being ahead of this country in this particular use of electricity, statistics, when allowance is made for the difference in size of population, prove the contrary. The *E.W.*, in the note referred to above, estimated that four years ago something over 2½ million domestic ranges were in service, consuming about 2·3 billion kWh per annum—just under 1,000 units per range. Our own 10th Annual Statistical Review of Progress in Domestic Electrification, published August 3, 1939, recorded 1,036,518 electric cookers (of approximately 5·2 kW average loading per cooker) in service on the mains of 377 undertakings. The data do not, of course, tell the whole story; actually they cover some 33 million only of the 45 million total population. Nevertheless, it will be clear that on the most conservative estimate, to be on a comparable footing with Great Britain, the U.S.A., with three times our population, should have had well over 3 million ranges in use pre-war. Another thing, British electric cookers in general are subjected to much more onerous use in everyday home catering than are American ranges. On the other side of the Atlantic, the habit of partaking of light snacks at home, and main meals at outside restaurants, is very prevalent. This is reflected in cooker consumption, which averages in this country nearer 1,500 than 1,000 units per annum, for a family of four persons.

METEOR

RADIO FREQUENCY HEATING

Power Valves

By L. L. Langton, A.M.I.E.E.

A PREVIOUS article* dealt with the generation of R.F. power by thermionic valves, and it was mentioned that in the case of an oscillator the voltage feed back to the grid must be in phase with the applied grid voltage. For this condition to be fulfilled the feed back voltage must be 180° out of phase with the anode voltage, as there is a phase reversal between the grid and anode voltage. Therefore another reversal is required to enable the feed-back voltage to reinforce the applied voltage.

It was also pointed out that the transfer of energy from the grid to anode is by virtue of an electron stream. Now, the speed of an electron is finite, and depends upon the potential gradient along its path, and so, in the case of a valve, will be governed by the geometry of the electrodes and the applied voltages. When the frequency of oscillation is very high, the electron transit time between grid and anode becomes comparable with the duration of a cycle, and so phasing arrangements become upset. The grid admittance, which is ordinarily very low, increases considerably when electron transit time becomes significant, and so the driving power required by the grid circuit becomes large.

The above considerations are major factors which limit the upper frequency at which a valve may generate full power. For the normal type of transmitting valve, the frequency limit lies between 20 and 30 megacycles. There are other factors also influencing this limit, for instance, the nature of the materials forming the seals through which leads are brought out of the valve. Normal types of glass would be heated by dielectric hysteresis losses to such an extent that they would reach the softening temperature of about 450°C, and the seal would then be destroyed.

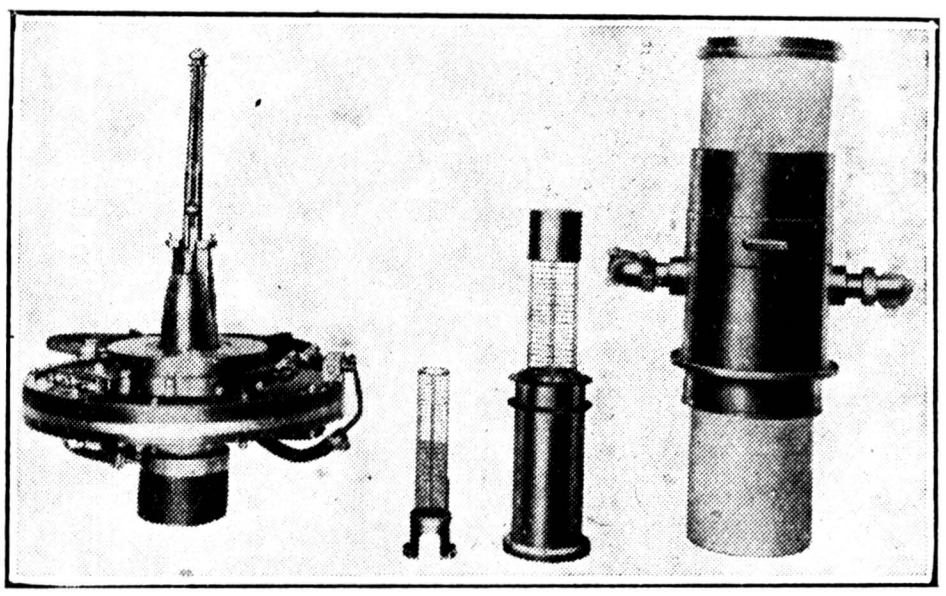
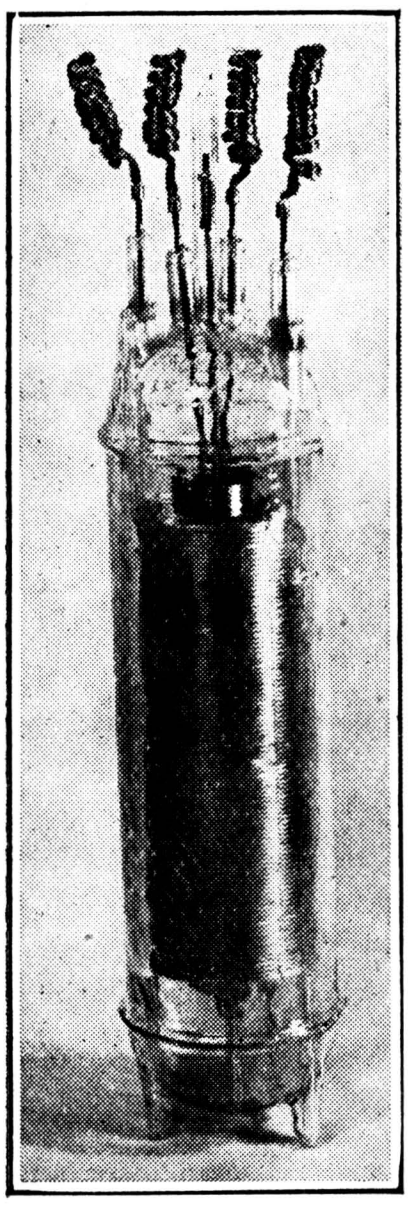


Fig. 3.—"Metrovick" Demountable Valve, 50 kW

Showing Component Parts, Electrodes, etc. See also Fig. 4.



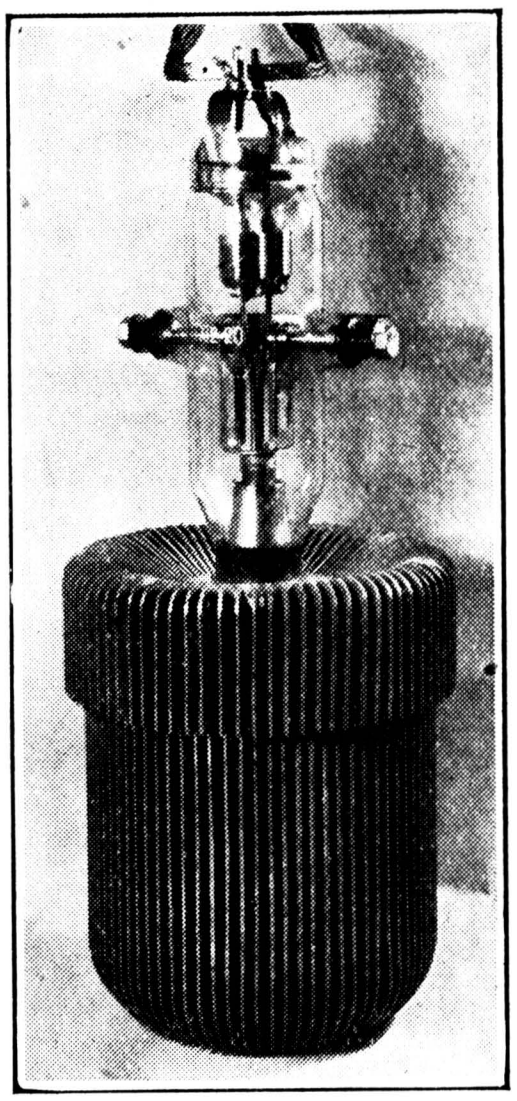


Fig. 1 and 2.—" Mullard " Valves.

On left, a Silicon Envelope Valve, type TX10-4,000 ; anode dissipation 4 kW, anode volts 10 kV, frequency 20 Mc/s maximum. On right, Forced Air-cooled Valve, type TX12-20R ; anode dissipation not determined, but of order of 16 kW.

Special, but rather costly, types of valve are made in which the transit time is considerably reduced by elaborate design. Materials having very low loss factors and high softening temperatures are used in the construction. In this manner valves can be made which will generate large powers at frequencies of 100 megacycles and higher.

Influence of High Frequency.—It was seen from the discussion in a previous article† that increased frequency is generally beneficial in heating materials by dielectric hysteresis, and for some of the low loss materials a very high frequency becomes essential. The normal types of thermo-setting plastic materials have somewhat greater loss factors than some of the thermo-plastic materials. Equipment operating at a frequency between 20 and 30 megacycles would be satisfactory for heating the former, though the efficiency would, of course, be higher if the equipment were capable of generating the same power at two or three times the frequency.

Whether it is worth while installing

* The Electrical Times, Nov. 2, 1944.
† The Electrical Times, October 5, 1944.

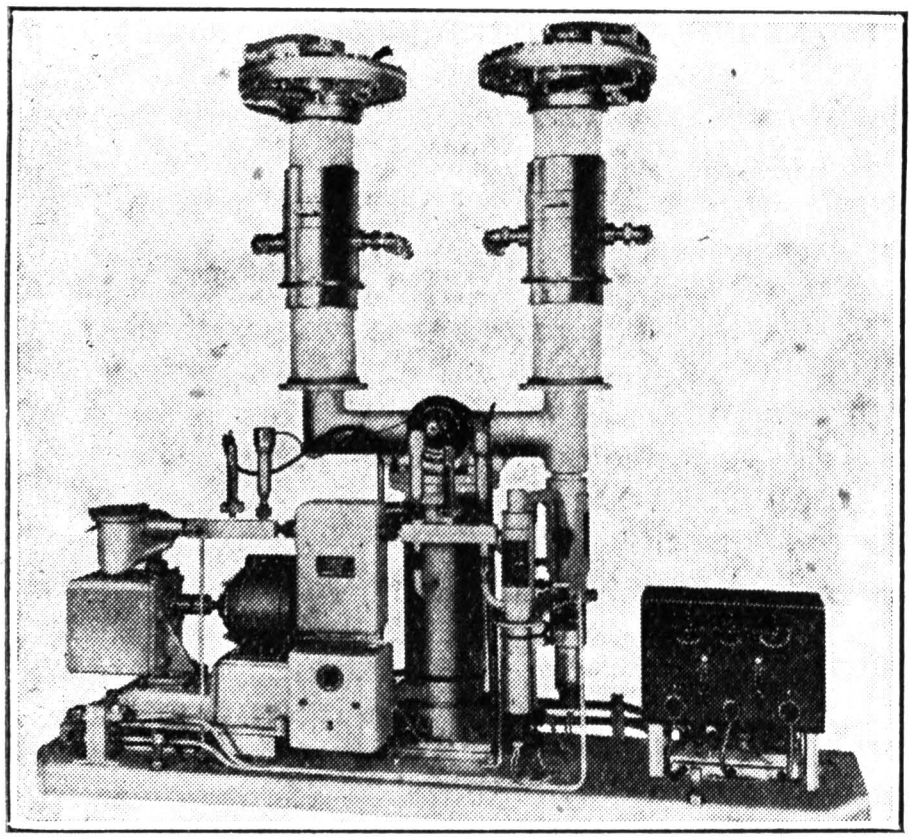


Fig. 4 .—Two Demountable " Metrovick " 50 kW Valves.

Shown mounted on the Vacuum Pumping Plant.

very high frequency equipment to heat some of the more lossful types of material is decided by economic considerations. First cost would be appreciably greater and the maintenance costs far higher, as not only are the valves more expensive but any circuit component which deteriorates slightly would require immediate attention or replacement.

It may well be that the upper frequency limit at which normal valves generate efficiently will be raised within a reasonably short time, as the field of application for high frequency valves will be greatly extended when Radio Frequency Heating becomes commonplace in this country. Valve manufacturers will then find it expedient to devote more research and development effort to improving the standard product.

The lower frequency range employed for the E.C.H. of metals will not, of course, demand any specialised type of valve, so far as transit time and losses in manufacturing materials are concerned, but it is probable that E.C.H. equipments of very high power will be fairly commonplace. There is, for example, one factory in America in which 3,000 kW of radio frequency power is used in flowing tin on to steel plate. Tin is a metal which is in short supply in America, and it has been found that a more consistent flow, and a considerable saving in tin, can be achieved when E.C.H. is employed.

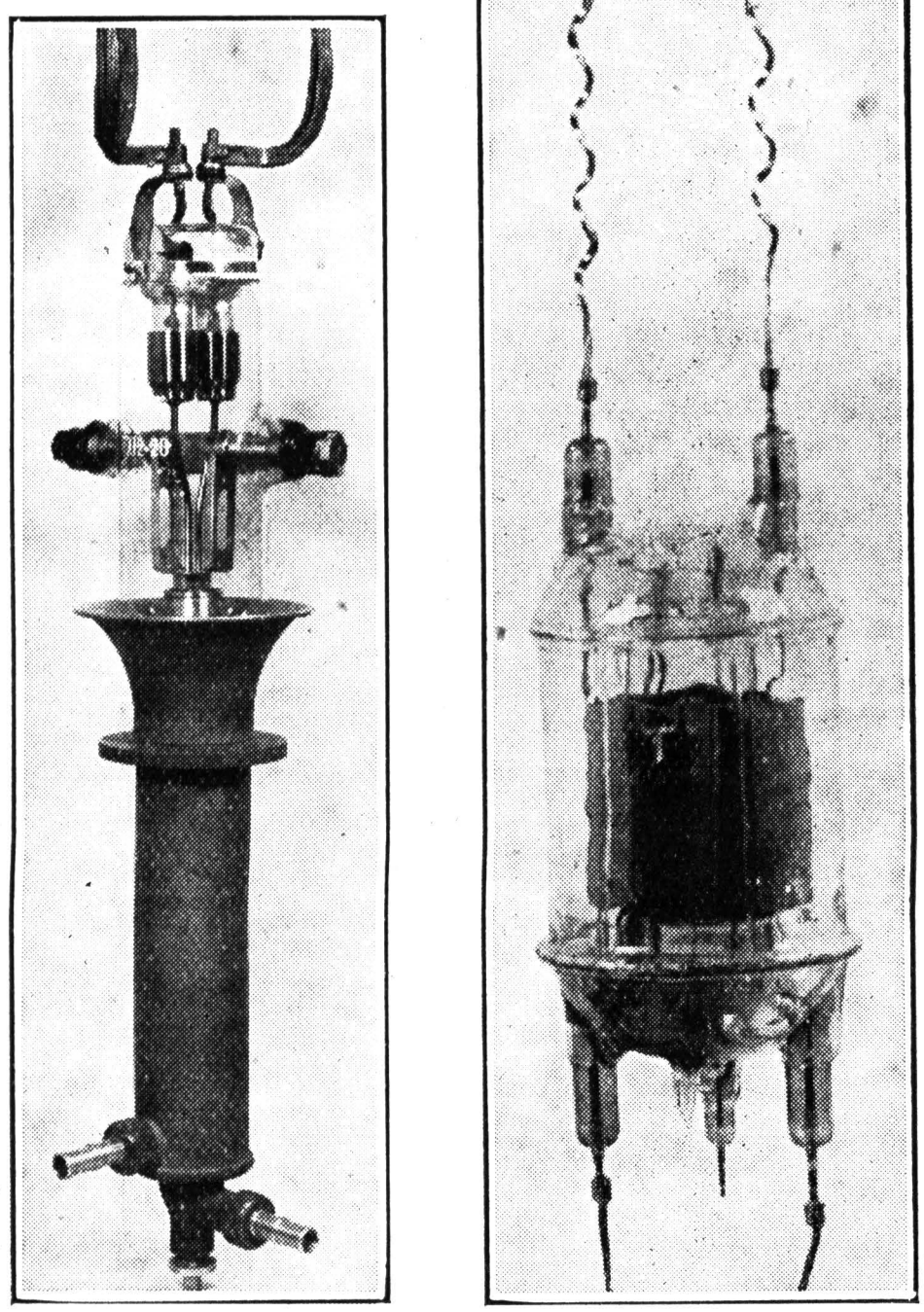
High Power Considerations.—Valves for the generation of very high power have in the past been in relatively small demand and are consequently costly. Here again, the extension of Radio Frequency Heating may be expected to bring about a reduction in their cost.

A major difficulty which arises when high power is to be obtained from a valve is the dissipation of heat produced at the anode. The anode efficiency of an R.F. power generator is about 66%, so that, if 2 kW of R.F. power is to be obtained from a valve the anode will have to dissipate heat due to 1 kW and the input power will be 3 kW.

Valves having envelopes of glass are limited in their power-handling capacity by the low melting point of glass. Heat radiated from the anode contained within the envelope would itself impair the envelope and seals if large power were to be handled.

One solution of this problem is to make the valve envelope of fused quartz as this material does not soften below a temperature of 1,500°C. Valves of this type have been obtainable for a number of years and have been extensively used by the Admiralty in radio transmitters. The manufacturing difficulties to be met in the fabrication of a quartz envelope are, however, considerable, and this type of valve is apt to be rather costly. But it still has a definite field of application for certain purposes.

A more usual solution of the problem of anode heat dissipation is to make the anode of copper and have no surrounding glass envelope. A glass-copper joint is formed at the base of the anode to enable the leads



Figs.5 and 6.—" Mullard "Water-cooled and Small Silicon Envelope Valves.

Type TX12-20 on left, anode dissipation 18 kW, anode volts 12 kV, maximum frequency 20 Mc/s. On right a TY2-300 Valve, anode dissipation 300 W, anode volts 2 kV, maximum frequency 50 Mc/s. Note grid and anode leads are brought out well spaced at one end of the valve and this facilitates operation at high frequency.

to the other electrodes to be brought through a suitable material. The copper anode may be fitted with fins and be cooled by forced air, or it may have a copper jacket to enable water to be circulated round the anode for cooling purposes.

The maxinum values of anode dissipation which are at present obtainable with glass envelope valves are from 1·5 to 2·0 kW; with forced air-cooled copper anode valves approximately 15 kW; and with water cooling up to 150 kW. The R.F. output obtainable from any type of valve is roughly twice the anode dissipating power. The use of water-cooled valves may necessitate the installation of a circulating system of pure water, as mains water in many parts of the country is unsuitable for cooling valves.

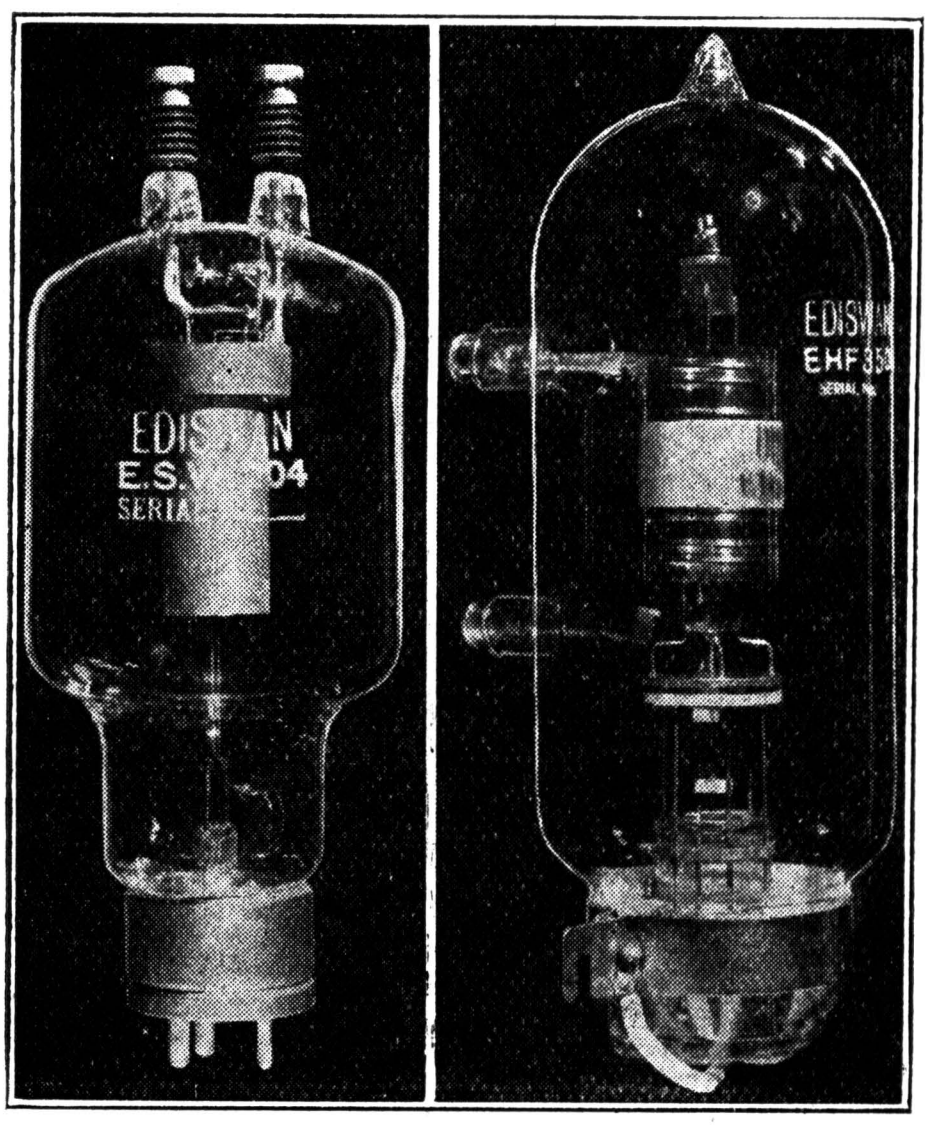


Fig. 7.—" Ediswan " Glass-envelope Valves.

The E.S.W. 204 valve, on left, has anode dissipation of 250 Watts : the E.H.F. 350 type, on right, 350 Watts.

Much research is at present being conducted to increase the power which air-cooled valves will handle, to obviate the handicaps which water cooling entails.

Nature of Ancillary Equipment.—The R.F. generator may be divided into two sections, one being the oscillator, which we have already considered, and the other the equipment necessary to supply the requisite power at the correct voltage for the operation of the oscillator. Filaments are in all cases heated by 50 cycle a.c., obtained from a transformer connected to the main. For the smaller type of valve having an anode dissipation of ½ kW the filament would need a voltage between 8 and 15 V with a power consumption of 80-100 W. Medium-sized valves usually have filaments requiring approximately 30 V, with a power consumption of about 1 kW, while in large valves of 70 W anode dissipation a power consumption of 7 kW at approximately 30 V is an average requirement.

The high tension voltage applied to the valve or valves should preferably be d.c. and the potential required will range from about 2,000 V for small valves, to a value not higher than 17,000 V for the largest valves. It is possible to operate R.F. generating equipment with 50 cycle a.c. applied between anode and filament of the oscillator, but this entails a considerable reduction in efficiency, as the valve will generate power only when the anode is positive with respect to the filament, and so be out of operation during the half cycle in which the anode is negative with respect to the filament. Full power will be generated during the positive half cycle only when the anode approaches peak voltage.

The choice between a.c. and d.c. high tension supplies is controlled largely by considerations of cost, for if with a valve costing £50, 2 kW of R.F. power may be generated with d.c. and 1 kW with a.c. h.t. supply, the choice would be for a.c. operation when the cost of the rectifying gear is more than £50 and for d.c. operation when it is less. The matter is not decided solely on this consideration, however, but cost is definitely the main factor when a choice has to be made.

With smaller equipments the mains input is usually single-phase. This is due largely to the dislike of most small consumers for three-phase apparatus. After rectification, efficient smoothing must be installed for satisfactory generating efficiency, as the r.m.s. ripple voltage in the case of single-phase full-wave rectification is 48·3%. If no smoothing is provided the anodes of the generator will be working well below their full efficiency, as conditions would be similar to providing a proportion of the required h.t. voltage by d.c. and super-imposing a.c. to make up the balance.

Rectifiers working from a three-phase supply, which is the usual input for medium and high power equipments, do not require smoothing as the r.m.s. ripple voltage is much reduced, having a value of 4·2% for full-wave rectification.

The operation of generator anodes on a.c. from three-phase supply offers interesting possibilities when the generator contains a large number of valves. Investigations are at present being conducted to improve the overall efficiency possible by this method. The elimination of rectifier gear would, of course, be advantageous if reasonable efficiency can be achieved and if the working life of valves does not become adversely affected.

Earlier articles on Radio Frequency Heating contributed by Mr. L. L. Langton appeared in our issues, September 14—Basic Principles ; October 5—Dielectric Hysteresis ; and November 2—Nature of the Equipment.

CHEMICAL CLEANING OF BOILERS

By Vernon Walker, A.M.I.E.E.

THE main factor in maintaining the internal surfaces of boilers clean is correct feed-water treatment. Great improvement in this technique has been made in the last few years, so that it is only in very exceptional cases that information is not available that will permit of controlling the feed-water treatment to an extent that will produce very little scale-forming material on the inside of the evaporating surface. Installations, however, using a high percentage of raw water make-up may entail expensive, and sometimes fairly complicated, control processes. The control problem also involves proper conditioning of the water to prevent corrosion due either to the pH value or dissolved gases, particularly oxygen. However, in the majority of cases the control is satisfactory, provided supervision and check testing is sufficient and accurate.

The chemical treatment that will prevent scale formation will in many cases produce sludge to a considerable extent, and it is the compromise between scale and sludge that causes the difficulty in control, and results in the need for internal cleaning if not correctly carried out.

The desirable distribution of the heating surfaces in some of the latest designs of high pressure boilers tends to increase the difficulty of internal cleaning by conventional tube cleaning apparatus. There is also a tendency in design to minimise the number of joints, and resulting potential leakage. The location or omission of header, handhole and other joints, tends to make the internal surfaces inaccessible for the tube cleaners. A compromise between accessibility and the number and location of joints therefore becomes a necessary consideration in boiler design.

Advantages of Chemical Cleaning.—For the foregoing reasons the development of chemical cleaning of boilers has made steady progress during the last few years, especially in American practice, and to some extent in this country. A number of forced circulation high pressure units have recently been installed in both countries, in which the surface is composed of relatively small tube, with consequent complete inaccessibility for tube cleaning by mechanical means. The chemical method has been employed on a number of these boilers with satisfactory results.

Chemical cleaning offers several advantages, including the following: (*a*) The solvent penetrates where it is difficult or impossible for cleaning tools to operate, therefore scale is removed from every part of the boiler; (*b*) dismantling of equipment is unnecessary, as the solvent can be circulated through all parts of the unit, this results in the saving of labour and material, such as joint rings; (*c*) chemically cleaned surfaces make possible scale-free operation, as it leaves no nucleus for immediate scale formation; (*d*) there is practically no metal loss; (*e*) pits and corrosion are shown up, and the chemical solvents clean out such depressions.

The chemical used depends on the chemical composition of the material to be removed, the base of most solvents used being either hydrochloric or lactic acid, together with an inhibitor, to prevent metal corrosion of the steel parts, which at the same time does not materially reduce scale reaction. There are numerous substances that possess inhibiting qualities in various degrees, including glue, dextrine, glucose, coal tar products, quinoline, and many others. The proper inhibitor should be selected after careful consideration has been given to the required treating temperature. The acid mixture is heated to the correct temperature, and an analysis of the discharge from the unit is used as a guide, treatment continuing until the solvent strength becomes constant, indicating that the reaction is complete. A thorough washing with warm water follows the acid, and an alkali has been used for the final wash to eliminate the last trace of acid.

Cleaning Methods.—The completeness of cleaning has been checked by cutting out sections for inspection. It has been possible to remove all the scale that has been formed in these sections, and in no case has there been evidence of damage due to this method of cleaning. In some instances, individual sections, such as an entire side wall, or an entire generating bank, have been cleaned as a unit, in order to minimise the amount of acid required, and to permit of varying the time of application commensurate with the amount of scale or sludge to be removed. In other cases, the entire boiler has been cleaned, using the boiler drum as a surge tank, and pumping the chemical through all the circuits simultaneously.

In one case, a return bend type of economiser was cleaned with inhibited acid in the following way: Each bank of vertical tubes was cleaned individually, the top and bottom return bends being removed, and a connection made to the bottom of the tube bank from the discharge of a small duplex pump, with the pump suction connected to a 55 gallon drum. A connection from the top of the tube bank returned to the drum

Provision was made for the blowing out of the tube bank with compressed air. Fresh water was first pumped through the bank for about fifteen minutes with the discharge to waste; this operation removing a large amount of sludge. The bank was then blown clear of water with compressed air. The 55 gallon drum was then filled with a 5% solution of inhibited acid, and this was circulated through the tubes for 20 minutes, the solution being returned to the drum in a closed circuit. Fresh water was then admitted to the pump suction, and the drum drain put to waste. Tests were taken on the return to the drum to determine whether all acid had been flushed from the tube bank. The bank was then again blown clear with compressed air, and a solution of 5 lb. of soda ash to 55 gallons of water circulated through the bank for about 20 minutes. The soda ash was flushed out with fresh water, and finally blown clear with compressed air.

Heat Exchange Equipment.—In America, several companies have specialised in cleaning heat exchange equipment by the chemical process. Some interesting details of the technique employed were given in an article by M. de Witt in a recent issue of *Combustion*.

In treating a unit, the exact chemical and physical characteristics of the scale are first determined, the sample being obtained if possible from a section of tube or plate from the hottest point. If this is unobtainable, a sample of the most dense scale is gathered, the sampler being certain that

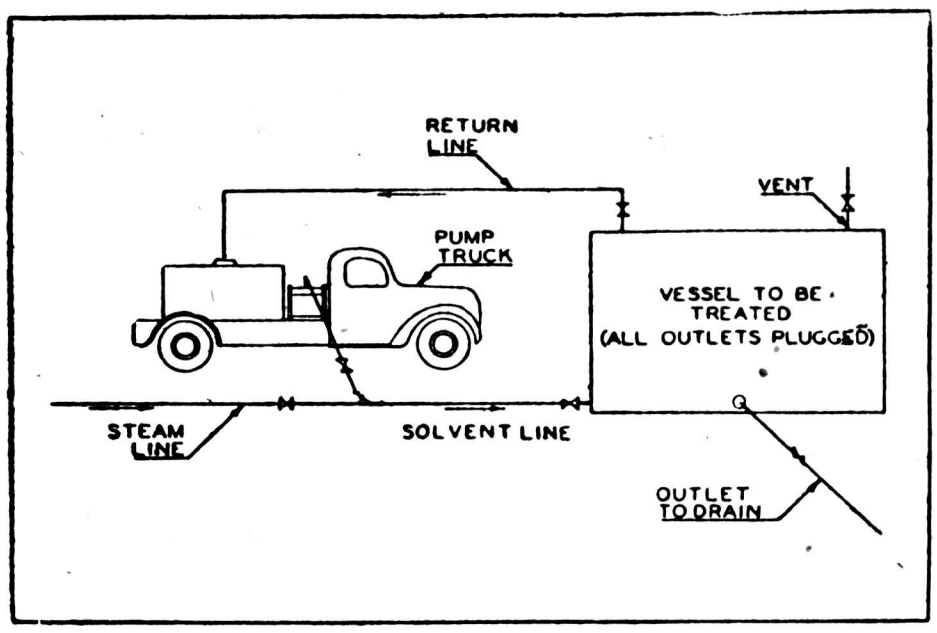


Fig. 1. Typical Cleaning Circuit.

bare metal has been reached. Preliminary field tests are carried out, and if the scale is sufficiently soluble, the type of solvent can be designated. On a less soluble scale, or when corrosive secondary reaction is suspected, the sample is sent to a central laboratory for a complete analysis to be made. A portion of the sample is tested for solubility in various solvents at different temperatures; tests are also carried out for disintegration, density, porosity, thickness, laminations and chemical composition. A second portion of the sample goes to an X-ray laboratory, where X-ray diffraction patterns are employed and compared to standards; thus the sample of scale is shown in its true state of chemical composition. Occasionally a scale is encountered whose pattern does not match any of the standards, in which case the X-ray analysis is supplemented by a spectrographic analysis, which shows the metallic elements present.

Solvent is transported to the job in a specially constructed truck unit complete with tanks, pumps, heaters for solvent, proportioning devices for diluting the solvent to the desired concentration, and fittings for connecting to the consumer's lines. Connections are made between the mobile service unit and the vessel to be cleaned, which, after draining, is filled with solvent at the required temperature. Inhibitors have recently been developed that will allow ample protection, with solvent temperatures as high as 200°F. After the vessel is filled, the technique varies with conditions, the method of treatment being dictated by laboratory analysis of the scale and experience. After the solvent has completed its work, it is drained to waste and the vessel flushed down. Fig. 1 shows a typical

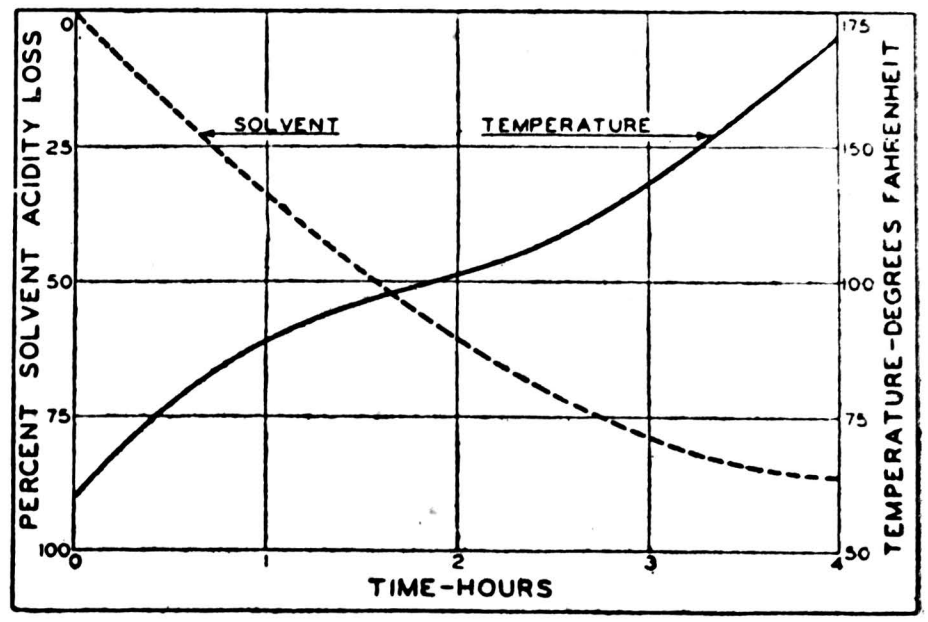


Fig. 2. Solvent Strength and Temperature Curve.

cleaning circuit, and Fig. 2 shows a solvent strength and temperature curve for a typical job.

Condensers, Feed Heaters, etc.—Satisfactory experiments on cleaning condensers, closed-feed heaters, oil coolers, etc., have also been carried out. The scale formed in condensers is seldom thick, but it has a great effect on the steam consumption of the turbine. The usual procedure is to introduce solvent into the steam space, and when the action is complete, transfer the same solvent to the water side. The ratio of steam space to water space volume is usually 2 : 1, so that enough solvent is available to fill the water side twice. There are variations of this technique; for instance, in one case a 2·6% inhibited muriatic acid solution was used. The condenser was filled to about the top row of tubes with water, the acid being then

added by the use of a wooden chute which extended below the water surface, and prevented acid coming in contact with the metal supports. The solvent was circulated for 24 hours, using the hot well pumps. After draining, treated water was circulated for 12 hours. The tubes were finally washed with a fire hose. An average analysis of the scale on the condenser tubes was :—

Organic	10·7%
Silicon oxide	0·08%
Ferric oxide	88·5%
Phosphorus pentoxide ..	0·72%

Removing "Mill Scale."—Chemical cleaning is also applicable to the removal of "mill scale" in new installations, and also scale resulting from welding operations. A treatment for such scale was recently carried out on a 800 lb. per sq. inch forced circulation boiler before it went into operation, treatment being for the removal of iron oxide only. The unit has approximately 68,000 linear feet of $1\frac{1}{4}$ in. generating tubing, and about 8,000 linear feet of economiser tubing. The headers are constructed without handholes, and it would have been impossible to clean by any other process. Analysis of the scale showed it contained the following iron oxides :—$Fe_2\ 0_4$, $Fe_2\ 0_3$, $Fe_3\ 0_4$.

Connections were made to a service trunk and solvent pumped into the boiler, which, required 5,080 gallons to fill. Constant check was kept on the solvent strength, and after six hours the concentration had levelled off to about 29%. The unit was then drained and filled with hot water to wash out any solids. An analysis of the spent solvent solution showed that approximately 500 lb. of iron oxide had been removed. This analysis does not take into account any scale which was loose and was washed out in suspension.

Outage Time.—The time required for the complete scale removal from boilers is from 8-24 hours, depending on conditions. Seldom, even on the largest units, does the time run over 24 hours. Treatment is sometimes started before the boiler cools down below 200°F., thus a boiler can be taken out of commission, be cleaned, and again put in service without completely cooling down, and without opening handholes except for inspection.

TOWN PLANNING ACT, 1944

Altered Position of Statutory Undertakings

THE position of statutory undertakings is considerably affected by the Town and Country Planning Act, 1944, passed last month. It will be recalled that under the Town and Country Planning Act, 1932, S. 41, land held by statutory undertakings could not be purchased without the consent of that undertaking, providing that consent was not unreasonably withheld. Now, however, lands held by statutory undertakings and apparatus over or under land may, under certain circumstances, be compulsorily purchased subject to necessary safeguards and compensation.

Scope of Act.—It should be noted first that the 1944 Act is of more limited scope than the 1932 Act. It applies only to areas of extensive war damage or of land needed for re-location of population and industries (S. 1) or to areas of bad lay-out and obsolete development (S. 9). Such areas are nominated by the Minister of Town and Country Planning (subsequently referred to as "the Minister" in this article).

Classification of Land.—In the application of the Act to statutory undertakings a distinction is drawn between land of a general nature to which the general provisions of the Act apply, and land which is used for the carrying on of the undertaking or land in which an interest is held for that purpose (S.13). It is to the latter only that the following provisions apply. Any question of this classification of land is to be decided by the Minister and the Minister of Fuel and Power (who is the Appropriate Minister in the case of Electricity Undertakings).

Compulsory Purchase of Land.—Where any compulsory purchase Order is made or proposed, the undertaker may make an objection to the Minister of Fuel within the time stated (which may not be less than 28 days) with a request that the specified land should be excluded from the Order (S.13 (3)). The Order may then be modified so as to exclude that land (S. 13 (3)), or a compulsory purchase Order made (S. 13 (5)). The procedure for authorising compulsory purchase of statutory undertakers' land is dealt with in the Third Schedule. The compulsory Order is made by the Minister and the Minister of Fuel, and if the statutory undertaking has not withdrawn the objection, the Order is provisional only, and shall be of no effect until confirmed by Parliament (S. 13 (4)).

Rights of Way.—Where a statutory undertaking has any apparatus on, under or over land to which this Act applies or has a right of way for laying down or maintaining apparatus on such land, the authority or Minister may serve a notice requiring the apparatus to be removed or the right of way to be extinguished within a specified time (S. 25 (1)). If not removed within that

time the Authority or Minister may remove it and dispose of it as they think fit. However, if a counter-notice is served on the authority or Minister within 28 days, objecting to the notice and the notice is not withdrawn, the Minister and Minister of Fuel may appoint a person before whom the two parties may be heard. The two Ministers may then make an Order and if an objection is still not withdrawn, the Order shall be of no effect until confirmed by Parliament (S. 25 (7)). The undertaking shall be entitled to recover compensation.

Extension or Modification of Powers.—Where it is necessary to provide services to land acquired under the Act or to facilitate adjustment resulting from the taking over of land from a statutory undertaking or extinguishment of rights or a decision on an interim development application by the undertaking, the Minister and Minister of Fuel may by Order provide for such extension or modification of the powers and duties of the undertaking as appears to them to be requisite (S.26). Such an Order may provide for purchase of land either compulsorily or by agreement, the erection of any buildings or works or for giving effect to financial arrangements between the planning authority and the undertaking. The representation to the two Ministers may be made by the undertaking or the planning authority where new or extended services are required. The usual provisions are made for dealing with objections, and any Order under this section (S. 26) requires confirmation by Parliament.

Removal of Impossible Obligations.—Where the extinguishment of any right or the acquisition of land has rendered impossible of fulfilment any obligation of an undertaking, the Minister of Fuel may by Order direct the undertaking to be relieved of the fulfilment of these obligations either partly or wholly (S. 27 (1)). Thus the obligation to supply electricity in certain roads under a Special Order may be removed. On a representation being made under this section, the Minister of Fuel will direct the method of notice to be given of the particulars to persons interested. The procedure for dealing with objections is dealt with in the first Schedule of the Act. If any objection is not withdrawn, the Order will not be effective until confirmed by Parliament. A person aggrieved under this section may apply to the High Court (S.16) as to the validity and date of operation of an Order (S.27 (5)).

Interim Development Control.—Sections 34-37 relate to applications by statutory undertakings for interim development of land for the purpose of carrying on the undertaking (S. 34 (2)). The decision on any application or appeal against such application is given by the Minister and the Minister of Fuel. Such a decision shall not be given until the Electricity Commissioners have granted permission for the borrowing or application of money for the scheme where such permission is necessary (S. 35 (1)). Any Order under S.35 requires Parliamentary confirmation, and compensation may be recovered. Also the undertaking may be relieved of impossible obligations (S.27). Section 4 of the Town and Country Planning (Interim Development) Act, 1943 (which relates to the revocation and modification of interim development permissions) applies subject to modifications to bring the procedure in dealing with statutory undertakings in line with that in the 1944 Act. The power to postpone consideration of an interim development application under Section 2 of the 1943 Act is limited to five years from the commencement of the 1944 Act.

Compensation.—Compensation is payable in respect of a compulsory purchase, extinguishment of any right under Section 25, and in respect of any refusal of permission to develop land or the granting of permission subject to conditions or revocation or modification of such permission (S. 36).

The amount of compensation shall include expenditure in acquiring land, providing apparatus, erecting buildings and doing work for the purpose of any adjustment, any decrease in net receipts (actual and estimated) directly attributable to the proceeding ; and the cost of removal of apparatus less the value after removal. The amount of compensation will be reduced by the estimated value of any property belonging to the undertaking which ceases to be used after any such adjustment and the amount of any increase in the net receipts which is directly attributable to the adjustment. In default of agreement on the amount of compensation the amount will be assessed by a tribunal of four persons specially appointed. **R. B.**

EDMUNDSONS' FIVE-YEAR PLAN

In the financial Press of Monday last were given many details of the Five-Year Plan of the Edmundson Group of Electricity Companies—the capital expenditure envisaged is in the neighbourhood of £15 million. Something of what has been proposed has already been made public ; this Brig.-Gen. Wade H. Hayes, managing director of Edmundsons, has amplified in this Press interview. We shall have occasion to return to the matter again, but briefly the managing director mentions directions received from the C.E.B. for extensions of stations in Shropshire and Cornwall ; the interest Edmundsons have in rural electrification, the general policy of the Company and the great amount of work already carried out and yet to be done. The final word is that the Company counts on the co-operation of the farmers in its rural schemes.

WIRING FOR AIRCRAFT

New British Standardised System

THE growing complexity of modern aircraft has demanded an ever increasing use of electrical equipment. In this way there has evolved a need for a special wiring system, to meet the particular requirements within the aircraft. Many systems have been put forward, but none meets all the essential requirements of flexibility, ease of connection, and lightness of weight. A major step forward has now been taken in the development of a standard wiring system for aircraft, which has been approved by the Technical Board of the Society of British Aircraft Constructors.

The Standard System.—This system provides the maximum of flexibility by the use of connector blocks to which connection is made by simplified plug-in leads. An idea of the compactness of the system can be gathered from the dimensions of a 5-way connector block which is only $2\frac{1}{8}$ in. wide,

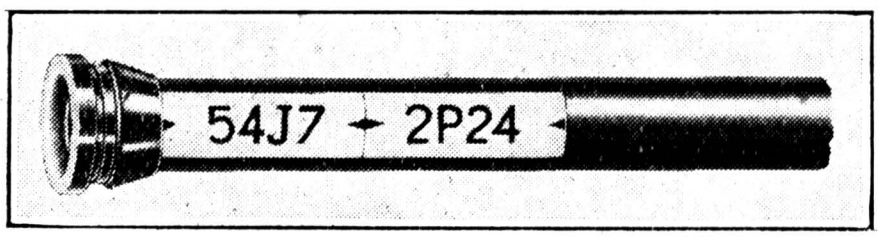


Fig. 1. Bushed P.V.C. Conduit.

$1\frac{1}{4}$ in. high and $1\frac{3}{8}$ in. deep. Wiring cables and conduits are supplied already cut to the correct length, with universal plug-in ferrules, so that assembly can be quickly made. It is anticipated that maintenance will be greatly facilitated by this system. Thus, for example, if a wing has to be detached and replaced by another, all that the electrician has to do is to unplug the leads from the connector block at the wing root and plug-in the wiring of the new wing to the same connector socket. The chief cause of failure in wiring systems is condensation which leads to corrosion. This is particularly prevalent in aircraft in view of the change of atmospheric conditions when climbing to higher altitudes. In this system, the effect of condensation is checked by a special honeycomb wiring pattern which provides moisture drainage and ventilation. This standard system will in future be installed on both civil and military types of aircraft.

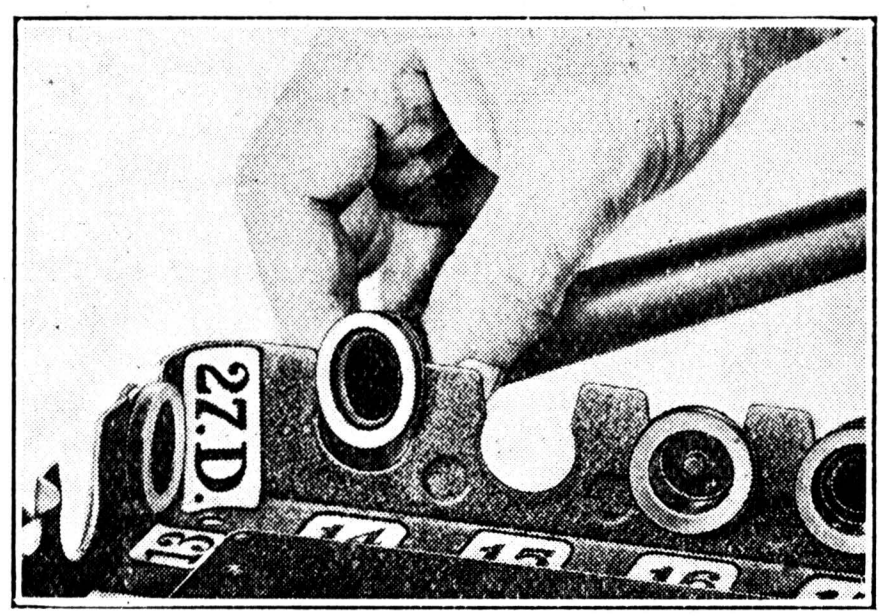


Fig. 2. Fixing Conduit to Joint Box.

Crabtree System.—This new method of wiring is based on the aircraft wiring system developed by J. A. Crabtree & Co., Ltd., and the more detailed notes below, together with illustrations, relate to this system. The cables used are of the standard Air Ministry type, and are cut to the required length and fitted with standard terminations and identification sleeves.

Conduit.—The conduits are extruded polyvinyl chloride and are available in four sizes up to $\frac{5}{8}$ in. After being cut to size they are fitted with grooved end bushes and marked with a code system as shown in Fig. 1. The advantage of p.v.c. for this class of wiring is that it is of light weight and is proof against petrol, acid, glycol, etc., and in the event of fire it does not support combustion. Also it is flexible and can be bent round obstructions.

The main conduit runs are enclosed in

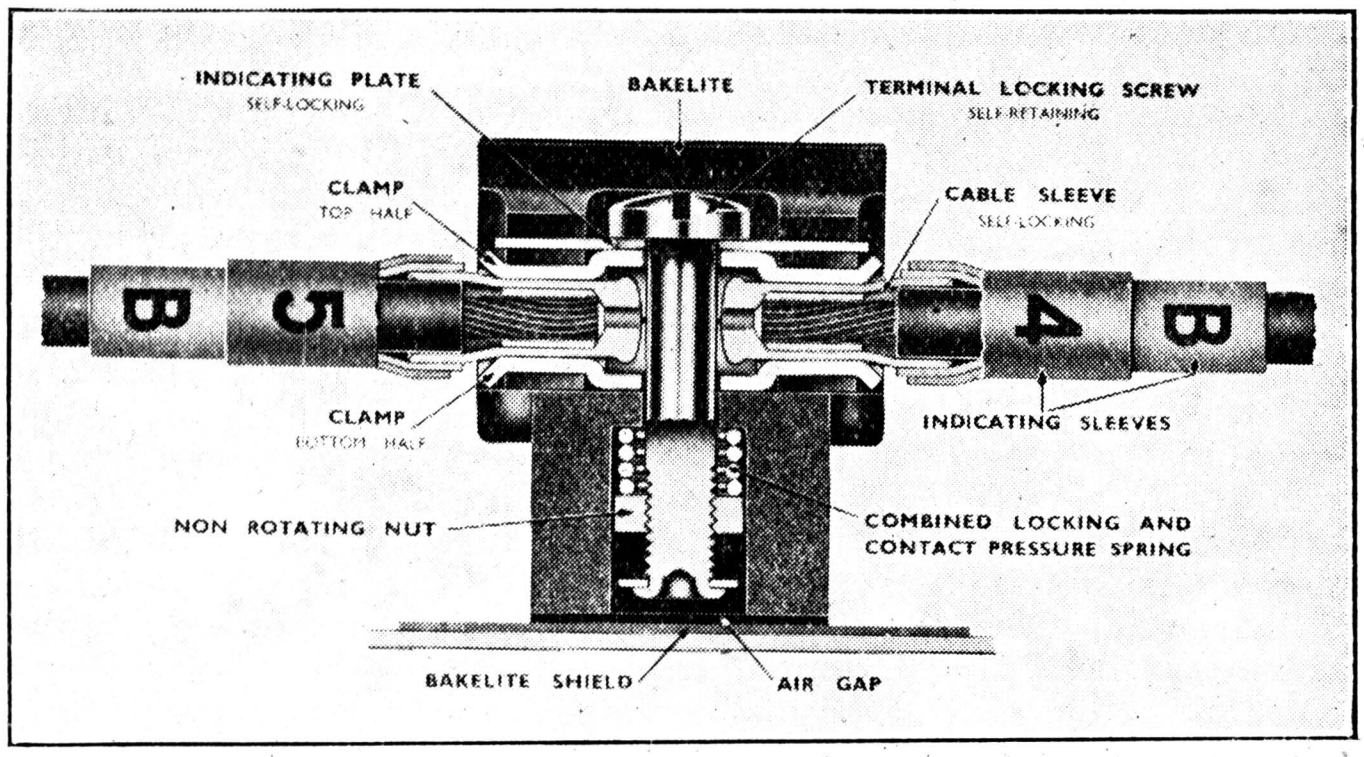


Fig. 3. Cross Section of Straight-through Connector.

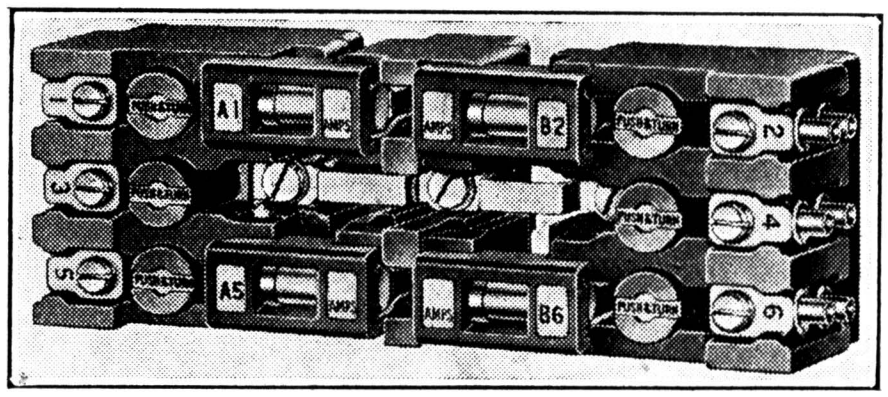


Fig. 4. Fuse Unit.

longitudinal troughs and held in position by means of buckles. These buckles are of special construction, made in two parts, a base and a spring clip which can be sprung into position round the conduit. By this means it is possible to take out any particular conduit from a group with a negligible disturbance of the others.

The joint boxes consist of a shallow steel base reinforced with an inner frame, and protected by a flush fitting cover of smooth cornerless exterior. When in position it is secured by two captive nuts. The holes for the conduit entry are of keyhole shape as may be seen from Fig. 2. To attach the conduit it is merely necessary to compress the bush and push it into the keyhole entry where it is firmly held.

Terminals.—The most interesting feature of the system is the terminal, a straight through type being illustrated in Fig. 3. It will be seen that the cable sleeves are held between two spring-loaded clamps which are rigidly locked in position by the action of a central screw. Under the head of the screw is a lozenge-shaped plate which serves both as a locking washer and as an identity disc, this plate carrying the number of the terminal concerned. Thus to connect the cable it is only necessary to plug it in and tighten up the screw. The maximum rating of these terminals is 37 A, but clamp type terminals are available for ratings up to 64 A. All terminals are mounted in moulded blocks arranged in multiples of five.

Fuse Unit.—A fuse unit for this system is shown in Fig. 4. Each fuse unit has a tandem arrangement to enable a pair of fuses to be supplied from a single positive link ; fusing being only on the positive side, all negative links being solid. Through the centre of each moulding a busbar is connected to a double set of fuse clips, and on each side of this central busbar there is a complete fuseway. Wiring terminals are of the type already described, and the isolation switch is a spring-loaded push-and-turn type button. Standard Air Ministry type cartridge fuses are used mounted in a carrier with a window opening large enough to enable the condition of the fuse element to be observed without removal.

Distribution Boards.—Distribution boards, which may be of single, double, or triple pole type, are fitted with a special incoming unit which permits of straight through connection. It also provides terminals for the busbars, facilities for isolating those busbars from the supply, and a connection point for an earth testing set. Below the incoming unit the fuse units are arranged in numbered sequence.

A junction box consists of a number of terminal blocks mounted in a standard type box. They are more frequently used in the larger aircraft as junction points between different sections of the fuselage. A typical unit is shown in Fig. 5. One of the most striking features of this system is the very thorough identification adopted for the different circuits. This is achieved without colour coding. In general, letters are used to indicate the type of box and numbers are used for the individual circuits.

The new British standard wiring system for aircraft represents a definite advance in wiring technique. The light weight, flexibility, unit

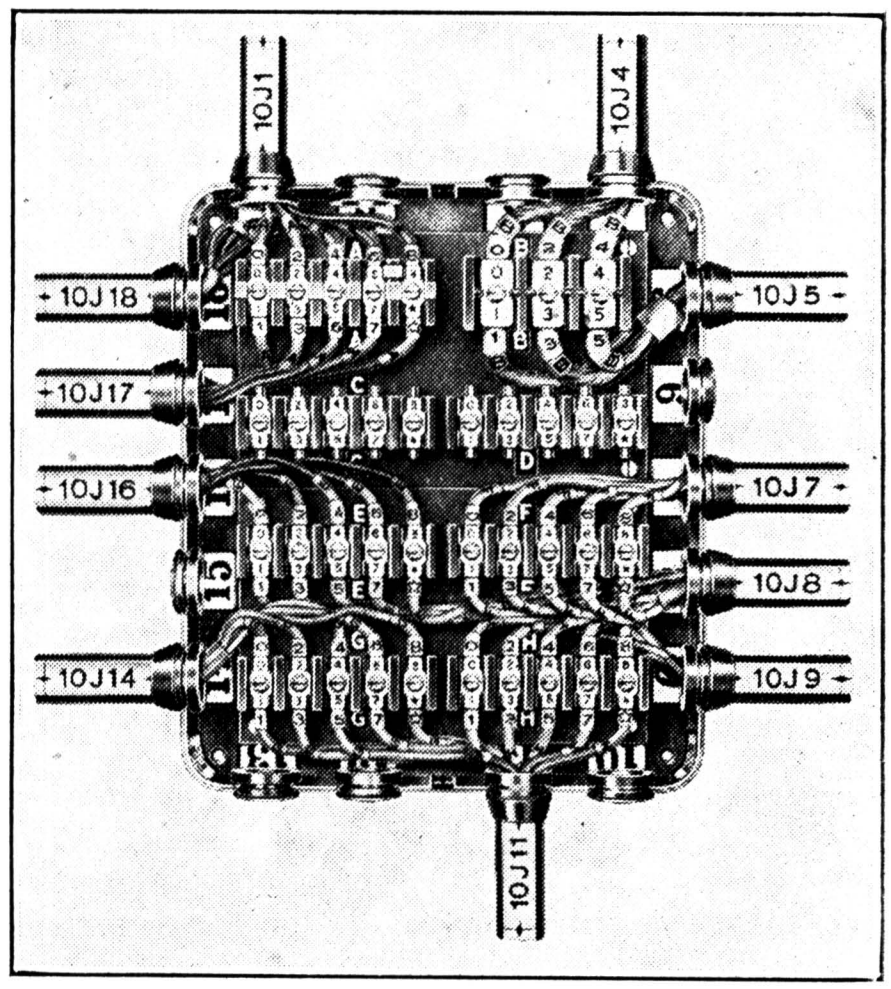


Fig. 5. Joint Box with Wiring.

construction and ease of maintenance provide a combination of advantages that has not hitherto been available. The system has been tested under the most onerous operating conditions, for there are none so great as those under which an aircraft has to operate. It may well prove, therefore, that this new system will find uses other than aircraft, and may appear in the domestic and industrial wiring sphere.

Hydro-Electric Development.—Sir Alexander Gibb regrets that in his recent address to the Institution of Chemical Engineers on "Hydro-Electric Development in Great Britain" an incorrect figure was quoted for the percentage cost of power in the manufacture of electrolytic magnesium. The figure should have been 20%, which, at a power cost of ¾d. a unit, might make difficult the production of this material at competitive prices.

BUSINESS ANNOUNCEMENTS

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

TENDERS INVITED

Dagenham Borough Council

TO ELECTRICAL CONTRACTORS

The Council invite tenders for ELECTRICAL INSTALLATION TO 14 HOUSES in Cresent Road, Dagenham. Form of tender and specification obtainable on application, with stamped addressed foolscap envelope, to Mr. A. E. Stickland, F.S.I., M.Inst.M. & Cy. E., Borough Engineer and Surveyor. A deposit of One Guinea (returnable on receipt of bona-fide tender) should also be forwarded with application. Tenders endorsed "Electrical Installation—Cresent Road," must be delivered to the undersigned by not later than December 16th, 1944.

The Council reserve the right to accept the lowest or any tender.

F. W. ALLEN,
Town Clerk.

Civic Centre,
Dagenham.
28th November, 1944.

APPOINTMENTS VACANT

Peterborough

APPOINTMENT OF DEPUTY CITY ELECTRICAL ENGINEER & MANAGER

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 sub-station equipment. Sales, development and commercial experience is also desirable.

Candidates must be between the ages of 35 and 48 and preference will be given to Corporate members of the I.E.E.

The Salary will be in accordance with Grade 1, Class "G," of the Schedule of Salaries of the National Joint Board for Employers and Members of Staff for the Electricity Supply Industry.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and terminable by one month's notice on either side.

Applications giving age, present appointment and duties, particulars of past service and all other essential information including the candidate's position with regard to liability for National Service, must be accompanied by copies of not more than three recent testimonials and forwarded to the Electrical Engineer, Electricity Works, Peterborough, in sealed envelope endorsed "Application for Deputy Electrical Engineer," not later than Saturday, 30th December, 1944.

Canvassing, either directly or indirectly will disqualify.

ARTHUR J. REEVES,
Town Clerk.

Town Hall,
Peterborough.

West Midlands Joint Electricity Authority

DISTRICT MAINS ENGINEER

Applications are invited for the above post from persons who have had extensive experience in the operation and maintenance of distribution works, including 33 K.V. and 11 K.V. transmission lines, together with low-tension network in urban and rural areas, high-tension and low-tension sub-stations.

A good works training with an electrical engineering firm of repute is essential.

Applicants should preferably possess a University Degree and be Corporate Members of the I.E.E.

Salary £508 p.a. in accordance with Class G, Grade 5 of the N.J.B. Schedule, plus £50 p.a. for additional responsibilities for maintenance of all 33 K.V. transmission.

The appointment will be subject to the Local Government Superannuation Act, 1937, and a satisfactory medical report.

Applicants should write quoting D.1001XA to the MINISTRY OF LABOUR AND NATIONAL SERVICE, Central (T. & S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms which should be returned completed on or before 19th December, 1944.

WORKS MANAGER required for RUBBER CABLE FACTORY. Applicants must have first-class practical experience in the manufacture of all types of Rubber Insulated Cables and possess sound knowledge of factory organisation and labour control. Progressive and permanent position. Essential Works. Applications, which will be treated in strictest confidence, to be sent in writing to SCOTTISH CABLES, LTD., Deanside, Renfrew, stating age, experience and salary expected.

* For Subscription, Official and Prepaid Advertisement Rates, see page 660.

APPOINTMENTS VACANT—*Continued*

Ministry of Fuel and Power

TEMPORARY JUNIOR ELECTRICAL INSPECTOR OF MINES

Applicants must be prepared to serve in any part of Great Britain.

Age : Not exceeding 50 years.

Commencing salary : £400 to £550 p.a. according to age, qualifications and experience.

Qualifications : Candidates must—

(*a*) hold a University degree in Electrical Engineering, the Graduateship of the Institution of Electrical Engineers, the National Certificate in Electrical Engineering or the First Class Certificate of the Association of Mining Electrical and Mechanical Engineers or show that they have been trained as electrical engineers ; and

(*b*) have had at least two years' practical experience in the application of electricity to mining.

Applicants should write quoting D.996 A to the MINISTRY OF LABOUR AND NATIONAL SERVICE, Central (T. & S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms which should be returned completed on or before 19th December, 1944.

City and County of Kingston-upon-Hull

ELECTRICITY DEPARTMENT

TECHNICAL ASSISTANT

Applications are invited for the above position from persons available now or immediately after the war.

Applicants should possess a sound knowledge and experience of electrical power engineering, should have served a works apprenticeship and possess an honours degree in engineering. Experience in consulting work would be an advantage.

Salary in accordance with N.J.B. Schedule, Class J., up to Grade 3 (£713 p.a. at present), according to qualifications.

The appointment is subject to a medical examination. The person appointed must reside within the City Boundary (waived during the War) and after three months' satisfactory probation will be required to contribute to the Local Government and Other Officers' Superannuation Scheme.

Applications should give names of references who may be consulted, and should be submitted to the GENERAL MANAGER, Electricity Offices, Ferensway, Hull, by January 1st, 1945.

4 Nov., 1944.

County Borough of Great Yarmouth

ELECTRICITY DEPARTMENT

POWER STATION SUPERINTENDENT

The Corporation invite applications for the position of Power Station Superintendent at their South Denes Generating Station at Great Yarmouth.

Candidates should be Corporate Members of the Institution of Electrical Engineers, and not over 45 years of age. They must have had a sound practical training and wide experience in the operation and maintenance of a " selected " generation station.

Salary will be in accordance with the National Joint Board Schedule, Class F, Grade 3.

The appointment is subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to undergo a medical examination. Canvassing members of the Corporation in any form, either directly or indirectly, will be a disqualification.

Forms of Application may be obtained from the undersigned and should be returned, in the official envelope provided, not later than the first post on Wednesday, December 20th, 1944.

FARRA CONWAY,
Town Clerk.

Town Hall,
Great Yarmouth.
27th November, 1944.

CROMPTON PARKINSON, LIMITED, have completed their plans for the maximum production and distribution of an extended range of electrical products both at home and overseas in the post-War period. They wish to have available for consideration a comprehensive list of potential SALES MANAGERS and SALES ENGINEERS. The list will include employees at present serving with H.M. Forces, men still in the organisation, and suitably qualified men not previously employed by the Company. These last may at present be employed elsewhere or in the Forces, but applications would be welcomed setting out fully details of qualifications, experience and outlook. Some of the products to be dealt with are electric motors of all types, switchgear, transformers, cable, lamps, electric vehicles, electric trucks and accumulators. All correspondence, which will be treated in the strictest confidence, should be addressed to the Chief Personnel Officer, Crompton Parkinson, Limited, Electra House, Victoria Embankment, London, W.C.2.

STOREKEEPER required to take charge of Sheffield Depot. Permanency and good prospects for right man. State age and experience to WALSALL CONDUITS, LTD., 22 Castle Gate, Nottingham.

GOVERNMENT DEPARTMENT requires TEMPORARY ASSISTANT ELECTRICAL ENGINEERS for service in Ceylon or Southern India. Candidates should possess B.Sc. degree or equivalent, and have had experience in planning, erection and maintenance of Shore Electrical Installation including machinery equipment and should indicate whether they would be prepared to serve elsewhere abroad than at the places stated.

Salary—up to £550 p.a. according to age, qualifications and experience, plus War Bonus £49 11s. 0d. p.a. In addition Colonial Allowance will be payable to compensate for additional cost of serving at a station abroad.

Applicants should write, quoting D.982 A, to the MINISTRY OF LABOUR AND NATIONAL SERVICE, Central (T. & S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 19th December, 1944.

Applications are invited for the undermentioned posts with a light electrical and radio firm in West London.

(*a*) One CHIEF MECHANICAL AND DEVELOPMENT DESIGN ENGINEER able to collaborate closely in the development of the mechanical side of electrical apparatus. A specialised knowledge of press work, particularly on light alloys, an advantage. Salary £600 to £800 p.a.

(*b*) One RADIO DEVELOPMENT ENGINEER with comprehensive design experience and well qualified in U.H.F., C.R.T., circuit and presentation work. Excellent post-war prospects. Salary £500 to £850 p.a.

Written applications (no callers) quoting Order No. Q.S. 567 for (*a*) or Q.S. 565 for (*b*), giving date of birth, name and address of present employer, and setting out experience and qualifications to the MINISTRY OF LABOUR AND NATIONAL SERVICE, Appointments Department, Sardinia Street, Kingsway, London, W.C.2.

ELECTRICAL ENGINEER required as WORKS MANAGER, approx. 200 hands, must have had a thorough and practical training and have knowledge of Mains Transformers and Chokes up to 25 KVA, instrument and small electro-mechanical manufactures. Must be capable organiser and disciplinarian. State experience, connection, age and salary required in confidence. Permanent and progressive position to right man. Employment subject to Ministry of Labour restrictions.—Box No. 8405, THE ELECTRICAL TIMES.

TUTORS required in Electrical Aeronautical and general subjects. Full time light work in London Area. Suitable for disabled men with technical qualifications.—Box No. 8423, THE ELECTRICAL TIMES.

RESISTANCE WELDING MACHINE MANUFACTURERS with established connection require SALES MANAGER. Knowledge of Resistance Welding Machines an asset, but with mechanical and electrical background, specialised training in Resistance Welding would be given. Applicant should be good correspondent with experience in publicity and advertising. Progressive position for keen, energetic man. State full particulars of experience and salary required to The Managing Director, MESSRS. A. I. ELECTRIC WELDING MACHINES, LTD., 64, Victoria Street, London, S.W.1.

LOCAL AUTHORITY requires OVERHEAD LINESMAN with experience of work on overhead low tension line construction and maintenance on both A.C.4 wire and D.C.3 wire systems, including servicing of consumers' premises, etc. Experience of Tramway or Trolley Bus overhead line work and/or motor vehicle driving an advantage. D.J.I.C. wage rate at present 1s. 11d. per hour.—Applications in writing to MINISTRY OF LABOUR, Employment Exchange, Pontypridd, Glam.

ENGINEER required by firm in North-West to contact users of electrical accessories throughout the country. Must have comprehensive experience and be able to discuss design. Car an advantage.—Full details to Box No. 8421, THE ELECTRICAL TIMES.

Large electrical engineering company established in the manufacture of electric cookers, washing machines and domestic appliances, require additional SALES REPRESENTATIVES.—Reply in confidence giving full particulars, age, experience, connections and salary required, to Box No. 8419, THE ELECTRICAL TIMES.

SALES REPRESENTATIVE required in Cardiff area for E.L.M.A. Lamp and Industrial Lighting. Reply, giving full details of previous selling experience, salary required, etc. Must be able to drive car.—Box No. 8429, THE ELECTRICAL TIMES.

LADY DEMONSTRATOR required. Applicants must be experienced in the demonstration of electric cookers and other electric domestic appliances, and must possess the

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

APPOINTMENTS VACANT — *Continued*

E.A.W. Diploma or other similar qualification. Apply in own handwriting, stating age, experience and salary required, to—THE RESIDENT ENGINEER AND MANAGER, The Wigtownshire Electricity Co., Ltd., 76 George Street, Stranraer, Wigtownshire.

APPOINTMENT WANTED

BOILER HOUSE ASSISTANT ENGINEER in a large station, over 100 M.W., desires a change, country district preferred. Chain grates and retort stokers. Large units.—Box No. 8425, THE ELECTRICAL TIMES.

BUSINESS OPPORTUNITIES

If you have an idea, or a patent, or an invention connected with an ELECTRIC DOMESTIC UTILITY and cannot manufacture or distribute, it might be of mutual advantage to correspond with :—

CENGAR DISTRIBUTING CO.,
Halifax, Yorkshire,

who have facilities not only to manufacture but also have an unequalled selling organisation specialising in the Electricity Supply Industry. Strictest confidence will be observed and a meeting of parties arranged at which any necessary references can be exchanged.

MANUFACTURER who is, in the near future intending to visit SWEDEN in connection with the export of materials which are used in the Radio and Electrical business, is willing to undertake one or two commissions for manufacturers who would like to take advantage of his visiting that country. Replies will be treated in strictest confidence and should be sent to Box No. 8431, THE ELECTRICAL TIMES.

AGENCIES

AUSTRALIAN FIRM of high repute and wide connections desires to get into touch with a British manufacturer of resistance wires for all purposes, who is not at present represented in Australia.—Box No. 8427, THE ELECTRICAL TIMES.

IRISH FIRM—Post-war trade—Free to accept AGENCIES from reliable Manufac turers of wiring accessories, refrigerators, vacuum cleaners, heating and cooking apparatus, electric clocks and other appliances.—Replies to Box No. 8409, THE ELECTRICAL TIMES.

WORK WANTED

ARMATURE, ROTOR & STATOR WINDING. We specialise in the repair and rewind all types of electrical machines from fractional H.P. upwards. Special departments for vacuum cleaners, driers, portable tools, etc. All work fully guaranteed.—WALTER CRANE, Greencoat Electrical Works, Westgate, Wakefield. Telephone 2172.

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 rewound. Quick service. ANDERSON's, Circus Yard, St. Ebbe'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.

ARMATURE, ROTOR and STATOR REWINDS and REPAIRS; fractional to 60 h.p. Prompt deliveries.—T. A. BOXALL & Co., Horley, Surrey. 'Phone : 654.

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

MEASURING INSTRUMENT REPAIRS. All makes of meters and instruments skilfully repaired by experts. Prompt service for essential purposes.—RUNBAKEN ELECTRICAL REPAIRS, Meter Dept. (S 52), Manchester, 1.

VACUUM CLEANERS : Armatures, Field Coils Rewound, Dryers, Portable Tools, Radio Transformers, etc. Quick deliveries. Work guaranteed.—E.I.B. Co., 112 Alum Rock Road, Birmingham, 8.

SPECIALISTS in Light Sheet Metal Work to any limits required. Large output of Water-tight and other boxes and their components. Hand and Power Presses, Arc, Gas and Spot Welding, Sub-Assemblies, Surface Grinding on B. & S. No. 2. Expert Tool-makers. Fully A.I.D. approved. Prompt attention given to all enquiries.—TETRA ENGINEERING CO., LTD., 1/3 Redhill Street, London, N.W.1. Telephone : EUSton 3707-8.

WANTED

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

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

Wanted, large quantity of 4 in. outside dia. TUBES from the dismantling of old Babcock Water-Tube Boilers. Best prices paid. Prepared to purchase Babcock & Wilcox Water-Tube Boilers for dismantling. —Apply, giving full details, to: MIDLAND IRON & HARDWARE Co., Cradley Heath.

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.

FOR SALE

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

ELECTRIC BULBS of all descriptions for all purposes, from 1·25 V to 20 V. Torch Cases, Batteries, Electric Lamps. Prompt delivery.—SUPLEX LAMPS, LTD., 50 Grays Inn Road, W.C.1. Tel.: HOL. 0225.

A.C. MOTORS, 1/50th h.p. to 3 h.p. from stock. Also many D.C.—JOHNSON ENGINEERING, 5, Spencer Street, Leamington Spa, and 86, Great Portland Street, London, W.1. Museum 6373.

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

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.

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.

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

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

TIMBER SECTIONAL BUILDINGS

In excellent condition, thoroughly reconditioned in our works. Over 30 buildings available.

9ft. × 8ft. 24ft. × 12ft. 54ft. × 20ft.
16ft. × 10ft. 30ft. × 15ft. 55ft. × 15ft.

No purchase licence required. Suitable for Hostels, Offices, Canteens, Workshops or Storage purposes. Also 5 pre-fabricated Timber Bungalows from £395 to £1,375. Write for list.—D. MCMASTER & Co., Mount Bures Works, Bures, Suffolk. 'Phone: Bures 251.

TRANSFORMER LEAD-IN WIRES. 7/38 and 14/38 s.w.g. Insu-Glass finished—various colours — stock. — SAXONIA, Greenwich, S.E.10.

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.

ENAMELLED OR PLAIN COPPER 18 s.w.g.-40 s.w.g. Insu-Glass insulated from stock.—SAXONIA, Roan Works, Greenwich, S.E.10.

BROOKS & BOHM, LTD.
90 VICTORIA STREET, LONDON, S.W.1.
(Vic 1441)

BATTERIES (B CLASS ONLY) all types.
TORCH CASES, Cycle Rear Lamps, Lease-Lend and Empire Bulbs, Household Lamps, Plugs and Socket, Switches, Soldering Irons, Flat Iron Elements, Fire Spirals, and other electrical accessories.

Write for list.

A LARGEST Stock Surplus Mirrors, Carbon Rods, Enamelled Cotton and Silk Instrument and Resistance Wires, Ebonite, Fibre, T.R.S. Cables, etc., Searchlights (sale or hire), etc.—LONDON ELECTRIC FIRM, Croydon.

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.

BUSINESS NOTICES

Change of Address.—We are informed by **Read & Ptnrs., Ltd.,** electrical engineers and contractors, that their office and stores were, on December 4, moved to more convenient premises at 28/30 Hatfields, Stamford Street, S.E.1. Stores address, 79 Broadwall, Stamford Street, S.E.1. Telephone and telegraphic addresses are unaltered.

Permitted Prices.—The Central Price Regulation Committee has approved the following prices for the 4-Valve T.R.F. Dulci radio receiver (**The Dulci Co., Ltd.**): Retail selling price, £12 12s.; wholesale selling price, £9 9s.; manufacturer's selling price, £7 15s. 11d.; prices exclusive of Purchase Tax.

COMMERCIAL INTELLIGENCE

LONDON GAZETTE

Bankruptcy Acts
Intended Dividends

Swansea.—Linnard, Charles Henry, 76 Manselton Road, Swansea, plumber and electrical engineer. Last day for proofs, December 9, 1944. Trustee, official receiver, 10 St. Mary's Square, Swansea.

London.—Weston, George Arthur, 5-6 Roman Wall House, Crutched Friars, E.C.3, electrical contractor and engineer. Amount per £, 4d. Supplemental, payable December 8, 1944, Bankruptcy Buildings, Carey Street, W.C.2.

Companies Act

The following company has, it is officially announced, been struck off the register: Great Eastern Electric Co., Ltd. (Registered March 30, 1939). It is stated that another company, with the same title, is at present carrying on business.

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.

Dec. 8.—**Manchester T.C.**—Two 5½ ton and one 100 ton electrical travelling cranes, with trolley wire and switchgear. Mr. R. A. S. Thwaites, chief engineer and manager, Electricity Department, Town Hall, Manchester. Deposit £1 1s. Advertised in issue for Nov. 23.

Dec. 16.—**Dagenham T.C.**—Electrical installation—14 houses. Mr. A. E. Stickland, borough engineer and surveyor. Deposit £1 1s. Advertised in this issue.

Dec. 18.—**Eye T.C.**—Centrifugal borehole pump, with vertical spindle electric motor and automatic control—8,000 g.p.h. Lt.-Col. W. H. Bateman, Batheaston, Bath. Deposit £1 1s.

Dec. 29.—**Bristol Mental Hospital.**—Rewiring cinema hall, etc. Messrs. Hoare, Lea & Ptnrs. 39 Broad Street, Bristol, 1. Deposit £3 3s. (applications by December 4).

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.

HESTON and ISLEWORTH.—Batteries for cars, for T.C., **D. P. Battery Co., Ltd.**

MONTGOMERYSHIRE.—Electric lighting at Bryn Street Centre, for County Education Committee, **Hall & Stinson, Ltd.,** Sheffield. £128.

AIR MINISTRY.—Week ended November 18: Electrical work, **Colston Electrical Co., Ltd.** Bristol.

COMPANY REGISTRATIONS

(Extracted from the Register issued by Jordan and Sons, 116-117 Chancery Lane, W.C.)

Star Domestic Appliances, Ltd., Star Works, Edge Lane Street, Royton, Lancs.—Manufacturers of and dealers in lighting and wireless apparatus, refrigerators, vacuum cleaners, etc. Capital £2,000. Directors: H. Fisher and Florence M. Fisher, both of 30 Tandle Hill Road, Royton.

H. Hoadley & Sons, Ltd.—To take over business of builders and electrical engineers carried on as "H. Hoadley & Sons," at 40 Oldhill Street, N.16. Capital £1,000. Directors: S. Trup, 27 Embassy House, West End Lane, N.W.; S. Trup, 26 Berkeley Road, N.8.

D. H. Geeves, Ltd., 265 *Merton Road, Leicester.* Mechanical, motor and electrical engineers, etc. Capital £1,000. Directors: J. Weyler, Sandford, The Rise, Rothley, Leics.; E. Lewin, Riversdale, Sileby Road, Barrow-on-Soar, Leics.; L. T. Norton, 7 High Street, Sileby, Leics.

Rap Distribution, Ltd., 145 *Ewell Road, Surbiton, Surrey.* To acquire the issued share capital of Service R.A.P., Ltd., N.R.H.S. Eastern Counties, Ltd., N.R.H.S. Midland Counties, Ltd., N.R.H.S. Western Counties, Ltd., and Scottish N.R.H.S., Ltd., and to carry on business of dealers in radio and television instruments, gramophones, etc. Capital £75,000. Directors: W. H. Berriedale-Johnson, Thornhill, St. Mary's Road, Long Ditton; Evelyn T. B. Berriedale-Johnson, same address; A. Edwards, M.P., 2 Caxton Street, S.W.1; G. F. R. Baguley, 4b Fredericks Place, E.C.2; E. Reid, 16 Bridge Street, Hawick; T. F. W. Lincoln, 7 Hall Quay, Gt. Yarmouth.

NOTES AND QUERIES

We are constantly receiving inquiries from readers on all sorts of matters. Technical questions are dealt with in Electricc l 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.

(13681) **"Ryeland" earthing clip,** makers of? W.E.W.—Multi-Way Earthing Clip, Ltd., Moat Farm, Kingscoughton, Alcester, Warwickshire.

(13682) **"Burgess" micro switch,** makers of? B.A.—Burgess Products Co., Ltd., Hinckley, Leics.

(13683) **"Castle" steriliser,** makers of? C.—Amalgamated Dental Co., Ltd., 7 Swallow Street, W.1.

(13684) **"Borough" fire,** makers of? W.W.—Homefyre, Ltd., 66 Brewery Road, N.7.

(13685) **Sifam Electrical Instrument Co., Ltd.,** address of? J.H.—Leigh Court, Higher Lincombe Road, Torquay.

(13686) **A. F. Bulgin & Co., Ltd.,** address of?—J.H.—Alfred's Way, Barking.

(13687) **"Ingraham" electric clock,** agents in this country? N.G.—Britannia Electric Lamp Works, Ltd., 14 Sunbeam Road, N.W.12.

(13688) **Ferguson Radio Co., Ltd.,** address of? N.G.—Gt. Cambridge Road, Enfield.

(13689) **Radio-Aid, Ltd.,** address of? W.S.W.—24 Whitcomb Street, W.C.2.

(13690) **"Galex" chucks,** makers of? J.S.F.—G. H. Alexander (Machinery), Ltd., 82 Coleshill Street, Birmingham, 4.

Answers Wanted

(13691) **"Wates Universal Meter"** made by Electrical Measuring Instruments Co., Ltd., late of 55 Cardington Street, N.W.1., present address? J.M.K.

(13692) **Beatty Bros., Ltd.,** late of Park Royal Road, N.W.10, present address? F.J.M.

(13693) **Fitting for tube lamp** with Registered No. R.D.774335. Name and address of maker? K.W.C.

PATENT SPECIFICATIONS ACCEPTED

The following are among the complete specifications which have been accepted by the Patent Office. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken. The information is extracted from the Patents journal by permission of the Controller.

Allmanna Svenska Elektriska Aktiebolaget. "Polyphase transformers for current converters." 6935/43. May 6, 1942 (565,247).

Andrews, J. B., and E. Katz. "Thermally operated electric cut-outs." 19408. Nov. 19, 1943 (565,322).

Bendix Aviation Corporation. "Means for reproducing motion electrically at a distance." 1495/43. Sept. 10, 1941 (565,277).

British Insulated Cables, Ltd., J. C. Quayle, and H. B. Chapman. "Electric cable." 7590. May 12, 1943 (565,228).

British Thomson-Houston Co., Ltd. "Electric protective switches." 15454/43. Sept. 26, 1942 (565,295). "Starting switches for electric discharge devices." 5284/43. April 4, 1942 (565,302). "Automatic protection of electric impedance networks." 19545/43. Nov. 23, 1942 (565,324).

British Thomson-Houston Co., Ltd. (General Electric Co.). "Electric impulse counting circuits." 4772. March 24, 1943 (565,283). "Insulated electrical conductors." 19751. November 26, 1943. (565,325).

Brookes, N. E. (General Control Co.). "Electric switches suitable for telephone systems." 16645. Oct. 11, 1943 (565,297).

Dubilier Condenser Co. (1925), Ltd., and P. R. Coursey. "Electrical condenser." 6794. April 29, 1943 (565,243).

Gall, D. C. "Movements of electrical instruments such as galvanometers." 10744. July 2, 1943 (565,312).

Goulstone, O. H. "Snap-action mechanism applicable for making and breaking electric contacts." 8862. June 2, 1943 (565,252).

Kolb, O. K. "Alternating electric current rectifiers for the selenium type." 19524. Nov. 22, 1943 (565,323).

Marconi's Wireless Telegraph Co., Ltd. "Apparatus for producing electrical energy of stabilized frequency." 11454/43. July 14, 1942 (565,266). "Envelopes for electric discharge devices and to contacts for sealing to such envelopes." 9134/3. Jan. 16, 1942 (565,274).

Martin, H., and Murex Welding Processes, Ltd. "Electric arc welding." 3629. March 5, 1943 (565,219).

Masteradio, Ltd., R. Pollock, and S. L. Robinson. "Electrical vibrators." 10879. July 5, 1943 (565,202).

Okonite-Callender Cable Co., Inc. "Electrical insulated wire." 18865/43. Dec. 30, 1942 (565,319).

Revo Electric Co., Ltd., and F. H. Reeves. "Tubular fluorescent electric lamp fittings." 8278. May 25, 1943 (565,310).

Sangamo Weston, Ltd., and H. J. Lovegrove. "Electric measuring instruments." 10818. July 3, 1943 (565,201).

Sangamo Weston, Ltd., and M. S. Snell. "Instrument type relays." 11204. July 10, 1943 (565,203).

Shepherd, G. R. (Westinghouse Electric International Co.). "Turbine blading." 11618. July 16, 1943 (565,292).

MEETINGS TO NOTE

Dec. 7.—Electrical Association for Women.—Film of T.V.A. and social afternoon.—20 Regent Street, S.W.1.—2.30 p.m.

Dec. 7.—I.E.E. (London).—"Standardisation and Design of A.C. Turbo-Type Generators." G. A. Juhlin. I.E.E. Building, Savoy Place, W.C.2.—5.30 p.m.

Dec. 8.—Institute of Fuel (South Wales).—"Application of Flocculation and Flotation Principles to the Recovery of Low Grade Fuel," J. O. Samuel. Engineers' Institute, Cardiff.—4.30 p.m.

Dec. 8.—Illuminating Engineering Society (Birmingham).—"Design and Lighting of a Post-War Civic Centre," L. G. Applebee. Crescent Theatre.—6 p.m.

Dec. 8.—I.E.E. (N.E. Students).—Brains Trust. Neville Hall, Newcastle-upon-Tyne.—6.30 p.m.

Dec. 8.—I.E.E. (N.W. Centre) (Radio Group).—"Theory and Performance of Corner Reflectors for Aerials," E. B. Moullin. Engineers' Club, Manchester.—6 p.m.

Dec. 9.—I.E.E. (London Students' Section).—Annual Dance. Lysbeth Hall, Soho Square.—6.10 p.m.

Dec. 9.—Junior Institution of Engineers (Inc.).—Presidential Address and Awards, Sir Maurice Denny. 39 Victoria Street, S.W.1.—2.30 p.m.

Dec. 9.—I.E.E., London (Bristol Students).—"Power System Operation and Maintenance," K. H. Hope and W. A. Storey. Merchant Venturers' Technical College, Bristol.—3 p.m.

Dec. 9.—A.S.E.E.—"P.V.C. in Practice." P. H. Barton. E.L.M.A., Lighting Service Bureau, 2 Savoy Hill, W.C.2.—2.15 p.m.

Dec. 9.—I.E.E. (Bristol Students).—"Power System Operation and Maintenance," K. H. Hope and W. A. Storey. Merchant Venturers' Technical College, Bristol.—3 p.m.

Dec. 11.—I.E.E. (North Eastern Section).—"Restocking Voltage as a Factor in the Performance Rating and Selection of Circuit Breakers," J. A. Harle and R. W. Wild. Neville Hall, Westgate Road, Newcastle-on-Tyne.—6.15 p.m.

Dec. 12.—I.E.E. (North-Western Students).—"Theory and Design of Air-Blast Circuit Breakers," W. M. Butler. Engineers' Club, Albert Square, Manchester.—6.30 p.m.

Dec. 13.—I.E.E. (Scottish).—"Design and Performance of Domestic Electric Appliances," W. N. C. Clinch, F. Lynn. Heriot-Watt College, Edinburgh.—6 p.m.

Dec. 13.—British Institution of Radio Engineers (North Eastern Section).—"Wave Guides," T. H. Turney. Neville Hall, Newcastle-on-Tyne.—6.0 p.m.

Dec. 13.—Institute of Fuel (Midland).—Chairman's address, L. F. Jeffrey. James Watt Memorial Institute, Birmingham.—2.30 p.m.

STOP PRESS

The successor to **Mr. H. A. Nevill, M.I.E.E.**, city electrical engineer and manager of Peterborough, who is retiring, is **Mr. G. N. Green, M.I.E.E.**, who went to Peterborough last June as deputy chief engineer. He will take over on March 1 next.

ELECTRICAL TIMES

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

SUBSCRIPTION RATES
(payable in advance)

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

CLASSIFIED ADVERTISEMENTS

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

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

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

COMMUNICATIONS AND REMITTANCES

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

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

CONTENTS

BUSINESS ANNOUNCEMENTS

THE E.D.A. SILVER JUBILEE

IT is, of course, in present circumstances, not easy to celebrate in fitting manner anniversaries which in normal times would be of outstanding interest. Yet such anniversaries should not go altogether unmarked, and the British facility for compromise has been brought into play in many instances. Thus it is with the Silver Jubilee of the British Electrical Development Association, to which attention was called in our last issue.

Mr. J. W. Beauchamp,
First Director.

A dinner was held last Thursday evening to mark this special occasion, but the size of the gathering had to be kept within very circumscribed limits—keeping out very many good friends of the Association who would otherwise have been present.

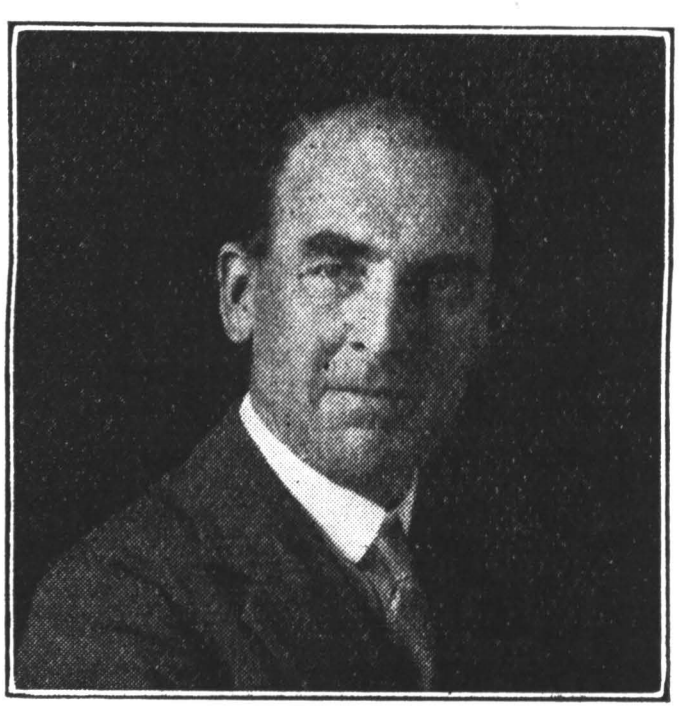
Historical.—It is appropriate here to consider the history of E.D.A. Actually it first advertised its existence at the beginning of July, 1919; but the period of gestation prior to its birth was a long one; actually we should be inclined to trace its early origin to the *West Ham Bulletin* so ably run by Mr. J. W. Beauchamp when chief engineer of that borough—later we recollect that medium of publicity was seized on to publicise other local things, and so part of its value for electrical publicity was lost. However, there was the germ of the idea.

It was appropriate therefore that Mr. Beauchamp's name should appear in E.D.A.'s first advertisement in the rôle of "Director and Secretary." On the Committee we note were representatives of the I.E.E., the I.M.E.A., the Conference of Chief Officials of London Electric Supply Companies, the Incorporated Association of Electric Power Companies, the B.E.A.M.A., the C.M.A. and the E.L.M.A.

Mr. A. C. Cramb,
Former Director.

The Association said the advertisement had been "formed on a co-operative basis to carry out publicity and propaganda work on behalf of the Electrical Industry"—correspondence from all "interested in the supply or use of electricity and electrical apparatus and the application of electrical methods to industrial, business and domestic purposes" was invited.

The Association may take pride in the fact that it has in good times and bad done its best, and quite a good best, to carry out its initial aspirations. Since 1935 membership has, however, been confined to the Central Electricity Board and to authorised electricity undertakings owned by local authorities, companies and joint electricity authorities. When E.D.A. began, there were fewer than 700,000 consumers in Britain — the figure now is nearer eleven million; similarly capital expenditure has grown from about £100 million to £700 million and annual revenue from £14 million to £125 million. In those early days only about 14% of the country's area was served by mains as against some 90% now; coal consumed per unit averaged



Lt.-Col. W. A. Vignoles,
Former Director.

Mr. V. W. Dale,
General Manager and Secretary.

5½ lb. against about 1 lb. now, and apparatus, lamps, and all sorts of things are now more efficient than in 1919; and, when normal times return, the electrical story should be easier to tell, especially as great numbers of our citizens (and citizenesses) have a much closer acquaintance with the possibilities of electricity in various applications than before.

A great part of E.D.A.'s work has centred on the domestic electricity side—"point-fives," "electric kitchens," "all-electric houses" are phrases associated with E.D.A. Exhibitions (an outstanding display at the British Empire Exhibition in 1924), competitions, publicity schemes of many kinds—the Association has been untiring; it has boosted "Electricity in the Factory," it has been closely in touch and helpful to the Government Ministries in this time of war—it has great schemes in view for the future.

The Dinner.—At the Celebration dinner the chair was taken by the President, **Lord Brabazon of Tara,** who first gave the toast of the Prime Minister, whose birthday it was.

The President then proposed "Electricity," coupled with the name of Sir Lawrence Bragg. Lord Brabazon said the object of the Association was to encourage the use of electricity in all its branches; he did not pretend that it was a philanthropic body; it was created to help to get new business and to get electricity known for all the jobs it could do. It had been in existence 25 years; and this, its birthday party, it was desired to make not a very ceremonial one, but rather a jolly one. They had asked H.M. Ministers—not to ask them for anything, or to do anything; but to make them aware of the existence of the Association, believing it had a big part to play in the popularising of electricity which would alleviate in a great way the task of the ordinary man and woman in their homes. It was not just in the construction of the house; it was in the relief of the drudgery inside and in the increased human leisure from which happiness should emerge. Lord Brabazon then gave an idea of the diversity of the work already accomplished, and pointed out how electricity came into everybody's life.

The Association wanted tremendously enthusiastic allies; if anybody mentioned the word, or if there was the slightest smell of gas, their potential went up and their amperage was irresistible. There were many things the gas people did that the Electrical Industry thought it could do better, but we owed them, the Gas Industry, a great debt of gratitude because it kept them on their toes and, he hoped, we kept them on theirs. There was still a lot to be done. We had standardised frequency, the question of voltage stuck out a thorny problem. Great benefits were to be derived from it, but it was a very expensive amusement; there were penalties to be paid by the pioneer, and we in this country had been pioneers in the development of electricity. It was because of the initiative and the imagination shown by our fathers in electrical installations that we had now such a variety of problems to face. In electricity to-day we were using what was experimental work of the laboratory twenty years ago. When Crookes invented his famous tube, it led to the remarkable hunting that went on in the great Cavendish laboratory, chiefly by J. J. Thomson, to the discovery of the corpuscular theory of electricity, and culminated in his very great experiment in determining the mass of the electron. It was looked upon as a purely philosophical conception, and of no interest at all except to science; but there was not a wireless set in the country that was not using the corpuscular theory of electricity and of the electron, something which was a purely philosophical conception. The President then passed to the present exploration of the microscopic world; he did not know if any of them had ever met the quantum, a very remarkable and advanced conception, but it was interesting to say that, for instance, on the theory of light there were two theories—the wave theory and the photon theory based on the quantum. Both worked. To-day Newton's laws of gravitation had been displaced by Einstein and the corpuscular theory of light was coming into fashion; all very remarkable, showing, in fact, how the world of physics had been bust up from top to bottom. What was going on in the laboratory to-day would be expressed in the home in a few years, and in the generation of electricity it was not for ever that we were going to burn coal. Already we had harnessed water and he hoped we would soon harness the tide. In the recent developments in physics we could see dimly other ways, more especially in regard to heavy labour, of generating power and it might well be that the cost of generation would go down and we should be divorced from mining coal to get our power. In this romantic history there shone like a beacon the great Cavendish laboratory, near Cambridge, the fountain head of physics of the whole world, and what illustrious names were associated with it. Started in 1870 by Cavendish, the first Cavendish professor was the great Clark Maxwell, who tidied up the experiments of the great Faraday and worked out the whole theory of wireless twenty years before it was contemplated. He was followed by the great Lord Rayleigh and afterwards that great scientist J. J. Thomson. He was followed by such a great man as Rutherford, who attacked the nucleus and revolutionised the whole conception of matter. When he died we had another great name, that of Sir Lawrence Bragg, the illustrious son of an illustrious and well-beloved father, and a fountain head of electricity.

Sir Lawrence Bragg, in reply, said he was glad to have this opportunity to pay tribute to the Electrical Industry. The bond between pure research on the one hand, and development in the Electrical Industry on the other, was a very close one. It was natural that an industry which had no old craftsmanship and sprang from the laboratory should have the closest connections with pure research. On the other hand, not only had this industry, more than any other, supplied the scientist with the weapons for research, but it had supplied the men. As an instance, for a long time he had been at Manchester, and naturally it was with Metropolitan-Vickers he had the closest contacts. That firm had given in recent years a little galaxy of stars in pure science, men who were leaders in their fields, one of our greatest metallurgists and one of our great experts in high tension gear. They had brought to it great achievements in pure science. It was a wonderful example really of reverse lease-lend which made them feel that they were the real allies of the Electrical Industry.

The speaker told of the romance of electricity, of Faraday, Volta, and of Joule. The war had, however, really made a very great change and he wondered what it was going to be like after it. We were going back now to a state of affairs which existed over a hundred years ago, when the mistress of the household knew all about all the things that went on in her house. In the war our younger people had had a technical training on a scale that never existed before. Wives in their homes were doing things that were done for them before. That was the modern version of back to the crafts and handicrafts and a knowledge about doing things with our hands which must have been one of the greatest psychological satisfactions of life in the old days and which, to a large extent, we had lost. The war had brought Science and the Electrical Industry together. One could not at present say much of the work done by the scientist in the various electrical devices in the war, but it really was a boy's thriller come true. It was a most remarkable phenomenon, this terrific impact of the best scientific and technical brains on the rate of development of things going on in the war. We had shown what we could do when we were really spurred on, and although many of our hopes for after the war would probably be disappointed, it was good to see what heights one might reach; it had the very greatest possibilities, encouraging everyone in the country to turn and use this new great power which electricity has given us for all sorts of purposes. The Association's task was not merely to overcome sales resistance, but to combine with the devices the industry made and used, a power of art and fitness for the purpose and the intelligence of the user.

VARIABLE-SPEED DRIVE FOR LATHES

FOR use in tool research where diverse investigations are made into cutting tool behaviour, the machinability of materials and the relative merits of different cutting lubricants, a special lathe has been built by George Swift & Sons, Ltd. For such versatile work the design of the drive and its control has presented several features of interest. The essential conditions to be fulfilled were that: Infinitely variable regulation of the spindle speed should be obtainable throughout a wide speed-range. It should be possible to pre-select the speed of the spindle with remote control of speed variation. Rapid acceleration and deceleration should be achieved without excessive stresses and the motor should operate smoothly throughout its speed range in order to yield a good finish.

The general construction of the lathe

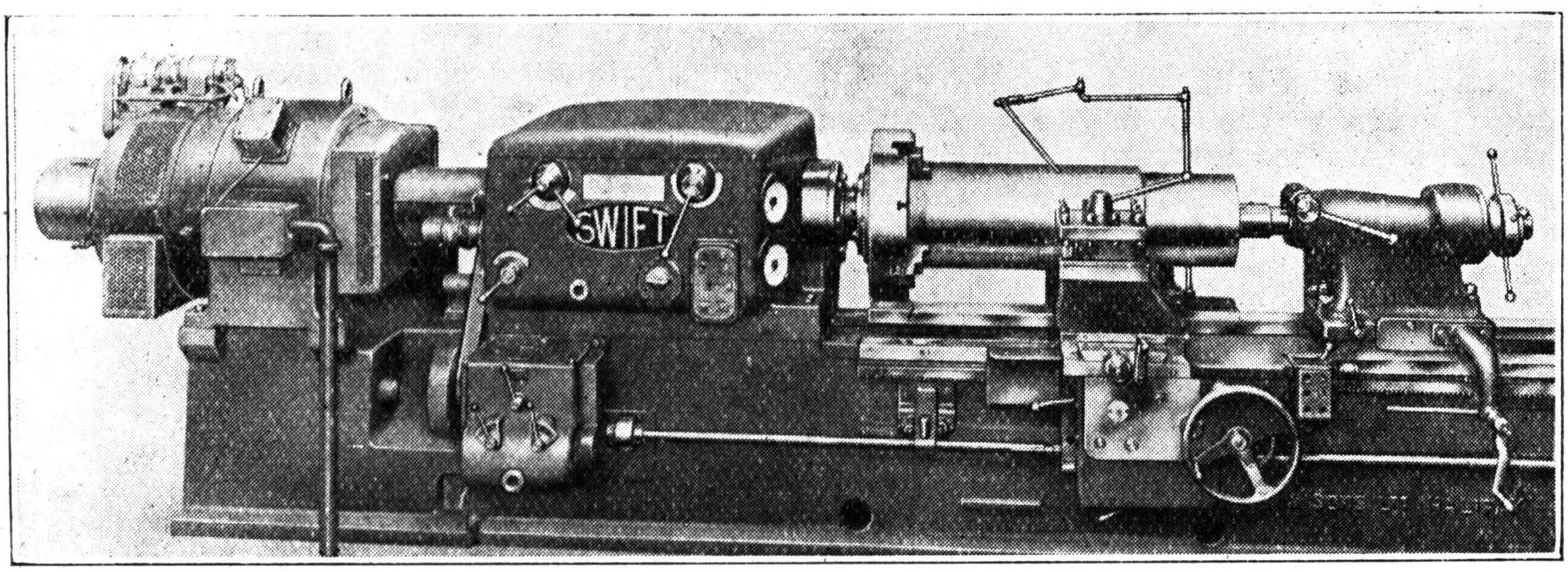


Fig. 1. Special Lathe for Investigation of Tool Characteristics.

permits a direct high speed spindle drive, through a flexible coupling, for high speed work, the electrical equipment being supplied by Metropolitan-Vickers Electrical, Co., Ltd. The motor, which is rated at 75 h.p., 1,500 r.p.m., operates at constant torque from that speed down to 600 r.p.m. For spindle speeds below this value, sliding reduction gears, contained in the gear box in the headstock, are introduced. With the motor speed range stated above, these gears give four ranges of spindle speed, viz: 600-250, 250-100, 100-40 and 40-17 r.p.m.

The motor is an a.c. variable speed commutator machine possessing characteristics inherently suited to this duty. The speed, when adjusted, remains practically constant, irrespective of the load, and speed control can be effected from a distance. The efficiency of the motor is high over the whole speed range, and the power factor is higher than

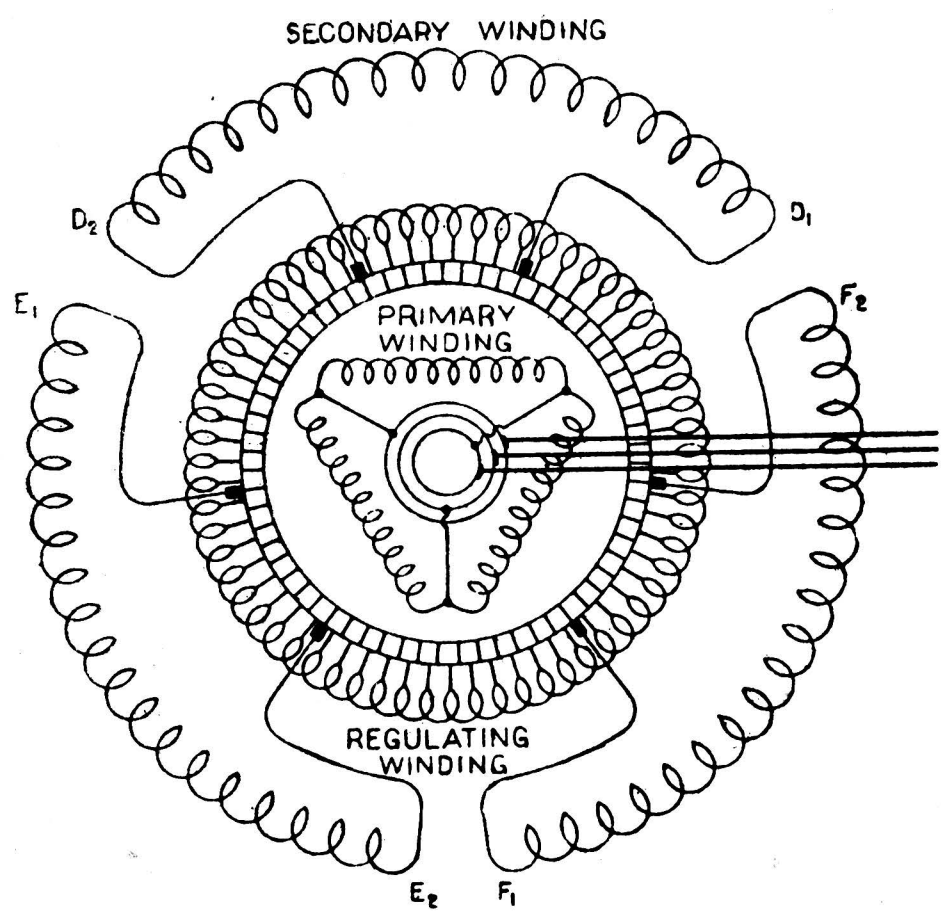


Fig. 2. Basic Motor Windings.

that of the more usual industrial motors throughout the major part of the speed range.

Starting conditions are simple, the pilot motor resetting the brush gear automatically to the correct position for starting.

Motor Construction.—The leading features in this design of motor are set out in Fig. 2. The primary winding is located on the rotor and is connected to the supply by slip rings: the secondary winding is on the stator. On the rotor there is also a regulating winding connected to a commutator, as in an ordinary d.c. armature. The commutator is provided with two brush rockers which can be moved relatively to each other, either by a hand wheel or remotely by electrical or mechanical means. On each phase, one end of the secondary winding is connected to a brush stud on one rocker and the other end to a stud on the opposite rocker. It will be evident, therefore, that the greater the distance the rockers are moved apart round the commutator, the greater will be the number of commutator segments and consequently the amount of regulating winding connected in series with the secondary winding. If the regulating brushes are brought together, the whole of the regulator winding will be cut out and the secondary winding short-circuited. The motor will then act as an ordinary induction motor and will run at slightly below synchronous speed.

If the regulating brushes are now separated, a certain voltage will exist between the brushes of each phase. The effect of this voltage thus injected into the secondary circuits is to compel the motor to change from synchronous speed to that speed at which the voltage induced in the secondary windings is sufficiently increased to restore the balance in the circuit. Thus, any speed within the range, above or below the synchronous speed, can be obtained.

Control.—On the lathe illustrated, to enable the operator to have full control of the spindle speed a selector switch is included in the control panel for pre-selecting the desired speed, or for allowing the speed to be modified by push-button control on the headstock. It consists essentially of a contact arm rotated over a contact disc by the handwheel and works in conjunction with a contact disc driven by the pilot motor which moves the brushgear. The contact disc of the controller is calibrated to the speed range concerned and the contact arm acts as a pointer for setting the speed. That speed can be preset with the motor at rest or running, and thereafter the handwheel can be left at that setting and the operator continues to control the motor by the push-buttons.

Push-buttons are located on the headstock and arranged for start, stop and inch on the main motor, raise and lower for the pilot motor and start and stop for the pump motor. Duplicate main motor push-buttons are provided on the saddle, and, in addition, left and right rapid power motion of the saddle. The saddle movement is performed by a separate squirrel cage motor with a reversing contactor starter.

The contactor control gear for main and pilot motor is contained in a floor mounted cubicle and is arranged for direct-on starting with a.c, protection of the main motor. Rapid stopping is achieved by plugging, in conjunction with a reverse rotation relay. Current limiting resistances are inserted in the secondary circuit during plugging.

POST-WAR INSTALLATIONS

AT a meeting of the I.E.E. Installations Section last week, **Mr. W. N. C. Clinch** opened a discussion* on the part of the report by No. 3 sub-committee of the I.E.E. Post-war Planning Committee dealing with installations, and on the M.O.W. No. 11 Report on Electrical Installations. Both of these have been described in detail in THE ELECTRICAL TIMES, February 3, 1944, and October 19, 1944, respectively, so it is not necessary to repeat here the findings of the two committees.

A considerable number of speakers took part in the discussion and greatest attention was concentrated on plugs and sockets, on which there appeared still to be a diversity of opinion. Some objection was raised to the proposed 3 kW fused plug, one view being that at the present time there are some 10,000 pieces of apparatus requiring a 1 kW plug to every one which requires a larger size. It was asked why the Committee had chosen the 3 kW size when the majority of small houses would not contain apparatus large enough to warrant it. The idea of one standard plug was strongly supported, but the size chosen was regarded with some doubts. Interchangeability of plugs and sockets was urged, but the view of one speaker was that B.S. 546 with its three sizes rendered this impossible.

Views were expressed for and against the recommendation that the Wiring Regulations of the Institution should be replaced by Basic Safety Regulations and Codes of Practice. One supply engineer welcomed the proposed change. He pointed out that strict adherence to the Regulations would have precluded the use of ring or room circuits in certain experimental houses with which he had been concerned. On the other hand, there were those who deprecated the idea of superseding the Institution's Regulations but made suggestions as to how they might be revised.

Ring Main.—Another matter of particular interest which was discussed was the ring circuit. There were some who expressed themselves whole-heartedly in favour of the proposed ring circuit, but it was felt that the claim in Report No. 11 that a saving of approximately 25% in a given case might be misleading. It was made clear that this statement should not be construed as meaning that the more adequate provisions recommended for post-war housing would be obtained at a 25% reduction on pre-war costs, but that the improved facilities would be obtained at a cost proportionately less than that which would be incurred if pre-war practices in methods of wiring were employed unchanged. Local fusing on the ring circuit was commented upon, and one speaker did not favour too many local fuses. It was agreed, however, that local fusings might be necessary for certain apparatus. Where it was necessary, it was urged that the fuse should be in the socket where it was out of the way.

Among the many suggestions put forward on matters of detail was that socket-outlets should be at hand level. Another suggestion was the greater use of 1 kW fires so that instead of one 3 kW fire at one end of a room with those present grouped round it to keep warm, there could be more than one fire in different positions and so make the whole room warm. The proposed 4 cu. ft. capacity for refrigerators was criticised because in a type of small house contemplated in one area there was not sufficient room to accommodate this large size. A capacity of 2 cu. ft. was considered by this speaker to be more suitable. An all-insulated system was advocated, thus eliminating the use of conduit, although it was admitted it might not be possible to achieve this immediately and that the question of interference with radio reception would need to be borne in mind.

Representatives of all sections of the industry concerned with installation work took part in the discussion, and the many constructive comments which were made will receive further consideration by the committee. Mr. J. R. Beard, chairman of the Committee responsible, replied to the discussion.

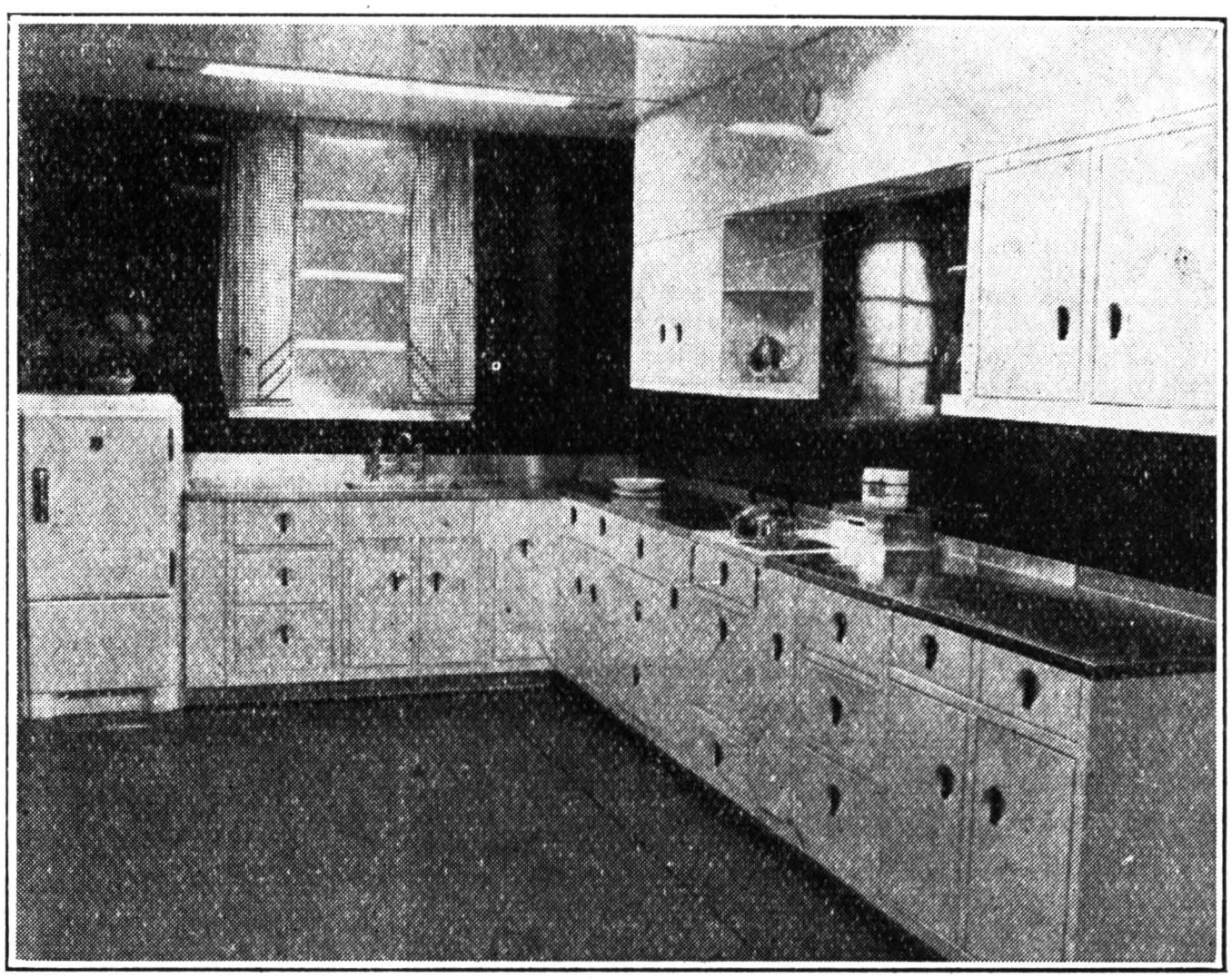
* These notes are a summary of an Official Précis of the discussion issued by the Institution.

"T.V.A." and "Power Lines."—In the note under this heading in our issue November 23, METEOR slipped into an error. The showing of the film was arranged by the Enfield Cable Works, Ltd., for their friends and customers, to whom Enfield literature was distributed on departure. The conclusion that Enfield Cable Works, Ltd., had actually co-operated in the production of the "Power Line" film, therefore, was not unnatural. In fairness it must be stated, however, that in his speech of welcome Lord Forrester specifically stated that the film "was not photographed at Enfield, although it might well have been, but at the only other factory in Great Britain where copper is refined, rolled, drawn and insulated within the one works boundary." In other words, the British Council made the film at the works of British Insulated Cables, Ltd., Prescot. The misunderstanding occasioned is regretted.

Notes on Wiring.—Owing to *Megohm's* indisposition this week, we are unable to publish this standard feature.

ALL-STEEL KITCHEN CABINETS

IN order to cater for the post-war housing problem, many different designs of kitchen cabinet have been produced. Basically these consist of a cooker, refrigerator and sink, arranged with suitable shelf accommodation. Where houses are to be mass-produced in large numbers, such as the Portal type house, standard kitchen units can, of course, be produced to fit the kitchen dimensions. In the more diverse sizes of kitchens that are likely to be met with in general building practice, a standard type kitchen unit may not be possible. With this in mind, Moffats Ltd. have produced a range of kitchen units which can be built up into cabinets to provide all the necessary accommodation that will be required in a kitchen. This unit principle not only allows great flexibility in the planning of modern kitchens, but it also permits modern ideas to be introduced into existing kitchens.



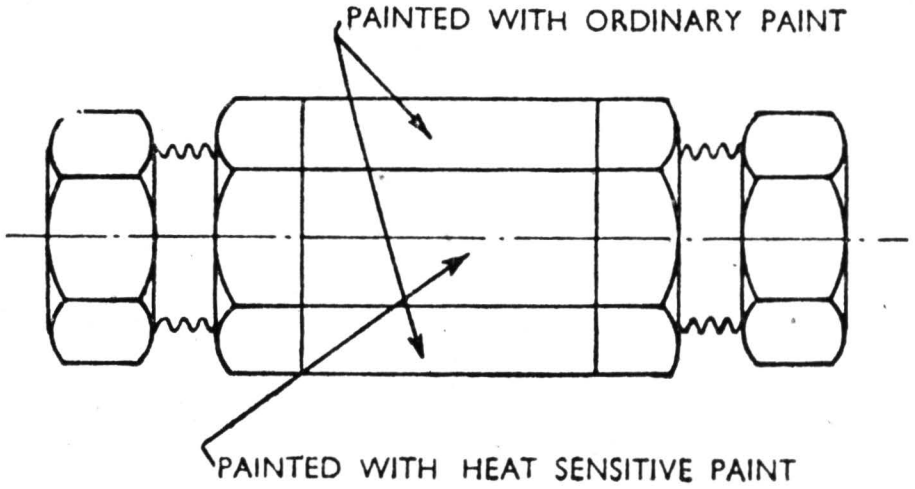
Kitchen Fitments Assembled from "Moffat" Units.

Typical units consist of a cupboard with a drawer above, 3 ft. high. This can be supplied either as a single door cabinet, or a double door cabinet. Either of these may be surmounted by upper cupboards, with adjustable shelves. Other units are a drawer unit, with corner shelves, a towel rail unit, with an electrically-heated towel rail, and a tray cupboard. All these units are made of 20 s.w.g. sheet steel, designed so as to provide clean lines with a minimum of ledges for accumulation of dust. They are finished with ivory or white baked synthetic enamel and the lower fitments have stainless steel tops to provide a working table. All hinges are hidden and the steel drawers are padded to minimise sound.

CHARGE ENGINEERS' NOTES

INDICATING HOT CONTACTS

IN overhead line practice the avoidance of high resistance contacts is a major problem especially where high fault currents may exist. Mid-span joints, non-tension



joints, air-break switches are all exposed to varying atmospheric conditions and liable to corrosion. Simple methods of testing for high contact resistance must be adopted due to the inability to close down important lines. Precautions are taken to reduce the dangers of corrosion, such as filling mid-span joints with Mobil grease, graphite grease and, in some instances, Woods metal, but these may deteriorate in service.

A fairly accurate method of testing would be to pass d.c. current through the joint and measure the drop. This method necessitates taking lines out of commission, is cumbersome and is expensive. Since bad contact resistance results in heating, some methods employed for testing incorporate materials sensitive to heat.

Some engineers test for hot contacts by the old method of a piece of paraffin wax on the end of a suitably insulated rod. By this means they determine whether the joint

contact is in a dangerous condition. The method, while effective, is not a measure of the temperature and necessitates routine testing. A better method is the use of heat sensitive paint. In the first instance the temperature must be fixed at which the joints and contacts need attention. The heat sensitive paint should alter colour at this temperature.

The method is shown in the illustration. Paint the two lower faces of the coupling with ordinary paint and the third with heat sensitive paint of same colour. Lower faces are used so that they can be observed from the ground. If the joint heats to the predetermined temperature, the sensitive paint changes colour and can be detected on patrol. I cannot, however, say how long the paint will last without renewal due to weathering.—**J. McC.**

LETTERS TO THE EDITOR

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

Grain Drying—All-Electric Possibilities

SIR,—After reading Mr. Cameron Brown's article on Grain Drying in your issue dated November 16, one could be left with the pessimistic impression that the all-electric possibilities were practically nil. I know of two driers other than "Kennedy & Kempe" conversions, namely, "Ransome Davies," and "Mather & Platt."

Are Undertakings refusing this summer load honestly for fear of transformer losses or insufficient capacity on the distribution network? Will they stand by and see other forms of heating used?

With regard to the "Kennedy & Kempe" drier on the Bedford Undertaking's system, the first season was dry; the second season was even drier, added to which the smooth operation of combine and drier enabled Mr. Allingham, the farmer, to complete the harvesting before the wet period of August came round. Consequently, no opportunity has yet arisen when authoritative figures can be given for a severe wet period; but in spite of this, every confidence is felt that the equipment will overcome successfully all seasonable variations.

The transformer on this particular farm is so arranged that it can be switched out by the supply authority when not required.

Incidentally, a welcome is extended to Mr. Cameron Brown to carry out any tests regarding efficiency and capabilities at some future date on this plant.

Nov. 28. H. G. WILD,
Consumers' Engineer.
Electricity Depart, Prebend Street, Bedford.

Radio Frequency Heating

SIR,—In reply to the letter of Mr. R. G. Medhurst, published in your issue of November 23, I would like to point out that since the power induced into the work is proportional to the μ of the work, and since the curves relating μ and temperature for iron and steel remain fairly level over most of the temperature range and fall sharply as the Curie point is approached, efficient heating conditions are maintained if the temperature of the Curie point is not exceeded.

The expression which I gave for optimum frequency is proportional to ρ/μ, and since ρ increases and μ decreases at high temperatures the optimum frequency will be greater at a high temperature. Mr. Medhurst rightly mentions that "The larger value should, of course, be taken if optimum efficiency throughout the heating cycle is to be maintained." This, I think, justifies my statement that "Since the Curie point need not be exceeded providing the quench is quickly applied, efficient conditions are maintained throughout the entire heating cycle with E.C.H."

The article in *Metal Progress* to which Mr. Medhurst refers does not give chapter and verse for the automatic regulation of the current throughout the heating cycle. The article is concerned with an alternator generating power at a frequency of 9,600 cycles, which is about the highest that can be achieved with a powerful alternator. Condensers are used in an effort to maintain a reasonable power factor load on the alternator, and it would appear that the adjustment of current in three steps has a similar object.

An alternator operating at a frequency below 10 kc would hardly come within the radio frequency sphere, and in any case its behaviour is somewhat similar to a thermionic generator employing master oscillator-tuned amplifier. It has already been pointed out that the use of such an arrangement is to be deprecated as it entails tuning the work circuit.

Burch and Davis show a calculated curve in which the efficiency of heating remains constant for increasing values of Ka exceeding 3. This will not, however, be achieved in practice, for with a generator of given power the current in the "work" coil will fall with rising frequency, owing to increased work coil resistance due to skin effect. Radiation losses will also be greater at a higher frequency.

Nov. 30. L. L. LANGTON, A.M.I.E.E.
Grove Park.

COOKING AND HEATING NOTES

INFRA-RED DRYING OF SAWDUST

DURING the final stages of ball and roller-bearing manufacture, the various parts are treated with lime, and before final assembly it is imperative that all lime deposits are removed so that possible corrosion is obviated. To achieve this, the balls and rollers are passed through sawdust, and of necessity this must be free from moisture.

Hitherto, the removal of moisture from the sawdust has been carried out by air drying, which was both a lengthy and somewhat uncertain method. Now, a much better result is being achieved by passing the sawdust through the tunnel of a G.E.C. infra-red lamp heating plant which has been specially designed for this purpose. Not only does this method dry the sawdust more quickly and more uniformly, but, in addition, the infra-red process has removed one other source of trouble that had been difficult to combat. In the first place, it is necessary to evaporate the moisture from the sawdust so that there is no tendency for fine wood particles to stick to the balls. Though this was achieved with varying success by the previous method, it did not succeed in removing the resinous content in the wood, with the result that tiny patches of resin still adhered to the balls after treatment. As with moisture, here was another possible cause of damage to be neutralised. The infra-red plant now in use solves this problem by volatilising the resins simultaneously with the evaporation of the moisture.

This installation is of particular interest, not merely because of the efficient way in which the sawdust is treated, but also because of the unusual manner in which it is carried past the infra-red equipment by a Fraser & Chalmers "Sherwen" Vibro conveyor. In this electro-vibrating type of conveyor no movement of the conveyor trough is visible, but the sawdust travels forward like a smooth flowing stream. The design is very simple and does not incorporate mechanical wearing parts.

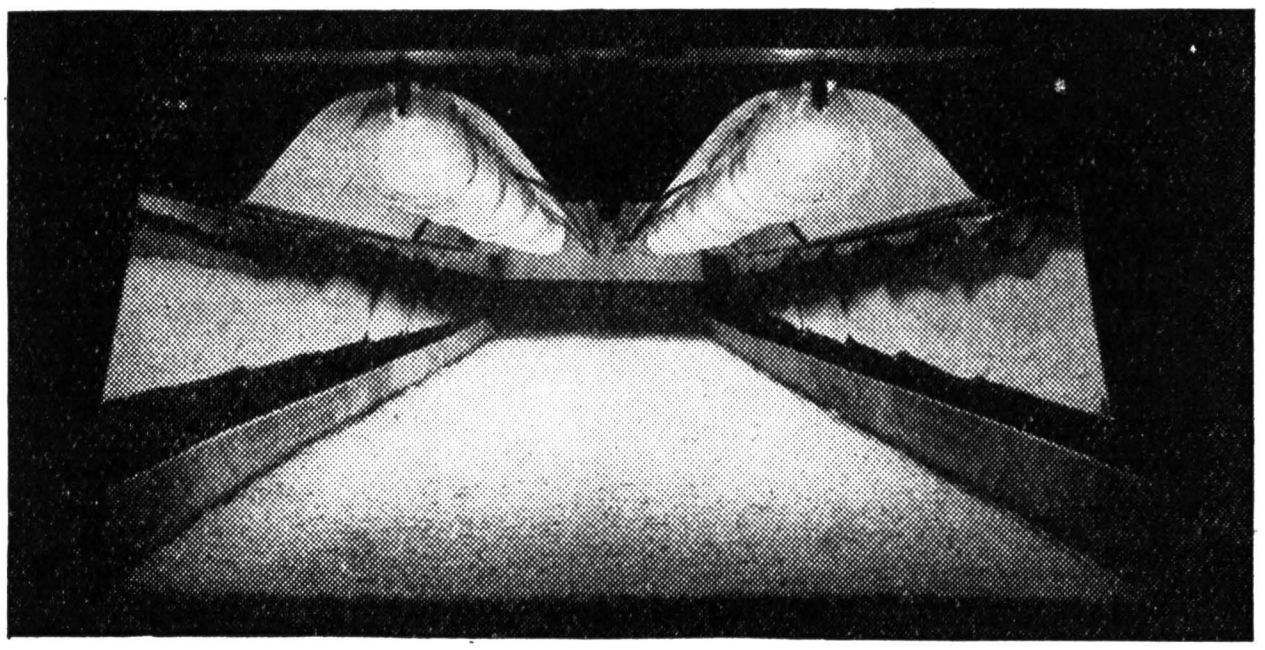


Fig. 2. Interior of Infra-red Tunnel.

Raising or lowering the voltage by means of a variable transformer or resistance increases or decreases the stroke, and consequently the speed of travel of the sawdust. The frequency of vibration is the same as that of the electricity supply, i.e., 50 cycles per second.

The infra-red heating plant consists of six rhodium-plated troughs of standard G.E.C. design (in two rows of three) each containing nine Osram infra-red industrial lamps, the total loading being 13·5 kW. The complete equipment handles 400 lb. of sawdust in 24 hours; the proportion of moisture evaporated being between 10 to 12 % by weight.

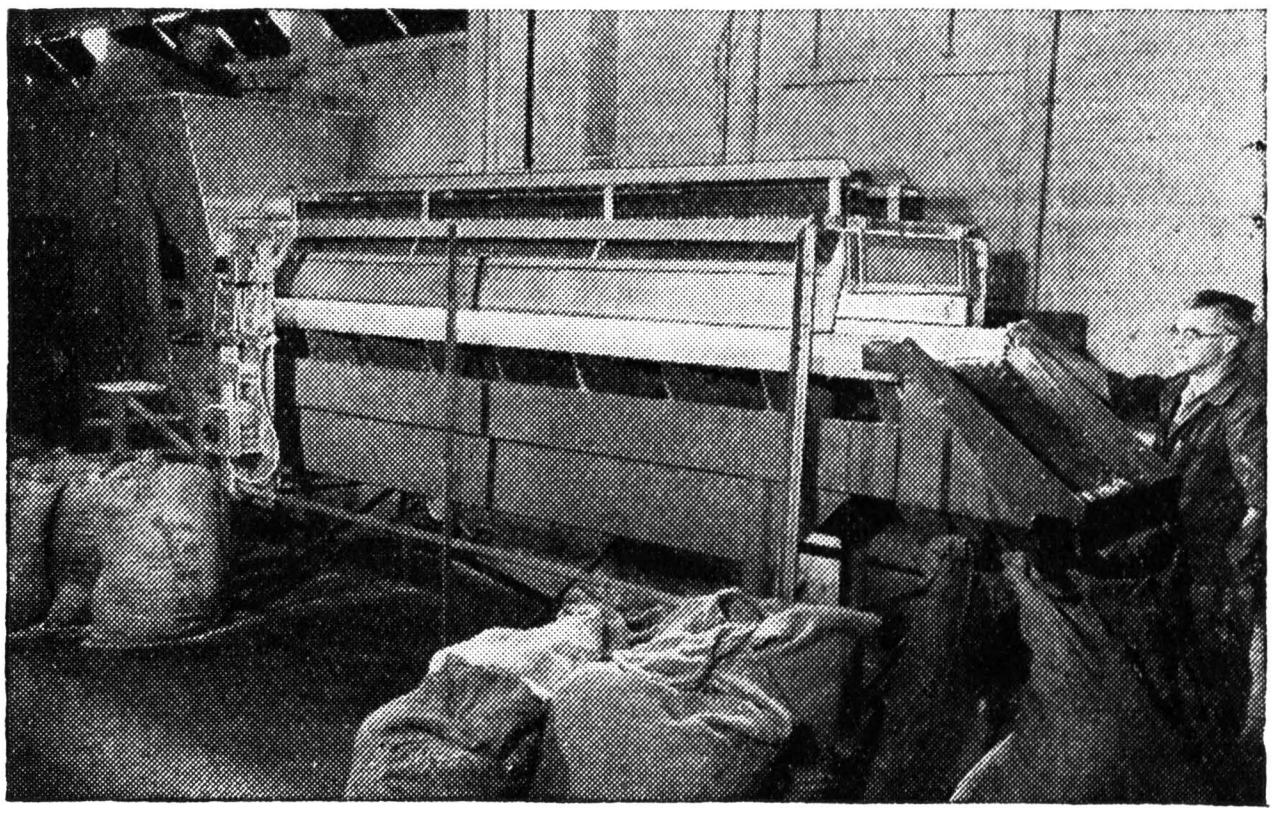


Fig. 1 Infra-red Plant Drying Sawdust for Ball-bearing Industry.

HOTSPOT

ELECTRIC PORTALS FOR BEDFORD

The Bedford Council, at their meeting on November 28, recommended that the Ministry be requested to supply the 143 prefabricated houses allocated to Bedford, electrically equipped throughout.

PERSONAL

It is of interest to the many who appreciate the fine work of **Sir Standen Leonard Pearce** to note that this appreciation extends beyond our own shores. Sir Standen has lately been informed by Mr. R. M. Gates, President of the American Society of Mechanical Engineers that that society has elected him an Honorary Member, and that arrangements are being made for the conferring of this honour upon him in due course.

Mr. A. B. Catling, A.M.Inst.C.E., A.M.I.E.E., borough electrical engineer and manager, Barking, has been appointed borough electrical engineer and manager at Willesden.

We hear from M.K. Electric Ltd. that the following have been appointed executive directors of the Company: **Mr. A. E. Mills,** commercial manager; **Mr. R. W. Dowsett,** assistant general manager (works); **Mr. A Johnstone,** works manager; and **Mr. N. Leevers**, supplies manager.

Mr. A. W. K. Billings, a vice-president of the Brazilian Traction, Light & Power Co., has been elected president, in succession to the late Sir Herbert Couzens. **Colonel Walter Gow, K.C.,** a vice-president, has been elected chairman, and **Mr. G. Howard Ferguson,** a director, has been elected a vice-president.

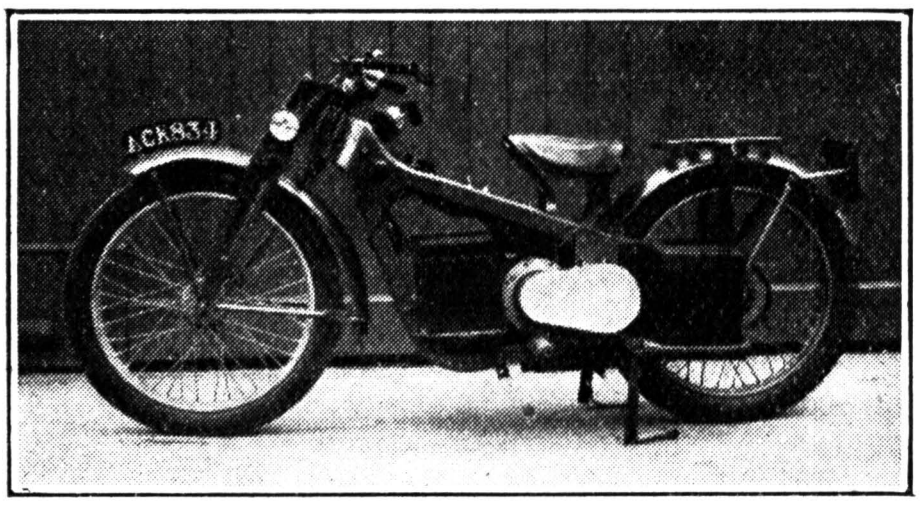
Mr. L. C. Cox, A.M.I.E.E., mains superintendent at Leyton, has retired for health reasons after forty-one years' service. Mr. Cox went to Leyton as mains superintendent in 1903, and has been in charge of the Mains, Meter and Public Lighting Department ever since; during this time he has been concerned in the many developments which have taken place in Leyton, particularly the big change-over scheme completed just before the war. Mr. Cox is succeeded by **Mr. W. O. Heather,** assistant mains superintendent.

Obituary.—With regret we hear of the death on November 16, of **Mr. T. E. Merry,** for many years Birmingham representative of the Hotpoint Electric Appliance Co., Ltd. Mr. Merry had been ill but a short time. He joined the Hotpoint Company in 1931 and was attached to the Nottingham branch; when the Birmingham Branch was opened in 1933 he was transferred there, and in January, 1942, he was seconded for duty with the Ministry of Supply, Birmingham Region. By his death the Company loses a valuable servant, who will be much missed by his colleagues and his many friends in the Electrical Industry.

NOTES AND NOTICES

All-Electric Motor-cycle

Our attention was drawn the other day to an all-electric motor-cycle constructed by Mr. W. Barrs, electrical manager of T. Dryden & Sons, Ltd., of Preston. It is an interesting and ingenious machine; the motive power is a converted generator developing about 1 h.p. from four conveniently stowed batteries; a simply-operated switch gives four electrical speeds.



The All-Electric Motor-Cycle.

The master control is twist grip operated. With a speed of 25 m.p.h. and a range of 50 miles on one charge (cost a penny) the machine provides a practical way of knocking about with minimum expense. The tax is but 17s. 6d. p.a., and there are no petrol worries, other advantages being silence in running and cleanliness not associated with petrol-driven motor-cycles. Mr. Barrs, we gather, visualises a streamlined model.

An E.A.W. Anniversary

There was a happy gathering at the headquarters of the Electrical Association for Women on November 30, when members met to pay tribute to their first President, **Viscountess Astor,** who is celebrating the silver jubilee of her entry into the House of Commons. It is twenty years since the E.A.W. was formed, and Lady Astor has been closely associated with it ever since. An outstanding occasion was when, at the British Empire Exhibition at Wembley in 1925 she was chairman of the International Conference of Women in Science, Industry and Commerce; she has for a quarter of a century been dynamic in pressing the cause of women's progress in this country. **Miss Caroline Haslett,** Director of the E.A.W., in a brief speech gave the assembled members the headlines of Lady Astor's achievements, and asked her to accept a gift from the Association to mark the occasion. Lady Astor replied, making it clear that she was happy that women here had progressed so far; but she envisages, we are sure, a good deal more progress to come. A pretty little ceremony was the cutting, by Lady Astor, of a birthday cake, bearing its appropriate candles. We found that, despite war difficulties, cake made and baked by an E.A.W. member is a very tasty affair.

Co-operation with Architects

Representatives of the Birmingham and Five Counties Architectural Association, the Coventry Society of Architects, the Leicester and Leicestershire Society of Architects and the Nottingham, Derby and Lincoln Architectural Society were the guests of the members of the Central England Area of the British Electrical Development Association at a lunch at Birmingham on November 14. An informal discussion followed, during which the Chairman of the E.D.A. Area, **Mr. R. H. Rawll, M.I.Mech.E., M.I.E.E.** (Sales and Development Engineer Birmingham Electric Supply Department), expressed the view that many problems of the post-war period in housing and building could only be solved successfully if far closer co-operation existed between electricity supply engineers and members of the architectural profession, both collectively and individually. He hoped that meeting would be the forerunner of many similar gatherings in future, when matters of mutual interest could be discussed to the benefit of both parties. This suggestion met with the unanimous approval, and it was agreed to hold a further meeting early in the New Year.

English Electric Apprentices

A record gathering of apprentices, with parents and officials of the English Electric Company, assembled in the Association Hall on November 17. It is an annual occasion whereat indentures are presented to apprentices who have completed training, and merit awards to industrious apprentices are announced. During the afternoon parents of the apprentices inspect the Works, see the work on which their boys are engaged and note the training facilities offered. In the evening came the Mayor and Mayoress of Stafford, the Deputy Mayor, and Dr. and Mrs. W. A. J. Chapman, Dr. Chapman being the newly appointed principal of the Stafford Technical College. The Company's officials included Mr. J. Rogers, general manager of Works; Mr. A. D. Sloan, chief engineer; Mr. J. W. C. Milligan, manager, Stafford Works; Mr. C. C. H. Wade and Mr. A. H. Wroe, managers of the Plant and Transformer and Switchgear Works respectively; and Mr. M. Landers, Chief Engineer, Fusegear Works. The chair was taken by Mr. F. Caunce, superintendent of the Company's Technical Education Department; he welcomed the visitors, and gave a short review of the progress and aims of the apprentice training scheme. Arrangements had been made with the education authorities and Dr. Chapman for day continuation classes for all boys and girls under sixteen, to commence next January. Attendance at these classes would be in works time, and paid for. There was a short address by the Mayor of Stafford, and then Mr. Milligan distributed completed indentures and merit awards; he read a message from Sir George Nelson, chairman and managing director. Mr. Milligan mentioned particularly two apprentices—Ronald McNaughton and Derek Senhenn, the former this year's winner of the Milligan Shield presented to the best all-round apprentice of the year, and the latter an outstanding apprentice both in the factory and in technical studies. It was the policy of the Company, as soon as possible, to raise the age limit for day continuation classes to 18. There seemed to be ample orders and work already booked, which would mean plenty of work and opportunity for the next five years or more; apprentices should equip themselves fully to meet the challenge of these years.

"Fettered Factories?"

This is the title of a pamphlet issued by Lt.-Col. T. H. G. Stevens—his object is to secure that there shall not be undue restriction on industrialists as to the siting of new factories. His argument is that a policy of Government choice of sites after the war may be influenced by considerations other than national economy, and he also points out that he, having spent a quarter of a century helping industrialists to select factory sites, finds his knowledge still imperfect—how much less therefore can a civil servant be qualified to select sites and have knowledge of the particular requirements and idiosyncrasies which may make or mar success?

Heating Apparatus Supplies

The Board of Trade, in consultation with the Ministry of Fuel and Power, has decided that it is no longer necessary to limit sales by wholesalers of electrical heating apparatus, or sales by either manufacturers or wholesalers of gas heating apparatus. They have accordingly revoked the Limitation of Supplies (Heating Apparatus) (No. 4) Order, 1944, by means of an Order which came into operation on December 1, 1944 (S.R. & O., 1944, No. 1326, price 1d., Stationery Office). Manufacturers of electrical heating apparatus, of a kind suitable for domestic or personal use, should, however, note that they are still subject to control as regards goods of their own manufacture. They may not manufacture or supply such goods except on the authority of a licence issued by the Board of Trade under the Electrical Appliances (Control of Manufacture and Supply) Order, 1942 (S.R. & O., 1942, No. 1453).

Calendars, Diaries and Almanacs.—Restrictions have stemmed the flood of date memorising aids in recent years. The first of this year's calendars to arrive is the pretty "Daphne" wall calendar of Mr. Christopher Wade (Gabriel, Wade & English)—"Daphne," makes a nice "pin-up" girl.

ELECTRIC SUPPLY NEWS

Croydon.—As most of the streets in the borough are controlled by a master switch the Electricity Committee proposes to utilise the 0·2 ft. candle standard for lighting. A small area not so controlled is to remain on the lower (0·02 ft. candle) standard during alerts. The work of improving the lighting is being applied as lamps and equipment become available. The proposed new generating station for Croydon, originally expected to be ready last July and to have installed two turbines each driving a 30,000 kW alternator, with an auxiliary 1,600 kW machine, has yet to be completed, the main machines, however, are now raised to 50,000 kW and the auxiliary to 2,500 kW. The proposal dates from March, 1942, when it was also proposed to install four boiler units each of an evaporative capacity of 200,000 lb. steam per hour, and auxiliary plant; also three cooling towers each of a capacity of 1·5 million gals. per hour. The boilers are now to be 300,000 lb/hr., and the cooling tower capacity 2·5 million g.p.h. Originally the estimate and the cost of the first section of the station (May, 1939) was £1,298,300, exclusive of specialist fees—but war conditions will raise this cost very materially—it is put at an overall figure of £3,644,600. Application has been made to the Electricity Commissioners for sanction to construct the new station. It is proposed to obtain tenders from selected contractors, instead of by public advertisement.

Guildford.—Having had a statement from the Electricity Committee as to the present financial position of the Corporation's Electricity Undertaking, the Corporation has agreed with the Committee's recommendation to give a rebate of 50% of the fixed charge of the "all-in" rate for the December quarter, which, it was explained, did not necessarily mean that a similar rebate would be given for the next March quarter—coal costs and other factors might influence it adversely.

PARLIAMENTARY

Fuel and Power Advisory Council.—On November 28 **Mr. Mainwaring** asked the Minister of Fuel and Power (1) whether the terms of reference given to the newly appointed Fuel and Power Advisory Council were intended to include the development of coal resources; (2) whether he was prepared to add to the Advisory Council men with experience of both sides of the industry; and (3) whether to provide for the development of industry in Wales, he was prepared to add to the Council at least one member with a special knowledge of Welsh needs. **Major Lloyd George** said the general function of the Council was to consider and advise upon the broad and fundamental problems of the development and efficient utilisation of the nation's fuel and power resources as a whole. The Council was not so constituted as to be qualified to deal with such matters as the organisation and actual working of the various fuel industries nor was it ever intended to refer to it such problems, which were proper to other and quite differently constituted bodies.

District Heating. — Mr. Bossom, on November 28, asked the Minister of Fuel and Power (1) what proportion of the thermal units generated in our larger power stations were converted into electricity; and what percentage would be available, if appropriate machinery were installed, for providing circulating district heating and circulating district hot water; and (2) whether the new electricity generating stations to be erected, under the auspices of the Central Electricity Board, would be equipped so as to use their surplus heat after the generation of electricity for the purpose of providing circulating district heating and circulating district hot water in the areas in which they were constructed. **Major Lloyd George** said that, as explained, the subject of district heating was at present being considered by a sub-committee of the Heating and Ventilation (Reconstruction) Committee appointed by the Department of Scientific and Industrial Research. The Government would wish to see the report of that Committee before it could formulate any policy on this matter. The development programme of generating stations just published was so urgent that it could not wait the formulation of a policy on district heating which would require legislation. The percentage of heat units in the electricity sent out from the larger and more modern generating stations as compared with the heating units in the coal used ranged from 25% to 28%. If certain difficulties were overcome and district heating from generating stations adopted, it might be possible to have made available 70% to 75% of the heat units in the coal for combined electrical and district heating purposes. The quantity of electricity, however, produced from every lb. of coal would be considerably less than with present methods and a proportionate increase in generating plant would be required to produce the same amount of electricity.

Street Lighting (Coal Consumption).—In a written answer to a question by **Sir T. Moore** as to what increase in the consumption of

coal would be involved monthly by the decision of the Government to reduce the black-out, **Major Lloyd George** said in pre-war days the consumption of coal required for the maintenance of street lighting was approximately 1,000,000 tons a year. Naturally, consumption in the winter was heavier than in the summer because of the longer hours of darkness, and as each lighting authority had its own arrangements for the number of hours during which the lamps were kept alight, it is difficult for him to give an estimate of the monthly consumption of coal. Resumed street lighting was on a much more limited scale than in pre-war days. While work on street lighting was still in progress it would be difficult to arrive at a reliable estimate of the amount of coal involved.

Scientific Publications.—**Sir E. Graham-Little** asked the Chancellor of the Exchequer what was the present amount of the financial aid given to the Royal Society and other bodies to assist scientific publications; and whether he was yet in a position to announce whether it would be possible to increase this amount in the near future. **Sir J. Anderson** said the grants in aid to the Royal Society and to the Royal Society of Edinburgh included provision of £2,700 and £300 respectively, allocated specifically to scientific publications. Scientific publications were also issued by other bodies receiving grants from public funds, notably the Medical Research Council and the Agricultural Research Council, but except as mentioned, the grants were not allocated to specific purposes. He could not yet state the amount of the grants which Parliament would be asked to provide in 1945 for scientific investigation and research.

ELECTRICAL COMPANIES

Dividends.—*Edmundsons Electricity Corporation.*—Interim dividend of 2½%.

Hick Hargreaves.—Interim dividend of 2%.

Marco Refrigerators.—Dividend of 2½% for the year.

British Thermostat Co.—Final dividend of 11%, making 18½% (profit to January 31, 1944, £34,799).

Cape Electric Tramways Co.—Dividend for year of 6% (profit £47,809).

R. & J. Dick.—Dividend for year to August, 10% (trading profit £32,674).

Crompton Parkinson.—Final dividend on ordinary and "A" ordinary stock, of 7⅓% actual, making 15% for the year. (Profit, £432,099; carried forward, £588,256.)

British Electric Transformer Co.—Final dividend of 6d. per share, on ordinary shares, making 9d. per share for year to September (Profit, £24,569, against £36,999 last time; carried forward, £180.)

Falk, Stadelmann & Co.—In the statement circulated with the accounts, Mr. G. Falk said the financial position was very sound. After provision for depreciation, insurance, A.R.P. and other expenses, the profit amounted to almost £113,000. There had been a slight diminution in trading profit, due to a lesser turnover in some departments, mainly accounted for by restrictions due to control of essential materials, quotas, etc. The interim dividend of 7½% paid last August was to be confirmed as the final dividend for the year. In the current year business generally was being maintained, and in order to facilitate distribution, premises well suited to this purpose had recently been obtained. Exports were still difficult, but the directors looked with confidence to an early resumption of the overseas trade. Lately it had been possible to acquire the goodwill, trade marks and patents of a manufacturing company engaged in the lighting industry. To preserve continuity of this business and its associations the directors formed a subsidiary company, and this was expected to prove a valuable auxiliary.

Perak River Hydro-Electric Power Co.—In his statement to the shareholders, Mr. W. Shearer said that they still had no information from Malaya as to the state of the Company's properties. He had last year hoped some arrangement might be made in respect of the annual service of the 5% stock guaranteed by the Treasury so that they should not be altogether denuded of their dwindling cash resources. An arrangement in the nature of a moratorium had now been made with H.M. Treasury, whereby the latter had assumed responsibility for the payment of the sinking fund for the year under review and of both interest and sinking fund as from the beginning of the current financial year. This arrangement should leave them with a sum in hand on re-entering into possession available to meet the cost of preliminary surveys, and, subject to the condition of the properties, expenditure in the nature of first-aid repairs. Under the terms of the trust deed securing the stock, they would be liable ultimately to repay all amounts advanced with interest, but shareholders would share the Board's appreciation of the sympathetic attitude of the Treasury.

St. Austell & District E.L. & P. Co.—A special meeting to be held on December 19 is to consider altering the articles to give the directors power to appoint up to seven directors, with a minimum of two. At present the maximum is five and minimum two.

General Electric Co.—The special meeting to create 2,000,000 4¼% £1 "C" preference shares has been called for December 21, at noon, at Magnet House, W.C.2.