WIRELESS INVENTIONS THAT ARE WANTED

THE HOLIDAY PORTABLE

Amateur Wireless And Electrics

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PRINCIPAL CONTENTS

WELL ILLUSTRATED

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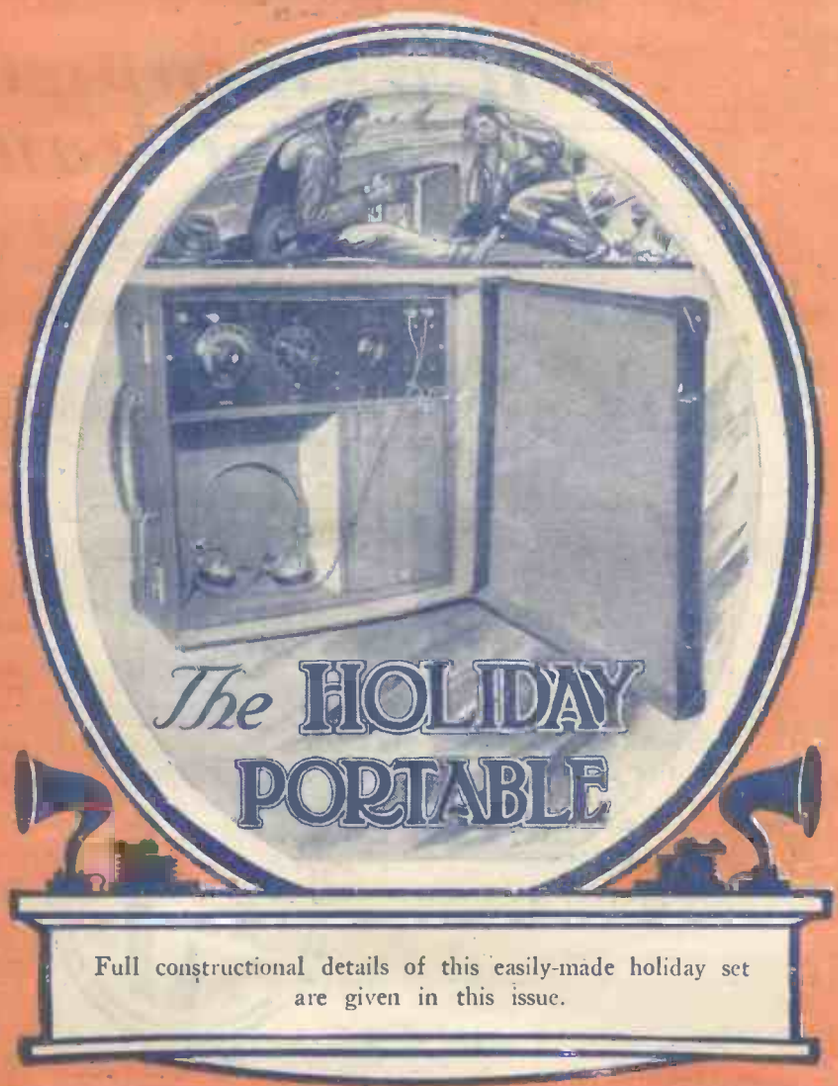

Full constructional details of this easily-made holiday set are given in this issue.

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

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Chief Contents

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General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

WIRELESS INVENTIONS THAT ARE WANTED

ENORMOUS fortunes have been made out of wireless during the last thirty years. Some people have made money by inventing, some by exploiting the inventions of others. It may be that the latter people have made more money than the former, but at the same time the inventor of an important device or arrangement must be either extremely unfortunate or extremely unwise if he does not make money out of it.

Every experimenter is a potential inventor, and it may well be that among the readers of "A.W." there are some capable of producing a much-needed invention if only they knew what was wanted. To these the following brief suggestions as to suitable lines of research may possibly point out the way to fame and fortune. In any case they may serve to direct their energies in a profitable direction and enable them to work systematically instead of at random.

A Perfect Rectifier

Many things yet remain to be invented. Take the present-day valve, for instance. Is it perfect? It is not. As an amplifier it does its work very well, but as a rectifier it has distinct failings. Worked on the bottom bend of its characteristic curve it is little, if any, better than a crystal and much more expensive. The grid-condenser-and-leak method of rectification leads to considerable distortion. The explanation of the function of the grid leak is that it allows the electronic accumulation on the grid of the valve to leak away between *each train of waves*. That is all very well for the reception of spark, which consists of trains of oscillations. But there are no trains of waves when telephony is being transmitted. The transmission is by means of modulated *continuous waves*, and so the grid leak never gets a chance to do its work properly.

A perfect rectifier is badly needed. It must be as stable as the valve and not much more expensive to buy and maintain, and it must give as perfect rectification as does the crystal. One will be produced some day.

Alternative to the Valve

The valve works well as an amplifier, but it is expensive in first cost and running expenses. It should be possible to devise an amplifier working on the same principle as the valve but requiring no vacuum and no filament. The idea of controlling a flow of electrons between two electrodes by means of a third electrode situated between them is good. Many attempts have been made so to control an electronic current flowing through a liquid. In the successful device which will eventually be evolved the control electrode may not be a grid but a coil of wire controlling the current by a magnetic field.

Oscillation Indicator

Oscillation in receiving sets does more, perhaps, to mar the reception of broadcasting at the present time than anything else. Few people would ruin the reception of others knowingly, and a fairly cheap device which would at once indicate when a valve receiver is causing interference with others would find a ready sale. There are many forms such a device might take. A lamp might be made to light or a bell to ring, etc., whenever one of the valves of the receiving set was generating oscillations. However, it must be remembered that, when signals are being received, oscillations are present in some of the receiving circuits even though oscillations are not being generated there. Reception would be impossible if the incoming waves did not set up oscillations in the aerial circuit, for instance, so that the device, on whatever principle it works, will not have to respond to the received oscillations.

Atmospheric Elimination

A problem which remains almost as far from solution as it did in the earliest days

(*Concluded at foot of next page*)

WHAT CIRCUIT SHALL I USE?

BEFORE one can start to design a new set it is necessary to decide what circuit is to be used. Even if it is intended to build a set to the instructions published in "A.W.," it is still necessary to come to some sort of conclusion as to the general type of circuit which is best suited to individual needs before looking for a description of a set that appeals.

This choice of circuit should be made with regard to three main considerations. Firstly, the kind of reception required, whether headphone or loud-speaker; whether from one station only or from a number of stations. Secondly, the distance from the desired station or stations. Thirdly, the conditions under which the set will be operated.

Loud-speaker Work

If loud-speaker work is required, at least one stage of L.F. should be included, and preferably two such stages if reception is desired from a station over ten miles away. For headphone reception only, no L.F. is needed, but one such stage will be a luxury that will often be appreciated.

The distance over which reception is to be carried out can be considered at the same time as the conditions under which the set is to be worked. A more than usually efficient aerial system will have the same effect as decreasing the distance from the transmitting station, while a poor aerial or earth will have exactly the reverse effect.

With an *average* aerial system no H.F. amplification is required for reception from a main station up to about 100 miles away, but it is an advantage when the distance is anything over 50 miles. For reception over several hundreds of miles, two H.F. stages will be necessary to make fairly sure of getting consistent results.

Having decided the question as to what H.F. and L.F. amplification is to be used, the next step is to choose suitable forms of coupling between the valves. For H.F. amplification on broadcast wavelengths aperiodic transformers and resistance-capacity couplings can be ruled out at once as hopelessly inefficient; the choice will thus lie between the tuned-anode method and tuned H.F. transformers.

Valve Couplings

It is indeed difficult to choose between these two, but for a single H.F. stage the tuned-anode method is perhaps the better from the point of view of simplicity and selectivity (unless the coupling between the transformer windings is variable, when greater selectivity will be gained at the expense of another adjustment). For two H.F. stages it is a good plan to use transformer coupling between the H.F. valves and tuned-anode coupling between the last H.F. valve and the detector.

For the L.F. side really first-class transformers are generally to be preferred, though resistance-capacity coupling is very popular at present. If this latter is used it should be remembered that three resistance-capacity coupled stages are required to give the same volume as two valves coupled by first-class transformers. Choke coupling is another alternative, but has little to recommend it except cheapness. A choke can be regarded as an autocoupled L.F. transformer with a 1/1 ratio. The distortion due to the iron core will be about the same as that in a good transformer, but the amplification obtained per stage will be considerably less.

Switches

What switches are to be incorporated (if any) should next be considered. It is usually undesirable to employ switches between H.F. stages, but if two such stages are used it will be found very convenient to be able to switch out one or both of them for short-range work. At distances of under twenty miles or so they do not increase the strength of reception, but they *do* increase distortion, make the set more difficult to operate, and make it harder to prevent self-oscillation. On the L.F. side switches (provided a suitable type are used) are always an advantage.

"Super" Circuits

We have so far considered only straight circuits, and it must be left to the choice of individual constructors as to what methods they employ to stabilise the H.F. side if more than one stage of H.F. amplification is to be used in the set. When only one stage is used it is unnecessary to take any other precautions than carefully spacing the wiring and leads of the H.F. circuits.

When two H.F. stages are employed the simplest method of stabilising the set is to control the grid potentials of the first two valves by means of a potentiometer connected across the filament battery, making the grids just sufficiently positive to prevent self-oscillation. If desired, of course, one of the more elaborate methods of neutralising the effect of the stray capacities can be used.

If very easy tuning is required it will be better to be satisfied with a moderate range and to omit H.F. amplification altogether. The Reinartz circuit has great advantages from the point of view of simplicity of operation, as with this arrangement reaction can be adjusted without greatly affecting the tuning.

When a reflex circuit is being considered it should be borne in mind that this class of circuit is more suited to powerful short-range loud-speaker work than for covering very long distances. Though one or more valves are saved, this advantage is counteracted to some extent by increased difficulty of operation. And a reflex stage is *not* equal to separate H.F. and L.F. stages, as the more complicated wiring reduces the H.F. efficiency.

J. W.

"WIRELESS INVENTIONS THAT ARE WANTED"
(*continued from preceding page*)

of wireless is that of eliminating atmospherics. Numerous attempts have been made to rid reception of this bugbear, but have been only partially successful. The trouble is that although atmospherics have no definite wavelength, the shock they administer to a receiving aerial is so great as to set this oscillating at its own natural frequency. As this is the frequency of the signals which it is desired to receive, it is not easy to get rid of the atmospherics without completely obliterating the signals in addition.

H.F. Amplification

The present tendency to do without H.F. amplification on short wavelengths is quite the wrong way to tackle a problem. The ability to extend the range of a receiver almost indefinitely is too great an advantage to allow the difficulties of carrying out H.F. amplification on short wavelengths to be shirked for all time. Some day a system of H.F. amplification will be evolved wherein the present difficulties of preventing self-oscillation and capacity losses will be overcome without introducing other losses, as is the case in all the systems available at present.

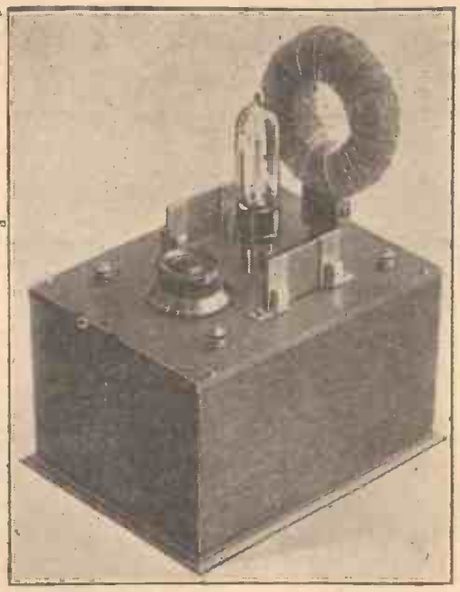
Selectivity

With the number of broadcasting stations increasing steadily, the need for selective tuning is becoming more pressing. True, almost any desired degree of selectivity can already be obtained, but in every case the tuning difficulties are greatly increased. This is not quite what is wanted. Some arrangement which will impart a very high degree of selectivity to a wireless set without complicating the operation of it would be a great boon to all users of long-range sets. It cannot be doubted that this problem will be solved at some not very distant date.

G. J. F.

THE "SUPER-UNIT"

A Unit that converts an ordinary set into an efficient Armstrong "Super"



Photograph of Complete Unit.

THE writer has long been of the opinion that for fairly short-range work the Armstrong super-regenerative receiver, when working properly, is ideal for the reception of broadcasting on the loud-speaker, but he is well aware that, from one cause or another, this circuit has attained more fame, and less popularity, than it deserves.

A Two-valve "Super"

One reason for its lack of popularity is undoubtedly to be found in the fact that the most attractive version, in which one valve only is employed, is undoubtedly tricky in operation, and has proved beyond the power of many to master. The two-valve type, however, in which a separate valve is used to supply the quenching oscillation or "whistle," does not present any great difficulties; it is, in fact, considerably easier to get a two-valve Armstrong working at its best than to get the best out of a receiver involving a stage of high-frequency amplification of conventional type. The Super-unit here described will convert any ordinary one-valve set into a two-valve Armstrong of a straightforward type.

Many who have managed to master the Armstrong circuit have been disappointed with its powers, which have been painted in rather glowing colours by some enthusiasts. Though it is perfectly possible to receive stations at a great distance, with this as with any other type of set, only the nearest station will normally give good enough reception for entertainment purposes; but to set against this limit of range, the signal strength obtainable is only limited by the capabilities of the valve, so that with a power valve of fair size good loud-speaking is obtained from the local station—at any rate, up to distances of fifty miles or so.

The circuit diagram of the two-valve receiver is shown in Fig. 1, in which V1 is the valve which combines the functions of high-frequency amplifier and detector, while V2 is occupied solely in generating the high thin whistle characteristic of all super-regenerative receivers. It will be seen on inspection of Fig. 1 that the circuit of V1 is simply a one-valve circuit of a type which is to be found already made up on every experimenter's table, and, further, that there is no connection between the two valves except the one lead from the bottom of the 1,250-turn quench coil to the outside of the grid condenser of the first valve, to which point the aerial is normally connected in a one-valve receiver.

The "Super-Unit"

It occurred, therefore, to the writer to make up a separate Super-unit embodying V2, the oscillator coils and condensers, and the radio-choke, so that the whole could be attached easily, when required, to the aerial terminal of a one-valve set which he already possessed, making a two-valve super-circuit; the necessity, therefore, of building up the Armstrong super as an entirely separate receiver was obviated.

In the matter of performance, no inferiority was shown by this method of construction when compared with a complete receiver wired up temporarily for preliminary experimenting, and the greater convenience is considerable.

The finished unit, as shown in the photograph, can be attached in a few moments to any ordinary one-valve set to convert it into an Armstrong super, without necessitating any alterations that will prevent the set fulfilling its original purpose. Furthermore, when once attached, the Super-unit may be left in position, it being only necessary when it is not required to refrain from lighting the valve.

The circuit diagram of the unit is shown in Fig. 2, and comparison with the full-circuit diagram of the complete receiver in Fig. 1 will show that it includes everything necessary which is not already to be found in an ordinary one-valve receiver. To facilitate comparison, the four terminals of the unit are marked on *both* diagrams as T1, T2, T3 and T4.

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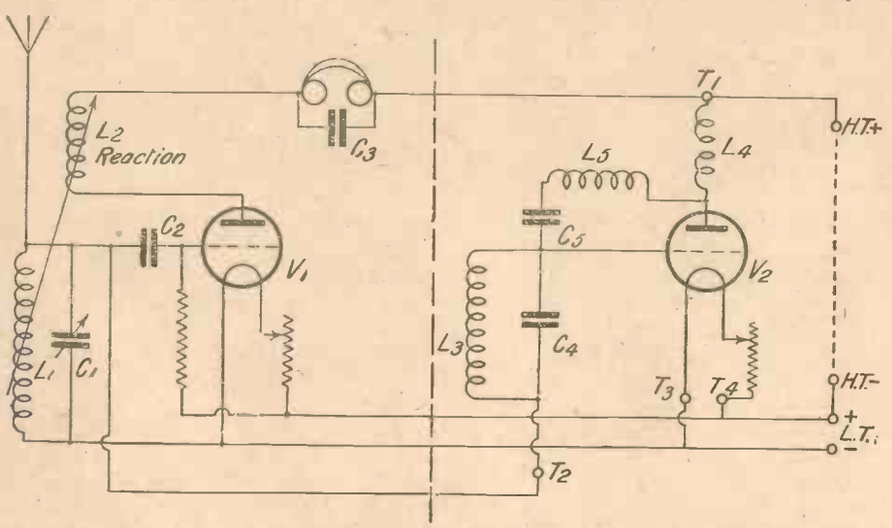


Fig. 1.—Circuit Diagram of Two-valve Receiver Embodying the "Super-Unit."

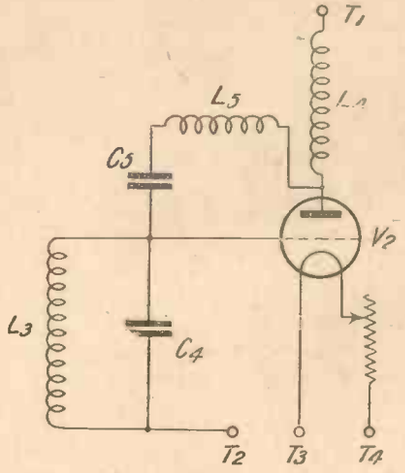


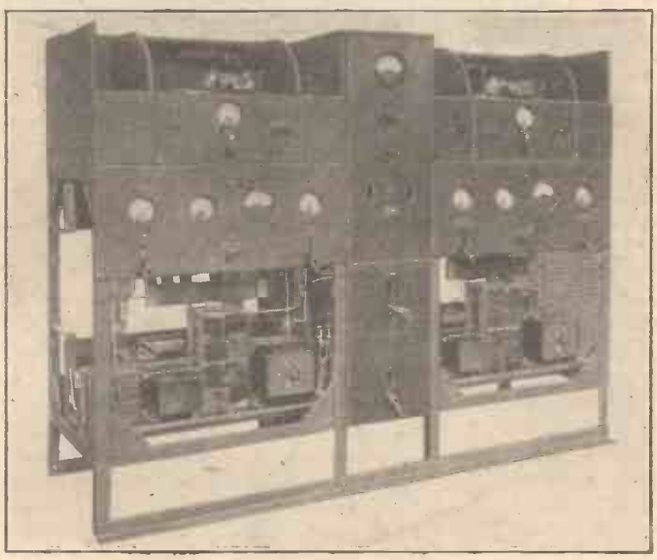
Fig. 2.—Circuit Diagram of "Super-Unit."

WHAT IS NEW IN AMERICA

An Electrical Voice for the Chorus Girl :: A Distinctly Novel Receiver

By LLOYD JACQUET

THERE has just been sprung on the American theatre-going public the greatest surprise for years. Florenz Ziegfeld has cleverly introduced electrical means of a special type of microphone. The electrical variations in turn are magnified hundreds of thousands of times, and are then brought to a huge cone loud-speaker which vibrates according to the electrical impulses, giving a faithful reproduction of the original studio rendition.



The "Electrical Chorus Girl" panel

The chorus of the review is synchronised with the record, and the illusion is perfect. As regards fidelity of tone the electrical voice is so good that its use even escaped the notice of dramatic critics at the first-night performance of the show, so real was the blending of the electrical and living voices and so good the reproduction.

"singers" in his latest musical review in order to assist the vocal efforts of his chorus and the instrumental rendition of the orchestra.

A huge sound-producing device is the basis for the electrical chorus. It is a giant replica of an improved type of gramophone operating from electrically cut records, and the sound is reproduced by the aid of amplifying valves.

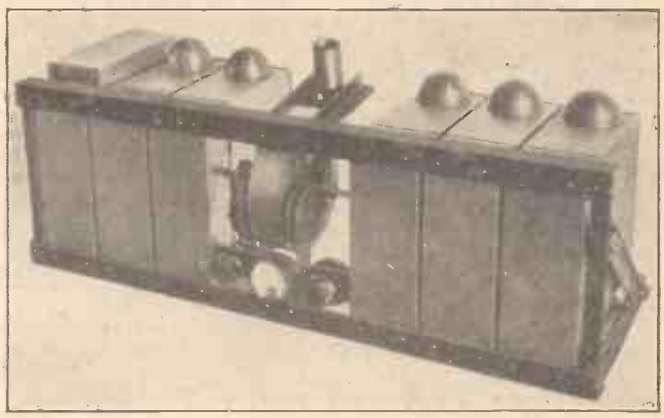
The records are made in the recording studio and transferred to the theatre; the indentations are transformed into corresponding ripples of an electric current by

A New Type of Receiver

The second photograph shows another distinct novelty. It is the interior of the Freed-Eisemann "800" —1927 Neutrodyne, with copper shielding for radio frequency stages and detector valve, and a steel compartment for audio frequency stages—all supported on a heavy angle-iron framework The set incorporates both the Hazeltine and Latour patents.

This eight-valve receiver may be operated with one hand by means of a uni-control mechanism in the form of a bakelite disc which, by virtue of a vernier-gear device, operates a gold-plated rotary drum bearing a pre-calibrated wavelength scale. This one tuning control takes the place of ten ordinary adjustments, and eliminates the necessity of expert knowledge in the operation of such an elaborate type of receiver. The set is always in tune for operation with the new form of neutralised frame aerial which is provided with it, or for any length of indoor or outdoor aerial.

Below the wavelength drum in the photograph can be seen the double-range high-resistance voltmeter, and to the left is the eight-position selector switch which allows the operator to see instantly the filament, high-tension and grid-bias voltages. Other special features are means of eliminating distortion and providing good selectivity.



The Freed-Eisemann "800" Receiver.

"THE 'SUPER-UNIT'" (*continued from preceding page*)

The coils shown as L3 and L4 in the two figures are the large oscillator coils necessary to produce the quenching oscillation already referred to; they may be a couple of honeycomb coils of 1,250 and 1,500 turns respectively. If it is preferred to use something less expensive, the two largest coils in a set of Oojah slabs may be substituted, at a cost of about one-quarter of that of the honeycomb coils; but there may be difficulty in some cases in getting a sufficiently powerful quenching oscillation with these, though the writer, using a small power valve, had no trouble on this score.

The coils incorporated in the Super-unit photographed were wound at home; they contain 1,250 and 1,500 turns of No. 28 and No. 32 d.c.c. wire respectively, and are wound as lattice coils on a 1-in. former. The winding is a heartbreaking task, and is not to be recommended save to those with an inexhaustible store of patience. The smaller coil L3 is tuned by the fixed condenser C4, which has a capacity of .001 microfarad; this gives a quenching oscillation of a pitch low enough to ensure good amplification and yet high enough to sound quite faint when the set is used.

The larger coil L4 acts as a semi-tuned choke for reaction purposes, reaction being obtained through the condenser C5, which may have a capacity of about .002 microfarad. It will be seen that in the unit designed by the writer both C4 and C5 are condensers of the plug-in variety, so that various values may be tried if desired. The coil L5 is a radio choke, and for reception on the broadcast wavelengths a 300-turn honeycomb coil is suitable. This coil, unlike the oscillator coils, has to be changed to suit the wavelength being received, and is consequently made to plug in in the conventional way.

The components necessary are as follows: Ebonite panel, size 8 in. by 6 in.; box to fit; two fixed condensers, with clips, .002 and .001 microfarad capacity respectively (McMichael); one filament resistance (preferably finely adjustable); one valve holder; one coil plug; four terminals; oscillator coils as described in text; also bolts, flex, tinned copper wire, etc.

A. L. M. S.

(*To be concluded.*)

A CONDENSER PANEL WITH MANY USES

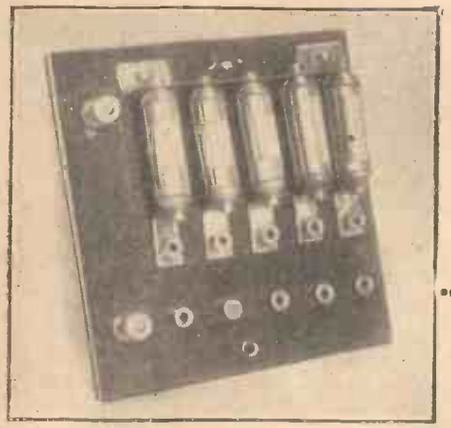


Fig. 2.—View of Front of Panel showing Condensers and Clips.

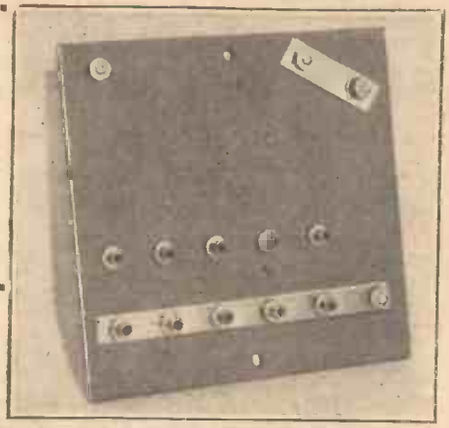


Fig. 3.—View of Back of Panel showing Sockets.

THE fixed condenser panel to be described will be found of great practical value to the experimenter. It will be found particularly useful as a tone-control unit for the loud-speaker.

Five fixed condensers of the K type, ranging progressively from .001- to .005-microfarad capacity, are connected as shown at A in Fig. 1, one side of each condenser being connected to a common lead which is joined to one of the "output" terminals T, and the opposite sides connected to a row of ordinary valve sockets. A second row of valve sockets, arranged as shown, are connected via a common lead to the other terminal, so that by using a simple two-pin plug B, with the pins connected together by means of wire or copper tape, any one of the five condensers may be brought into use, or by using two plugs any two condensers may be connected in parallel, and so on. As a further refinement, a plug may be arranged as shown at C with a fixed condenser joined to the two pins so that this condenser may be connected in series with any one of the five condensers.

The condensers, sockets and terminals are mounted on a small ebonite panel in the manner shown in Fig. 2. A back view of the panel is shown in Fig. 3. It will be seen that the top ends of the condensers (Fig. 2) are all joined to a single sheet-brass angle clip, which is attached to the panel by means of two small bolts, one bolt being connected via a short brass link to one of the terminals. The link is shown in the top right-hand corner in Fig. 3 and also at F in Fig. 4. The multiple angle-clip is cut out and drilled as shown at D in Fig. 4, the two feet being formed by simply bending the extensions to right-angles at the dotted lines. The distance between the holes for the bolts should be 2¾ in. The opposite ends of the condensers will, of course, each require a separate clip. These clips are arranged as shown at E in Fig. 4, bent to right-angles at the dotted line.

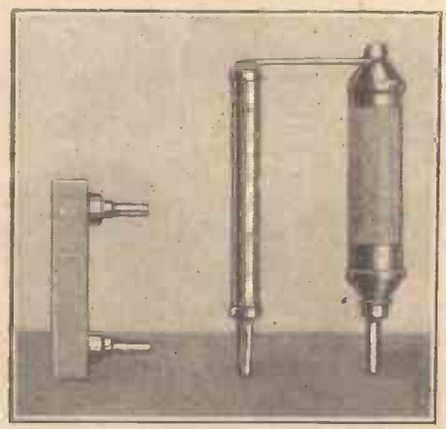


Fig. 6.—Short-circuiting Plug and Arrangement for Series Condenser.

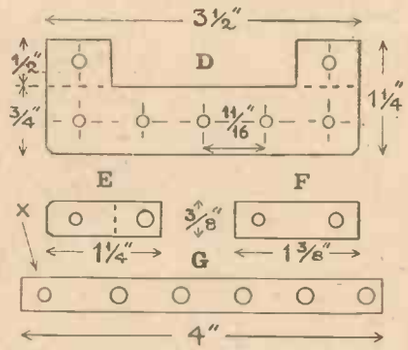


Fig. 4.—Details of Clips and Connecting Pieces.

Fig. 5 shows the panel layout, the two holes on the left being drilled to take the terminals, the holes along the top edge for the multiple clip D, and the ten holes in the lower portion for the sockets. The lower row of sockets and the lower terminal are all joined together by means of a sheet-brass strip G, Fig. 4, which should be about ⅝ in. wide and preferably marked off from the holes in the panel. The hole X is provided for the terminal.

The arrangement of the short-circuiting plugs or links is of little importance providing the pins are spaced correctly and that good electrical contact is made between them. The plugs used by the writer consist of short lengths of ordinary square-section brass slider rod, which are drilled and tapped to take the shanks of the valve pins. One of these plugs is shown on the left in Fig. 6. The plug for the series condenser may also be arranged according to taste, two clips being screwed one each side of a small ebonite block in the orthodox way, or special pins made to connect direct to the condenser. The arrangement adopted by the writer is shown on the right in Fig. 6, where a valve pin is screwed into one end of the condenser, and another soldered to one end of a short brass tube. One of the clips supplied with the condenser is flattened out, and the original foot is soldered to the other end of the brass tube, leaving the slotted portion of the clip to engage the screw in the upper end of the condenser; thus the distance between the pins may be adjusted if necessary. If the valve pin will not fit the thread in the condenser the shank should be cut off and the pin soldered to the head of the existing fixing screw.

There is practically no limit to the number of condensers which may be used should one require a more extensive range of capacities. The panel may be mounted on a simple baseboard or on a shallow cabinet as desired.

O. J. R.

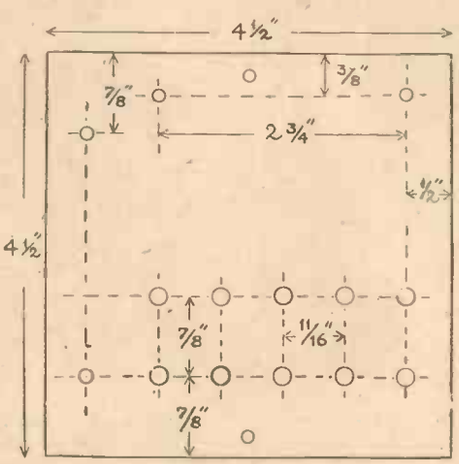


Fig. 5.—Drilling Diagram of Panel.

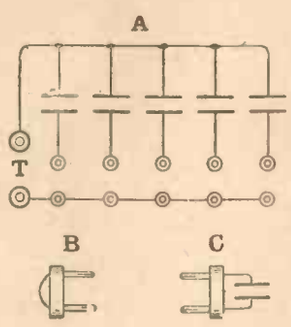


Fig. 1.—Diagram of Connections.

PRACTICAL ODDS & ENDS

Marking Ivorine

IVORINE is largely used in the construction of such devices as indicating tabs, name plates, directly-calibrated tuning condenser scales, and similar refinements, all of which entail marking the ivorine.

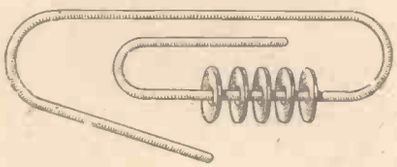
Other than engraving, which is rather out of the scope of the average constructor, the best medium for marking is indian ink, but by itself it is not very satisfactory, as it easily cracks and scales off.

However, a thin coat of celluloid varnish, which can be made by dissolving scrap celluloid in acetone or amyl-acetate, applied when the ink is just dry, will permanently fix the markings and give the surface of the ivorine a high polish.

B. H.

A Nut and Washer Tip

WHEN the space available for storing small parts is restricted, and articles such as nuts, tags and washers have to be kept in one or two boxes only, irrespective of size, it is possible to waste a lot of time in looking for a small part of unusual dimensions, even though one may

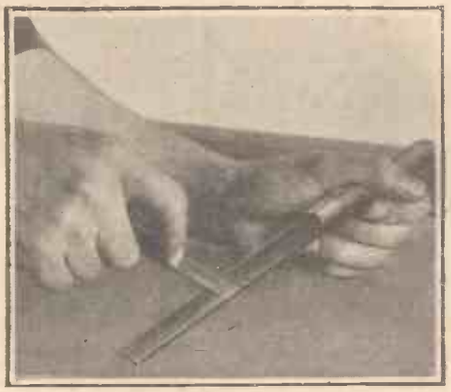


be sure that two or three such pieces are in the box, if they could only be found. A simple method of keeping different articles sorted in such circumstances is to string them, in the manner illustrated, on wire paper clips—6 B.A. nuts on one clip, 5 B.A. on another, 6 B.A. soldering tags on a third, and so on. H. P.

A File-cleaning Hint

HERE is a tip, little known outside instrument-making factories, for cleaning superfine files, which are so essential for putting a good finish on brass switch parts. Superfine files are very prone to getting clogged, and when their teeth are filled up with brass, instead of imparting a smooth finish they scratch the work, sometimes very deeply. Unfortunately the ordinary wire brush or "file card" is useless for cleaning superfine files.

To remove these filings obtain a small strip of sheet brass, the softer the better. See that it has a straight leading edge, and push it across the file in the direction of the teeth as shown in the photograph.



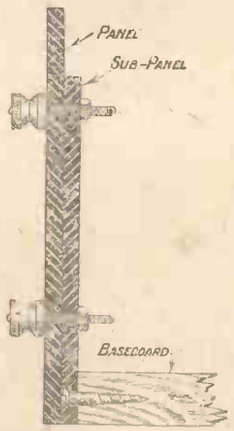
Method of Cleaning a File.

After one or two such movements the edge of the brass will be worn to the exact shape of the grooves across the file and every scrap of metal will be pushed out, leaving the file quite clean. R. B. H.

Mounting Vertical Panels

WHERE the good appearance of an American type of receiver is more than usually desirable, the use of woodscrews to attach the panel to the baseboard should be avoided.

A superior method of mounting the panel is to screw two or more small sub-



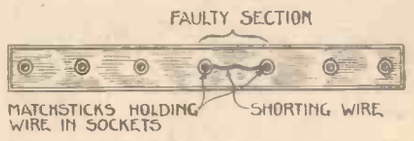
Mounting for Upright Panels.

panels to the baseboard, the number varying according to the length of the main panel. The woodscrews used should have countersunk heads. The small panels need not be more than 2 in. wide, and their position should be such that they coincide with the mounting holes of panel components, preferably terminals or other components with long mounting bushes. Similar holes should be drilled in the sub-panels and the components used to fasten the main panel to them.

Where the mounting bushes are at earth potential, stout sheet brass instead of ebonite may be used, permitting components with shorter mounting bushes to be utilised. B. H.

H.T. Battery Running Down

THOSE who use the block or slab type of high-tension battery, with the tapped points, often find that the set will emit crackling and howling noises even when the voltage recorded by a meter placed across the two outside terminals does not show any great drop from the initial value when the cell was new. If the voltmeter is placed across each tapping in turn, that is to say, so that the voltage of each section is read, then in the majority of cases the fault will become apparent, and a particular section will be found to be absolutely run down. The remedy is, of



Faulty H.T.B. Section Shorted.

course, to short circuit the faulty section by connecting a piece of wire across it and then using the battery in the ordinary way. It sometimes happens that the amateur does not possess a number of the small connecting or wander-plugs which are used for making the connection; a good tip is to wedge in the piece of wire, as shown in the sketch. This is used for short circuiting with the end of a match stick. A. H. H.

PORTABLE SETS

WHEN building a portable set, the accumulator should always be partitioned off from the rest of the set, as the fumes from the acid will very quickly corrode the wiring and components unless this precaution is taken.

In the case of dry batteries, of course, this is unnecessary, but they should be secured firmly in place, otherwise they will break loose and cause damage.

D. A. S. H.

On Your Wavelength!

Experiments in High-frequency Work

THERE still remains much to be done in the matter of improving our existing methods of high-frequency amplification. Probably many of my readers have long ere this experimented with this fascinating aspect of wireless, and have confessed to themselves inwardly that it is not so simple as it appears on the surface. Rarely does one find a multi-stage high-frequency amplifier of the straight variety—that is, with no stunt—which, valve for valve, does its full quota of work. An extremely sensitive amplifier of this description is to be prized, and if it is both sensitive and stable in manipulation, then the designer has hit upon a very lucky combination.

Unfortunately for us the two ingredients of stability and sensitivity do not go at all well together in the broadcast receiver, and he is a fortunate man who can combine the two. A matter which has always to be contended with is the fact that maximum efficiency cannot be obtained in such a set unless the neutrodyne system of stabilising is resorted to, for a high-frequency set which has a very low resistance to alternating currents is a very difficult thing to work and one which is likely to cause much heartburning amongst one's neighbours.

The Troubles of Uncle Sam

I hear from America that they are having rather a hectic time over there just now in the way of broadcasting. It all happened like this. The United States already had something like six hundred stations, and another six hundred or so were dying to start operations. The authorities refused licences to these on the ground that enough is as good as a feast. It appeared that existing laws gave them power to control problems concerning the number of stations and their wavelengths. A little rift within the lute was caused by one station which, in defiance of all prohibitions, started to broadcast on a wavelength already belonging to somebody else, defying the authorities to stop it. A lawsuit took place, the outcome of which was a decision that the authorities had no power to prevent would-be broadcasters from broadcasting or existing broadcasters from changing their wavelengths just as they liked. At the present time, then, American wireless enthusiasts are beginning to wonder whether they really like hearing four or five programmes superimposed upon one another. They will have to go on wondering for a little while, since nothing can be done about it until Congress meets in the autumn and evolves new legislation on the point. Meanwhile confusion is becoming worse confounded. Stations are collaring each other's wavelengths, and the only way for any transmission to get through is for it to make more noise than the others. I gather that complaints about the monotonous nature of the programmes are not being received at the broadcasting stations in New York and other American cities!

Wireless and Weather

Rather an extraordinary title, and one which may lead readers to think that I am about to discourse on statics again, but I hasten to assure you that such is not the case. What I really want to do is to refer to the belief which is rapidly gaining ground that the weather also affects wireless in ways other than by the creation of atmospherics. It is held in some circles that the clouds play a large part in diverting wireless waves away from their natural path, and that, moreover, they have an effect on the Heaviside layer which plays havoc with the generally accepted theory that waves of a certain length are reflected by it. Also many amateurs declare that when working on short waves in a room the atmosphere of which is fairly well charged with tobacco smoke, signals rapidly become weaker as the smoke becomes denser.

Whether these theories are correct or not I am unable to say, but there is no doubt but that the general state of the weather can and does have a peculiar effect upon the travelling propensities and directive properties of signals transmitted on certain wavelengths. It may take many years to establish a direct connection between the cause and effect of night fading, night distortions and similar phenomena, but when eventually this has been done I should not be surprised to find that the state of the weather plays an important part in the conclusions.

H.T. Batteries and their Work

Sometimes when I am faced with some of the large multi-valve sets which are rapidly becoming popular owing to the reduced prices of valves, I wonder whether the owners fully appreciate the enormous expenditure which is entailed in running them owing to the large amount of energy taken from the H.T. battery. Several times of late I have been called in to doctor sets of this description which hitherto had given excellent results, but which, for some reason unknown to the owners, had now ceased to deliver the goods in their usual fashion. In each case the root of the trouble was the fact that the H.T. battery had passed its final milliamp after a very brief period of existence of about two months. Those persons who are contemplating the construction of such sets would be well advised to obtain specially large H.T. units, or alternatively a set of H.T. accumulators should be installed. These latter will save the original extra expenditure a hundred times over in the course of a few years, and the owner will always be sure of getting the best out of his set. Although the expense may seem great, the extra expenditure is a trifle when compared to the cost of the necessary parts for a large set consisting of from five to six valves.

A Curious Happening

For some little time I had been rather dissatisfied about the performance of the high-frequency side of a set which I employ a good deal for long-distance work. So far as I could see there was nothing at all wrong with it, but whenever I brought it into use the ether seemed very dead, though another set might find it quite lively. Then it occurred to me to take the curves of the H.F. valves, which are anti-capacity dull-emitters that have been in use for a very long time. What I found was that the emission of each valve was down to something less than half of what it had been, which accounts for everything. But I really cannot blame these particular valves for not standing up to their work, since most of them have been in pretty regular use for over three years.

Even the best of valves of the dull-emitter class wears out in time owing to a gradual dissipation of the surface coating of the filament. You can sometimes restore ancient dull-emitters to their old vigour by giving them a long run with the H.T. supply switched off or by flashing them, which means applying ten or fifteen volts to their filaments for a fraction of a second at a time by making a brushing contact with a piece of flex. If you have a set that is showing signs of sluggishness you may find it a good tip to try the effect of placing a new valve in each holder in turn. Old dull-emitters, by the way, so long as their filaments are intact, can still be used as bright valves, in which condition they will often give a respectable period of further service.

Expensive Economy

I have a friend who is a great believer in economy, though lately he has had some rude shocks which are making him begin to wonder whether after all the cheapest is really the best. One of these occurred not long ago when he purchased a particularly cheap cabinet for a five-valve set that he had just made up. He showed me the thing shortly after he had unpacked it, and I must say that, apart from a general appearance of flimsiness, it did not look too bad; but when I saw it about ten days

On Your Wavelength! (continued)

later it was looking about as bad as a cabinet can look. The weather that we have been having this summer has doubtless been a little trying; but I do not think that a cabinet standing in an ordinary living room should sag right down in the middle like an aerial that badly wants hauling up. Nor do I feel somehow that the lid, abhorring, like nature, the straight line, should curl up like a potato crisp. And it is really rather a nuisance when you have got the set into its cabinet to find that you cannot remove it again owing to the fact that the contortions of the latter have caused it to grip both the main panel and those which support the terminals so firmly that nothing but a case opener will separate them. The cabinet is still engaged in warping, and if it continues to do so at the present rate of progress it will probably be inside out by the time that these lines appear in print. If, therefore, you are contemplating the purchase of a new cabinet I would strongly advise you not to try to save a few shillings by purchasing something cheap and probably very nasty, which sooner or later is absolutely sure to give you trouble.

Have You Heard Them?

Though Russia has at the present time quite a number of broadcasting stations, one does not often come across people in this country who have managed to pick them up either by accident or design. Published lists show that there are now nine fairly regular transmissions, four of these being on the longer waves between 900 and 1,400 metres, three on the ordinary broadcast band, and two, those of the Popoff (we will hope it won't!) station at Moscow on 79 and 25 metres. During the summer I have come across one or two of them, though generally they are a little disappointing as regards signal strength in view of their high power rating.

Moscow Central is a 12-kilowatt station, whilst most of the others have 2-kilowatt plants. The 420- and 450-metre transmissions are quite worth trying for at times; they come in well. Both of these are at Moscow, and they are therefore about as far away from this country as any stations in Europe. They are not difficult to identify, since the Trade Union station on 450 metres comes in between Leipzig and Stuttgart, whilst Radio Peredatcha is just below Glasgow. If, therefore, you hear when your tuning is adjusted to these positions speech in a rather spluttery language which is not German you may feel pretty sure that Moscow is calling. You can make quite certain by tuning in just before closing-down time when the bells of the Kremlin are usually relayed. The programmes contain some very good music at times, though enormous chunks of them seem to be given up to speechifying.

The Holiday Season

Just at this time of year there are generally letters in the papers reminding those who are off for their holidays to make arrangements for their pussy-cats before they depart. I do not therefore see why I should not remind my readers to give their wireless sets a passing thought ere they start for the sea. Last year neighbours of a friend of mine were puzzled after his departure by strange noises which came from his house. Though the place appeared to be empty, sounds of revelry were heard by night, and at intervals the sound of human voices percolated through the closed doors and windows. Eventually members of the local police force broke in to investigate, and found that the receiving set had been left switched on. As the valves were of the .06 type, it had continued to function quite happily for rather more than a week, though the high-tension battery was showing signs of becoming a little tired. What I want to say then is, don't forget to switch off your set, and whatever else you do, remember to earth the aerial. Having done these things you may go away with an untroubled conscience.

G. B. S.

I was more than sorry that the irrepressible Mr. George Bernard Shaw could not be broadcast the other night because he declined to refrain from saying anything that might be of a controversial character. Can you imagine Mr. Shaw saying anything that was not? I am quite sure that when he says "How do you do?" or "Good morning" there is something distinctly controversial about his remarks or the way in which he makes them. G. B. S. did, as a matter of fact, broadcast some little time ago, when he gave us one of the best "turns" that we have ever had before the microphone by reading one of his own short plays. I always hoped that he would do this kind of thing again, and now that it has been discovered that he cannot be let loose before the microphone when making speeches, perhaps the B.B.C. will endeavour to persuade him to give us another reading.

The Wireless Exhibition

I am very glad to hear that the Wireless Exhibition is to be held this year at a time when schoolboys will be able to attend. It opens on September 4 and continues to the 18th. As most of the schools do not return until the second or third week in September, one can be pretty sure that boys will attend in droves. Boys are amongst the keenest of wireless amateurs. Myself, I have three of my own ranging from ten to fifteen, and each of them has his own home-made set. Some of the best home-made receivers that I have seen have been turned out by youngsters, who nowadays have a pretty good knowledge of wireless theory and practice, and will take any amount of trouble over making sets. I see that the exhibition space is already nearly booked up, and as this year it is open to all wireless traders, the show should be the best and most representative that we have ever had.

Opinions Divided

I notice that there is a certain amount of opposition amongst a section of listeners to the idea of providing alternative programmes for the London area from stations working within the radius of the 300-500-metre band. Those who are against the scheme are afraid that should it mature they will be unable to receive any other stations but those that are almost on their own doorsteps. I have an idea that many of them base their objections upon the belief that the two stations for London are to be present 2LO and Marconi House. Whatever happens to the Oxford Street plant, one can say quite definitely that regular broadcasting will not be done from Marconi House. Transmissions from this station interfere seriously with radio work at the Air Ministry.

It is more than likely that when we do get alternative programmes for London they will be transmitted from stations situated a long way from one another, and placed probably right outside the suburbs. With the two stations but a mile or so apart, as was the case during the recent tests, it may be very difficult to separate their transmissions or to hear anything of the other stations upon the broadcast waveband. But if they are situated many miles from one another, one of them, perhaps, well to the north and the other right away to the south, then these difficulties will be largely removed.

All the Difference

We wireless folk are curious people. Not long ago a friend of mine spent the best part of an evening in inveighing against our home programmes. What particularly stuck in his gizzard was the amount of jazz music (he did not call it music) that was provided. As for him, he said, he never listened to the stuff; he switched off at once as soon as it was turned on. A few nights later there was a violent ring at my front-door bell and the said friend was ushered in in a great state of excitement. "Come round at once," he cried; "it's simply *marvellous*." I went. As we entered his door I heard unmistakable strains of dance music. In his den the loud-speaker was pouring out "Barcelona" and "Valencia" and things like that, accompanied by about a dozen different morse signals. "Isn't it *beautiful?*" said my friend. "Do you realise that that's Rome?" Well, I suppose that distance lends enchantment. THERMION.

"A.W." TESTS OF APPARATUS

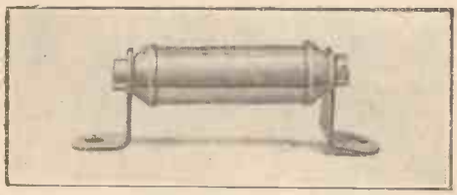
Conducted in the "Amateur Wireless" Research and Test Department

The Wates "K" Fixed Condenser

WHERE it is necessary to use a condenser taking very little room, the K-type fixed condenser made by Wates Bros., Limited, 13-14, Great Queen Street, Kingsway, W.C.2, will serve the purpose admirably. The photograph will make it clear that when it is not desired to mount the component on the panel it may be incorporated in the wiring by joining the wires directly under the terminal screws at each end.

Constructed under a new principle, it is claimed that the accuracy is greater than that of the usual type of condenser with flat plates.

The actual construction is somewhat novel, as celluloid is used instead of mica for the dielectric, and the plates consist of two long strips of copper foil rolled up into the form of a tube, with the celluloid between each. Solid brass end-pieces are provided, and these are fitted with screws for connection purposes. The condenser is very compact and should certainly appeal to the home constructor.



Wates K-type Fixed Condenser.

It is made in the following capacities: .0001, .0002, .0003, .0005, .001, .002, .003, .006 microfarad.

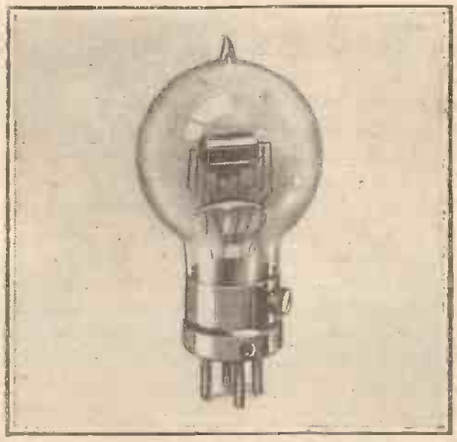
The clips allow of either panel or baseboard mounting, and they are provided with slots so that it is but a moment's work to slacken the screws and slip another condenser into place if it should be desired to alter the capacity in the circuit.

The Tetrode Valve

RECENTLY we have been testing out some circuits embodying the four-electrode valve, the actual valves used being the Philips Tetrode, supplied to us by Ameloy Products, of Camomile Chambers, Camomile Street, London, E.C.3.

Judging from the results obtained it is remarkable how little the double-grid valve is used in this country. As a detector it surpasses *by far* the ordinary three-electrode valve, and the amplification obtained was so great that there was little difference to be noticed between a receiver using two three-electrode valves and one using a single four-electrode valve.

The Tetrode valve contains four electrodes, two being grids, the outer or control grid and the inner or auxiliary grid. The latter enables the valve to be used with an extremely low plate voltage,



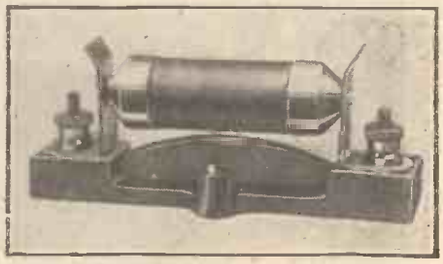
The Tetrode Four-electrode Valve.

necessitating the use of only a very small H.T. battery. In the design of portable sets the weight of the batteries is a very important consideration, and the four-electrode valve is thus especially suitable for portable sets. Moreover, it may be substituted in place of any existing three-electrode valve without rebuilding or rewiring the apparatus.

The filament, plate and control grid are connected in the ordinary way to the four pins of the base, whilst the auxiliary grid is connected to a small terminal mounted on the cap. The valve may therefore be inserted in, say, the detector-valve socket, and the small terminal on the cap connected to a tapping of the H.T. battery, applying not more than 10 volts to the inner grid.

Mullard Wire-wound Resistances

THE Mullard wire-wound resistance, manufactured by The Mullard Wireless Service Co., Ltd., of Nightingale Lane, Balham, London, S.W.12, is made in two standard



Mullard Anode Resistance.

values of 80,000 and 100,000 ohms, other values being made to specification.

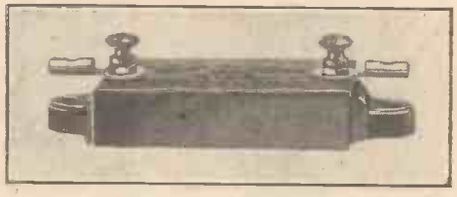
The advantages of a wire-wound resistance suitable for insertion in the anode circuit of a valve for resistance-capacity amplification are not hard to find. With the old-fashioned paste or powder resistance a noisy amplification was obtained due to the slight change in resistance of the paste or powder. The actual value of the resistance also depended on the temperature and the humidity of the atmosphere.

On the other hand, a resistance consisting of wire must always have a constant value, and may be manufactured to give a definite constant resistance value accurate within a small percentage to the stated value.

In this respect the Mullard resistances gave values within 3 per cent. of the rated values, and this accuracy is maintained under all conditions of reasonable use. Each resistance is contained in a cartridge type of case, mounted between metal clips bolted by large terminals to a moulded insulating base.

Efesca Fixed Condenser

THERE are several points worthy of notice concerning the fixed condensers manufactured by Falk, Stadelmann and Co., Ltd., of Efesca Electrical Works, 83 to 93, Farringdon Road, London, E.C.1.



Efesca Fixed Condenser.

Each condenser is manufactured by precision machinery, ensuring that the capacities of condensers having similar rated values are always constant. The mica is measured for thickness by a micrometer and for size by a steel gauge, and the plates and mica strips are clamped tightly together by an enclosing brass case. Each condenser is then tested on a capacity bridge, after which it is inserted into the moulded case and hermetically sealed. A further test on the capacity bridge is then made.

The result of all this is to produce a fixed condenser having a capacity that is within very fine limits of the stated value, and the construction is such that neither time nor climatic conditions will have any effect on the electrical characteristics.

The new scheme of European wavelengths adopted by the *Union Internationale de Radiophonie* at its last meeting will take effect on and from September 15.

The Zworykin Photo-electric Cell.

A STEP TOWARDS TELEVISION

Interesting Details of the Zworykin Photo-electric Cell

THE main problem to be solved before television becomes an accomplished fact is the production of a device which will treat a shadow as the microphone does a whisper. The photo-electric cell is apparently the important link in the chain of developments which will lead to the perfect transmission of complete scenes by radio.

The fundamental principles of the photo-electric cell were discovered by Hallwachs, a German physicist. These principles are based on the fact that certain metals give off electrons when their surfaces are illuminated. Generally an alkali metal is employed, such as potassium, sodium, caesium, rubidium or lithium. The photo-electric cell had been merely a scientific curiosity, employed only in minor processes of an experimental nature, until Dr. V. K. Zworykin, a member of the research staff of the Westinghouse Electric and Manufacturing Co., of East Pittsburgh, Pa., put the current obtained from the photo-electric cell to work in an instrument which brings television much nearer fulfilment. This was only accomplished after two years' experimenting.

Photo-electric Cell and Valve

Dr. Zworykin, in achieving the conversion of light waves into electrical power, has made an extremely sensitive mechanical agency, which is a combination of a photo-electric cell and what is practically a standard thermionic valve, such as is used in broadcast reception. The device is so responsive to light changes that smoke as faint as a whiff from a cigarette passing between the source of light and the instrument can affect the energy-giving properties of the photo-electric cell. Variations of light falling on the instrument instantly produce variations of electrical current, which may be amplified by the ordinary valve section of the instrument.

The bulbous end of the photo-electric cell is coated with potassium hydride, which throws off showers of electrons when light falls on it. Any variations in the light vary the intensity of the electron shower. If the light is weak, the shower is feeble; if the light is strong, then the emission is heavy. In order to prevent the light from the filament falling on the sensitive film of alkaline metal the filament is operated at a temperature below visual emission. As a further protection metal shields are used to cover the filament. By the combination of valve and photo-electric cell the current resulting from light falling on the cell is amplified before it leaves the valve.

The Westinghouse Electric and Manufacturing Co. are experimenting with a system for broadcasting pictures with this new valve as the basis of the system. Dr. Zworykin has pointed out that all the processes necessary for television are already in existence. "The theory is all right," he said, "but at present the apparatus would be cumbersome and uncertain. But it will be simplified. It will take some years, but we shall eventually have the instantaneous or nearly instantaneous transmission of motion pictures."

Extreme Sensitivity

The reaction of the Zworykin valve to light variation is extraordinarily rapid, being approximately one-hundred-thousandth of a second, and since, when incorporated in a suitable circuit, it will send out radio impulses of any desired frequency in direct proportion to the amount of light falling upon it, it has opened the way for the development of television.

In addition, Dr. Zworykin's valve has a number of other practical uses. It can be utilised as a fire-detector and alarm in the holds of ships and other unattended places, for measuring the lights of celestial bodies, and the conversion of printed words into audible sounds so that the blind may read by ear.

F. C. L.

Tests being carried out with the Zworykin Photo-electric Cell.

CHECKING RECEIVER CONNECTIONS

IT is a very easy matter in wiring a complicated multi-valve receiver, especially one employing switching, to omit or make a wrong connection; and as the fault is often correspondingly difficult to locate, the necessity of a systematic method of checking is obvious.

The following method is to be recommended, being quite simple and practically infallible: Put the circuit diagram or blueprint from which the set has been wired on one side, and from the receiver itself draw another circuit diagram, without taking anything for granted, exactly as given by the wiring.

Comparison between this circuit and the original diagram will indicate any faults and their location.

B. H.

INSULATION

MOST people interested in wireless or electricity know that all metals are conductors of electricity in varying degrees, according to their composition and the nature of the electrical impulse to be transmitted. An insulator may broadly be said to be a substance which resists the passage of an electric current. It is essential to realise, however, that the resistance offered not only depends on the substance itself, but, as in the case of conductors,

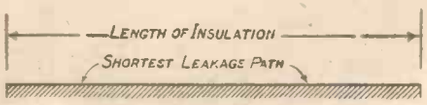


Fig. 1.—Example of Insulator with Short Leakage Path.

the nature of the electrical stress applied across it. We must therefore consider the nature of the electric current to be dealt with in taking into account suitable insulation for any particular purpose.

In ordinary commercial electrical engineering large powers are to be dealt with, and whilst, in Great Britain particularly, very high standards of efficiency are recognised, in the interests of safety and economy, yet the limits worked to are not nearly good enough to satisfy the requirements of wireless engineering, where often very minute currents are to be dealt with, and only the very smallest percentage of loss is permissible.

In considering insulation we may divide the electrical currents to be dealt with into two groups:

(1) Direct current and low-frequency alternating current.

(2) High- or radio-frequency alternating current.

Dealing with direct current first. The amount of leakage taking place depends directly on the nature of the insulation used, the length of the path (or thickness of insulation) between conductors, and the voltage or potential difference set up across it.

It is therefore possible to compile a table (see below) giving the breakdown voltage or dielectric strength of materials to be subjected to D.C. potentials. These, though, are bound to be only approximate, since the nature of the insulation (electrically) may be varied by factors such as the amount of moisture present in it.

Materials which are hygroscopic (readily absorb moisture) are naturally not as suitable for insulation as non-hygroscopic substances. Often, however, they can be rendered suitable by impregnating or saturating them with paraffin-wax or other suitable insulating substance. A common method of doing this is to immerse the substance in boiling paraffin-wax, the heat driving out the moisture and the wax filling up all interstices. It is obvious that to be effective the boiling must occupy some hours in the case of thick or hard substances in order to ensure saturation.

Material	*Dielectric Strength: Volts, per cm. thickness*
Air	38,000
Paraffin oil	80,000 to 100,000
Transformer oil ..	75,000 ,, 150,000
Paper	14,000 ,, 80,000
Paraffin waxed paper	300,000 ,, 400,000
Paraffin wax	130,000 ,, 150,000
Glass	130,000 ,, 270,000
Ebonite	280,000 ,, 500,000
Mica	300,000 ,, 2,000,000
Slate	2,000

The insulation is further dependent on the nature of the surface of the material. In effect this is really due to the fact that (assuming absence of any foreign substance) the effective length of the leakage path is altered. If a matt or rough surface is examined microscopically it will be seen to be considerably "pitted." A smooth substance, on the other hand, has the "pitting" present to far less degree.

We may illustrate the two cases as where the corrugated surface represents the "surface leakage path" to an electrical current. The path to be traversed is obviously longer than that between two equally distant points on a dead smooth surface, and therefore the resistance is higher (Figs. 1 and 2).

For the usual purposes of broadcast reception the D.C. potentials to be provided for are not likely to exceed 200 to 300 volts, even where large power amplifiers are used. As long, therefore, as the precaution is taken to avoid substances which can easily absorb moisture, there is considerable latitude in the choice of materials available.

To turn now to high- or radio-frequency currents. The losses may be classified as follows:

(1) Direct insulation resistance of the substance (D.C.).

(2) Dielectric losses.

(3) Loss due to phase difference of the material.

The first-named remains practically constant independent of frequency, but cannot be considered thus, since 2 and 3 then enter the question and have very considerable effects.

Provided, therefore, that the insulation to D.C. of the same voltage is satisfactory, the material will be suitable if the losses due to 2 and 3 can be kept low.

Dealing now with the second (2), if we assume the frequency to be exceedingly high, it will be obvious that if the conductors are of large area opposed to one another as in Fig. 3, this arrangement will form a condenser, the capacity of which depends upon:

(1) The area of the "plates"; (2) the distance separating them; (3) the dielectric material.

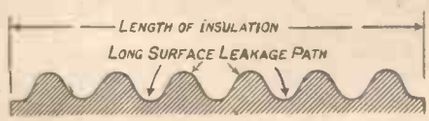


Fig. 2.—Example of Insulator with Long Leakage Path.

If any substance other than air is introduced between the "plates" as a dielectric, the capacity of the condenser will be increased. The amount of current (in this case representing leakage) which will flow depends on the reactance or "resistance" of the condenser. The latter may be calculated from the formula:

$R = \frac{1}{2 \pi FC}$ ohms, where $\pi = 3.14$, F = frequency and C = capacity in farads. An increase in either F or C, or both, will lower the reactance and increase the current flow, the current being equal to $\frac{\text{Voltage}}{\text{Reactance}}$ in the case of a simple condenser in an A.C. circuit.

Now in the case of any given H.F. circuit in which we desire to introduce insulation, the factors F (frequency) V (voltage) remain fixed, and C (capacity) is the only variable factor within our control. We have seen above that C governs the reactance, and a constant K governs C, as also does the area of the opposed conductors. In the table given above values of K are shown for various dielectric materials.

DIELECTRIC CONSTANTS

Material	*K*
Air	1.0
Mica	4 to 8
Ebonite	2 to 4
Bakelite	5 to 7
Silk	4.6
Paper	2 to 4
Transformer oil ..	2.5
Castor oil	4.7
Celluloid	7 to 10
Wood	3 to 6

Suppose a given condenser with air dielectric has a capacity of 1 microfarad. If ebonite, for instance, is substituted as a

dielectric, all other factors remaining the same, the capacity will be increased two to four times. Thus, though not in itself a source of loss, the dielectric constant of the material introduces losses by adding to the capacity and absorbing power.

The arrangement in Fig. 4 shows an improvement over that in Fig. 3. The area of the conductors opposed to one

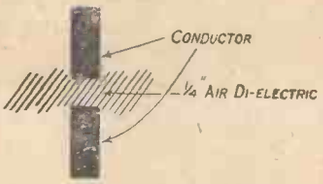


Fig. 4.—Small Dielectric Capacity.

another is reduced to a minimum, and since air forms the dielectric, the capacity is reduced as far as is practicable.

This principle is applied to certain valve holders designed for high frequencies where the ebonite or other insulating material is drilled out between the sockets, thus providing an air space between.

The reduction of the thickness of the dielectric material, however, will not necessarily reduce the losses. Reducing the thickness of dielectric causes a concentration of the field of force acting between the two conductors, the lines of force being crowded into a much smaller cross-sectional area.

This raises an interesting study in connection with the practice of fitting small ebonite or other insulating bushes to insulate variable condensers. We are, therefore, in a vicious circle, and attention should rather be given to the dielectric properties of the material and reduction of area of opposed conductors than to reduction of dielectric mass. The use of Pyrex glass (the electrical properties of which are excellent) for condenser and other insulation is definitely, therefore, not a fad, but an effort to reduce losses to an absolute minimum. Unfortunately, however, its advantages for variable condensers are generally nullified, because we cannot reduce coil losses to such a proportionately high degree.

We now come to the third consideration

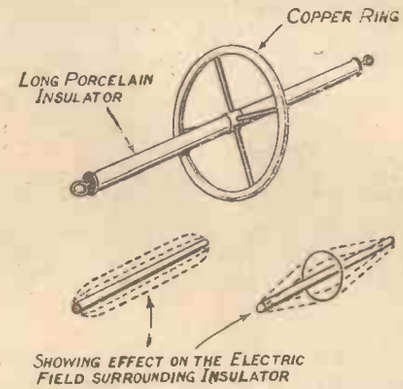


Fig. 5.—Example and Effect of Corona Ring.

—phase difference of the material. This is not easily explained, but it is well known that in an A.C. circuit containing capacity the voltage and current are 90 degrees out of phase, the current leading the voltage. A certain phase displacement takes place in the case of insulators due to the imperfect nature of the dielectric substance and the fact that a certain current flow is produced. This phase displacement manifests itself in the form of heat. It is interesting to note that otherwise good materials are not always the best from the point of view of low phase angle difference. In large transmitters where very heavy high-frequency currents are handled, it has frequently been found that ebonite and other materials become so heated as to actually set up combustion. Various kinds of woods have proved the most satisfactory material in such respect, particularly those whose nature is more cellular (softer), enabling

Fig. 3.—Large Dielectric Capacity.

thorough and effective drying, and, in the case of woods immersed in paraffin-wax or similar material, more complete impregnation.

Reverting to what has previously been said regarding the concentration of field in a dielectric substance, an interesting method of reducing the losses is to be noted in the application of "corona shields" to aerial insulators used for high-power transmission, such, for instance, as those in use at Rugby. The shield comprises a tubular copper ring surrounding the insulator and held away from it by a "spider," the whole arrangement being as shown in Fig. 5.

The presence of the conducting ring has the effect of distorting the field so that it is more evenly distributed over the space between the ends of the insulator, thus reducing the number of lines of force in the insulator itself and the electrical strain set up.

R. B.

FACTS ABOUT DULL-EMITTERS

A LARGE number of amateurs are unaware that there are two main types of dull-emitter valve manufactured in this country. The first of these is the coated-filament type of valve. Examples of this class are to be found in the Cossor dull-emitter, certain types of the Mullard series, and also in the Wecovalve. In the main this type consists of a thin strip of platinum or some other suitable core which has been coated with an oxide of barium, calcium, or strontium. In general this type of filament runs at a temperature of 1,000 to 1,500 degrees K. This compares very well with the temperature of 2,200 to 2,500 degrees K of the ordinary bright-emitter valve.

The second type of filament is the thoriated type of dull-emitter. Examples of this class are to be found in the DER and DE5 types of valves. For this type the very highest degree of vacuum is required or the emission will very quickly fall off. In order to obtain the high vacuum it is usual in most dull-emitters of this class to use a chemical agent to assist in exhaustion. The most common of these agents used is magnesium, and this is welded to the anode of the valve, and at one stage of the manufacture the anode is heated and the magnesium is thus volatilised. The use of magnesium in a valve can be detected by the silvery, mirror-like deposit on the bulb.

Magnesium is more electro-positive than the thorium in the filament, and any gas in the valve will tend to combine with the magnesium rather than with the filament. Thoriated filaments will give a relatively large emission at 1,500 to 1,900 degrees K if they are specially treated in the course of manufacture. This special treatment consists in the main of raising the filament to 2,900 degrees K for a minute or two, followed by a slight forming process running at 2,250 degrees K.

A. H. H.

The new 15-kilowatt broadcasting transmitter, erected on behalf of the Lettish Posts and Telegraphs, is now effecting nightly tests on wavelengths varying between 2000-2,600 metres. The call is: Hallo. Hallo. Radiotéléphonie Kovno.

WHAT IS LOUD-SPEAKER STRENGTH?

IT has happened to everyone at one time or another to meet an enthusiastic friend who tells him that he receives some station on the loud-speaker either with a crystal or with an incredibly small number of valves. On going for a demonstration one often finds that the friend's idea of loud-speaker strength is not quite one's own.

It is a pity that there are no standards by which one can go in measuring loud-speaker strength, and undoubtedly it would be a good thing if something like those indicated below were generally adopted. Bare loud-speaker strength: every word (speech is much more reliable than music for testing purposes) clearly audible at not less than six feet; loud-speaker strength: clear audibility at fifteen feet; full loud-speaker strength: clear audibility at fifty feet; big loud-speaker strength: clear audibility at one hundred and fifty feet and over. We might possibly adopt such terms as L.S.1, L.S.2.5, etc., the figures representing the tens of feet at which speech can be clearly heard.

J. H. R.

NEXT WEEK AT 2LO

By "THE LISTENER"

Reginald Whitehead.

In the Programmes

CHAMBER music still predominates in the B.B.C.'s scheme of programmes, though it is a type of music that appeals to a very small section of the public. On Sunday afternoon a programme will be given by Anthony Bernard and his London Chamber Orchestra, which includes the inevitable sixteenth-century works, in this instance a suite by Dowland. On the modern side we have a suite by Alec Rowley, a concerto by Vivaldi, and pianoforte works of Palmgren. The singer is Joan Elwes, who will give settings of poems of A. E. Housman, by Dr. Vaughan Williams, the violin obbligato, specially written, being played by Samuel Kutcher, the leader of the orchestra. The evening programme consists mainly of organ recitals by Reginald Goss-Custard.

An excerpt from the Lyric Theatre, Hammersmith, success, *Lionel and Clarissa,* is to be given on Monday, with Nigel Playfair, its manager, producer and player, in the cast. The 10 o'clock feature will be provided by the Wireless Orchestra, conducted by L. Stanton Jefferies, with songs by that fine bass, Reginald Whitehead.

Ruby Helder, the lady tenor, reappears on Tuesday, and a special feature of the same night's programme is a performance of Oliphant Down's play, *The Maker of Dreams,* in which the three players are Ben Field, Robert Harris and Gwen Frangcon-Davies. Later follows a reading of Tennyson's poems by Fabia Drake, with songs by Franklyn Kelsey.

The B.B.C. has a predilection for negro music, and Wednesday's evening programme opens with a half-hour of variety, in which Clara Alexander gives negro impersonations. At 8.30 we are promised a symphony concert conducted by Percy Pitt; this includes Beethoven's No. 8 Symphony and the overture "From the South," by Elgar. Modern works form the basis of the concert which follows at 10.25, when Stanford Robinson will conduct.

A more popular scheme is arranged for Thursday, when the music of the Band of H.M. 2nd Battalion The Queen's Own Royal West Kent Regiment, will be relayed from the Granville Gardens Pavilion, Dover, with studio interludes by Roy Henderson and the Walsh Brothers. At 10.5 the British Vocal Quartet, consisting of Esther Coleman, Dorothy Bennett, Eric Greene and Dale Smith, will give a cycle of old English melodies arranged by Lane Wilson, and entitled "Flora's Holiday."

Dorothy Bennett.

In the Programmes

Mr. Edward German, the great English composer, conducts a programme of his own works on Friday, which will contain some of his less hackneyed works, including incidental music to "The Tempest." Miss Mary Foster will be the vocalist. At 10 o'clock a variety programme will be carried out by Ronald Gourley and the music-hall and revue star, Gwen Farrar.

Graham John, the part author of *Hearts and Diamonds* and *By the Way,* has written the special *Saturday Night Revue* which will have a first performance on Saturday, the artistes including Geoffrey Gwyther, Sybil Seager, Tommy Handley, and Florence Oldham. Ivy St. Helier will give ragtime songs at 9 o'clock, followed later by a half-hour of music by Harry Solloway, playing the first Grieg violin sonata, and accompanied by Victor Hely Hutchinson.

THE INTERNATIONAL WIRELESS SET COMPETITION

THE CHOSEN SETS

WE go to press on the first of the days on which the sets sent in for the British Elimination Competition are on public view in the offices of Messrs. Cassell and Co., Ltd., La Belle Sauvage, Ludgate Hill, London, E.C.4.

The judges found plenty of hard work when they essayed their task. There were half a dozen sets pre-eminently marked out to go to the States, there to represent British amateur construction in competition with other nationalities. There were another half a dozen sets at the other end of the line—sets displaying obvious defects in designing, assembling or wiring, and they stood no chance whatever. But there were scores of sets which had very seriously to be considered and their pros and cons carefully weighed. In the end the judges (consisting of the Editor of AMATEUR WIRELESS; "A.W.'s" Technical Adviser, Dr. Sydney Brydon, D.Sc., M.I.E.E.; and members of the Technical Staff) decided unanimously that nineteen sets should go to the States, and the following are the names and addresses of the competitors successful in this first round:

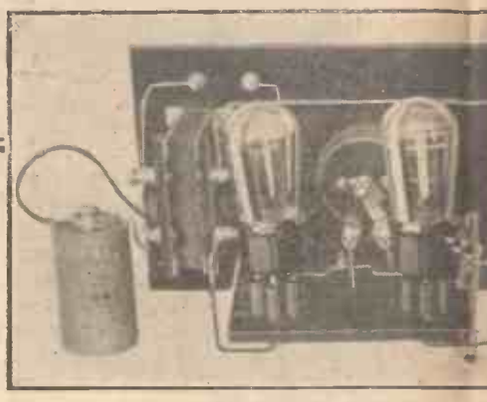
J. L. Blanks, 104, Humberstone Road, Plaistow.
H. P. Booker, 16, Newcombe Road, St. James, Northampton.
H. Budd, 102, St. John's Park, Blackheath, S.E.3.
E. Collins, 27½, Wellclose Square, E.1.
W. Dorling, 70, Finlay Street, Fulham, S.W.6.
E. Emmons, The Copse, Hamble, Southampton.
W. H. Farley, 56, Lillian Road, Barnes, S.W.13.
F. Fisher, 67, Edenbridge Road, Bush Hill Park, N.
W. Fricker, 7, Red Rice Estate, nr. Andover.
F. Fry, 293, Wandsworth Road, S.W.8.
S. Green, 157, Wigan Road, Westhoughton, nr. Bolton, Lancs.
S. R. Heath, Bracknell, Bristol Road, Sherborne.
J. E. Llewellyn, Elmsfield, Baldock Road, Letchworth.
K. Loweth, 51, Bedford Road, Clapham, S.W.4.
G. P. Searle, Bella Vista, King's Road, Paignton.
G. Todd, New Pavement, Pocklington, E. Yorks.
H. Warren, Slades, St. Austell, Cornwall.
H. Wilkinson, 5, Morris Grove, Kirkstall, nr. Leeds.
R. Stuart Wortley, Junr., Highcroft, Claverdon, Warwick.

As soon as possible after the elimination competition is over (some days before these lines will be read) the unsuccessful sets will be packed and returned carriage paid to their owners. The twenty representative sets, fully insured, will be sent to the States, and as soon as the result of the American contest is known an announcement will be made in these pages.

Photograph of Interior Part of Receiver.

THE HOLIDA

Constructional Details of a Quickly-made Portable Two-valver



Photograph showing Compo

A REALLY portable set adds greatly to the pleasures of summer, and the way that it can be set down and instantly operated under many unusual conditions is most fascinating.

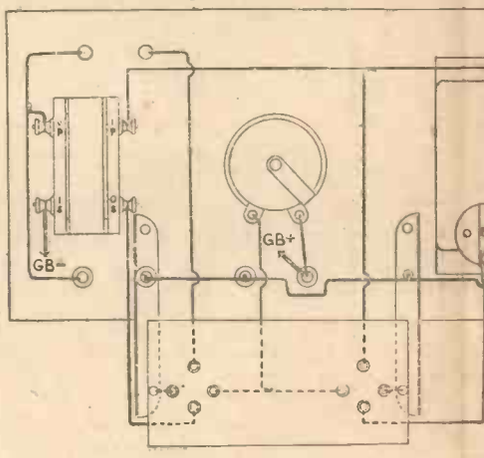
Some Practical Tests

The set illustrated and described in this article will completely fill the requirements of most people. It is quite inexpensive to construct, and the efficiency of the set is of a high order. Within six or seven miles of 2 L O it works a loud-speaker quite well, and reception with telephones has been tested up to sixteen miles. One experiment the writer carried out was to take the set in a closed car travelling out of London up the North Road. Reception of the transmission from London was maintained uninterrupted until after leaving High Barnet. This was accomplished in daylight. At night the reception would probably have been better. The set was also used in a train on the Southern Railway to Bromley, in Kent. Although 2 L O was heard all the way down with the exception of when in Penge tunnel, it was only clear at stops. The electric train produced *some* "atmospherics," presumably by the sparking of the slippers on the conductor rail. While in Penge tunnel London's carrier wave could not be heterodyned even.

These trials were made using the self-contained loop in the set. The instrument is, however, provided with aerial and earth terminals to which an aerial system can be connected without it being necessary in any way to alter the set. Then it becomes a powerful broadcast receiver capable of operating a loud-speaker up to thirty miles and of bringing in more distant stations on the phones.

As a purely portable set its range can be greatly increased by carrying 60 or 70 ft. of insulated wire, and attaching one end to the aerial terminal and hooking the rest up over some convenient object as high as possible. Of course an ideal arrangement in the country would be to fly a kite and let it take up 100 ft. of light aerial. This should prove to be a most efficient collector of energy.

The set proper is assembled on a $\frac{3}{16}$-in. ebonite panel measuring 15 in. by 5 in. The components comprise Ormond .0005 low-loss square-law tuning condenser with



combined vernier dial; Polar .0003 mica-dielectric reaction condenser; light low-frequency transformer; rheostat; grid condenser (.0003) and leak; two Climax anti-vibration valve holders; screws, terminals and wire. There will also be required a one-cell grid-bias battery.

Fig. 11 (see p. 156) is the panel drilling plan. This panel is mounted in a rectangular support for the frame aerial, which somewhat resembles a honeycomb frame. This frame-aerial support measures 16¼ in. square by 5 in. wide. Beneath the ebonite panel the space is occupied by a partition with a lid for the high-tension and low-tension batteries, and a baize-lined recess for housing phones or an Amplion Dragonfly loud-speaker.

The photographs show this assembly,

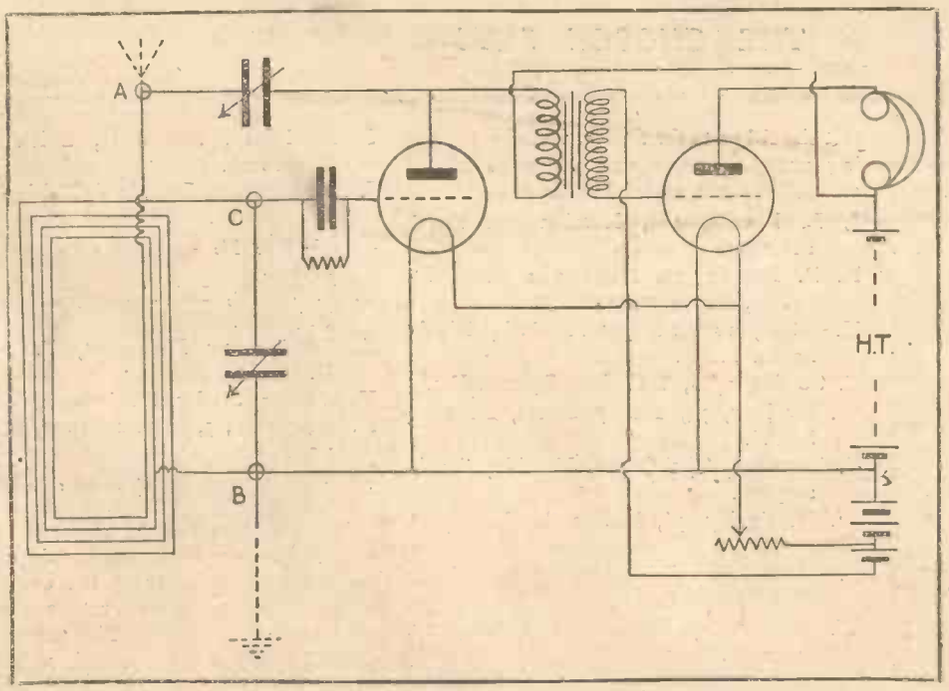
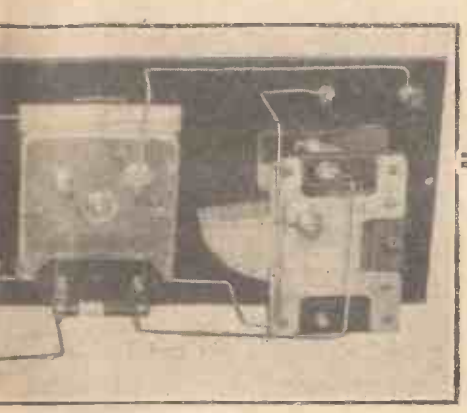


Fig. 2.—The Circuit Diagram.

Y PORTABLE

With Notes on some Interesting Tests carried out by the Designer



onents at Back of Panel.

how the frame aerial is wired, and how the whole fits into an attaché-case type of container. This outer case has to be just over 6 in. deep to allow for the projection of the vernier-dial knob. Four round-headed screws with washers under their heads hold the frame within the container.

The theoretical circuit diagram (Fig. 2)

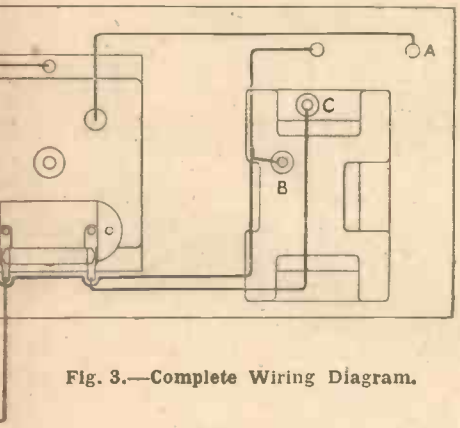


Fig. 3.—Complete Wiring Diagram.

shows that the Reinartz arrangement is employed, and that what has been referred to as a 16¼-in. frame aerial is really no more than a large tuning coil of 15 turns spaced ⅛ in. apart. Between four of these turns at the low-potential end a four-turns reaction coil is interwound. The outside end of the supplementary coil is the point A on the diagram. Its other end is the point B. B is also connected to the end of the larger coil, which finishes on the frame adjoining the end A of the reaction coil. The other end of the 15-turn coil is the point C. This "frame-coil" is wound with a "cable" of three strands of No. 26 S.W.G. silk-covered wire twisted together their whole length and soldered together at the ends. Frame-aerial flex would be quite satisfactory, but perhaps more expensive, or No. 22 S.W.G. double-cotton-covered wire could also be safely used.

Wiring

Fig. 3 is the complete wiring diagram showing each connection as it actually runs and the location of the components behind the main panel and the valve shelf. The grid condenser with its leak is fastened with screws to a pair of brackets (really leak clips), which are soldered to the case of the Polar variable condenser. The connection from the plate of the first valve and the primary of the transformer to the case of the Polar condenser is made to one of the clamping nuts instead of to the tag provided, as this method gives a simpler connection.

A portable set is often subjected to considerable vibration which might lead to broken connections or nuts working loose, therefore in making this set all connections were carefully twisted round the terminal shanks, etc., as well as being soldered. The nuts of clamping screws, too, were soldered after being tightened up to ensure they would not work loose.

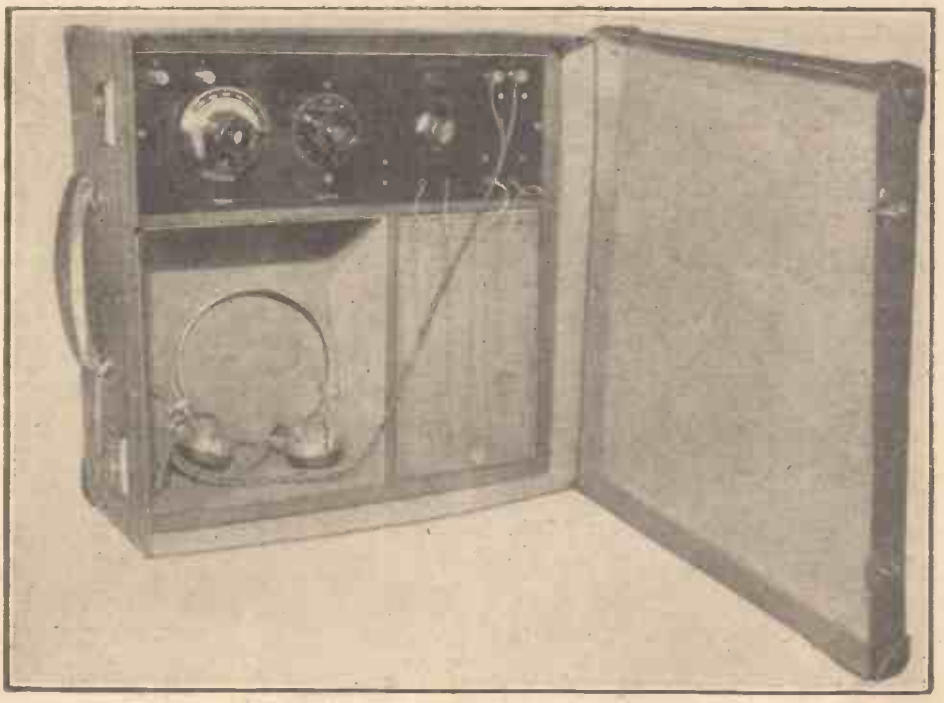
Photograph showing Arrangement of Batteries.

The connections to the batteries are made with rubber-covered flex. The ends at the set are soldered to four Clix plugs instead of being clamped in terminals that might possibly work loose.

Current Supply

The high-tension minus lead has inserted in it a fuse consisting of a pocket-lamp bulb and holder. The high-tension is supplied by an Ever-Ready 66-volt battery. Current for the valves is provided by two Ever-Ready cycle-lamp batteries (No. 126), which are wired in parallel so as to double their current-giving capacity. This is done by connecting the plus to plus and the minus to minus. They then share the task of heating the valve fila-

(Concluded at foot of next page)



Photograph of the Complete Receiver ready for use.

SAFETY FOR YOUR VALVES

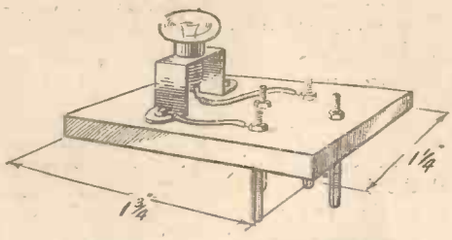
Details of a Handy Little Gadget that will Save your Valve Filaments

WHEN the construction of a new set has been finished, or when alterations have been made in the wiring of an existing one, there come the anxious moments when the first tests are made. It is extraordinary how easy it is for even the most careful worker to make at times a wrong connection whilst wiring up, and to fail to discover it when the connections are checked over. Such a mistake may easily lead to the burning out of one or more valves when practical tests are made.

A simple and easily-made little gadget, which I have found of the greatest use, is the "safety-first" device seen in the drawing. The foundation is a piece of ¼-in. ebonite 1¾ in. long by 1¾ in. wide. At one end of this four valve pins are mounted in their proper positions—a job which is very easily done if you possess a valve pin template. If you have not this useful accessory, you can easily make a temporary substitute by standing a valve on a sheet of note-paper, holding it firmly in position, and drawing round each pin with a pencil. Use valve pins whose threaded portion is long enough to allow them to protrude about ¼ in. on the upper side of the ebonite.

At the other end of the piece of ebonite is a batten flashlamp holder, which can be obtained for twopence from almost any shop which deals in electrical supplies. The frame of the holder is connected by a wire to one of the filament pins, and a second wire connects the other filament pin to the screw contact in the centre of the holder.

To test out a newly-wired receiving set, connect the accumulator across the low-tension terminals and insert the little gadget, with a flashlamp bulb in the



A Safety-first Device for Valves.

socket, into each valve holder in turn. If the low-tension connections are correct the lamp should light up in every case. Leaving the accumulator in position, connect the high-tension battery across the high-tension terminals, and try each valve holder again. A wrong connection or a short circuit in the high-tension leads that would cause a valve, if used for the purpose, to be burnt out will be shown up at once by the wrecking of the flashlamp bulb.

You can now test out the plate circuit connections by disconnecting the accumulator and wiring it across the high-tension terminals in place of the H.T.B. Leave the wire of the safety-first device which connects the L.T. positive pin to the holder, but connect the other wire to the plate pin instead of to the L.T. negative pin. The valve should now light up in each holder. If there is a high resistance in any plate circuit, such as the primary of a low-frequency transformer, this resistance should be temporarily shorted, or the valve will not light up even if connections are correct.

The grid circuits may also be tested out by replacing the accumulator across the low-tension terminals, and by connecting the lamp holder to the grid pin and the appropriate filament pin, high resistances such as grid leaks being temporarily shorted.

J. H. R.

Radio-Toulouse regularly relays operatic and other performances from the Capitol Theatre and others in that city.

In introducing the Brighton Broadcast Night, which is expected to be the pioneer of a series of "Town Nights," the Mayor of Brighton suggested that such "Town Nights" should be developed along lines which would encourage a competitive spirit between towns in the United Kingdom.

Radio fans visiting Switzerland during the summer or winter seasons, and who are desirous of taking their wireless receivers with them, may now do so on payment of a licence fee of 5 francs, providing a deposit of 20 francs is made with the Swiss Customs, this amount being returned on departure.

"THE HOLIDAY PORTABLE" (*continued from preceding page*)

ments. Mullard .06-ampere 3-volt valves are used (one detector and the other low-frequency). These are quite satisfactory, although Marconi Osram DE2 L.F. valves and Cosmos Shortpath suit the Reinartz circuit very well. These valves, however, take more low-tension current, and would require a 2-volt accumulator. It will be found that in the set as designed (see Fig. 4) there is just room for an Oldham unspillable accumulator, as well as the high-tension battery in the battery compartment.

Operation

The operation of the set is quite simple, there being only one tuning control. When the set is used so as to receive on its frame only, it is permissible to apply reaction capacity until the set oscillates, and to search for the station by heterodyning the carrier wave. Without a wavemeter it would be very difficult to tune in otherwise unless very near the transmitting station, and, of course, the frame aerial radiates very little energy. It might, however, annoy the user of another receiving set in the same house.

D. G. O. H.

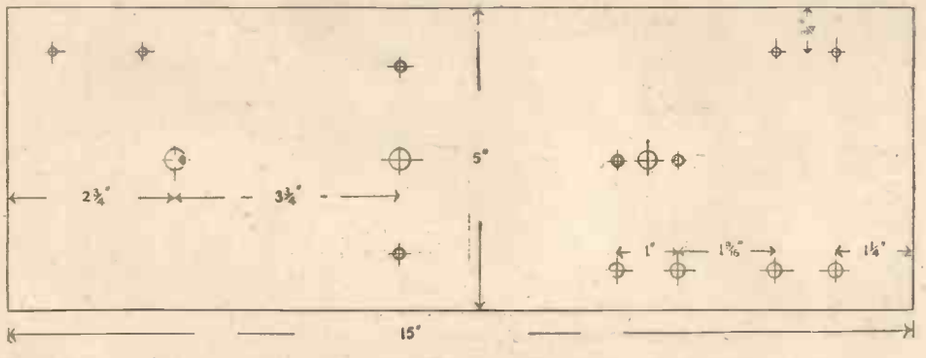


Fig. 1.—Drilling Diagram of Panel of The Holiday Portable Set.

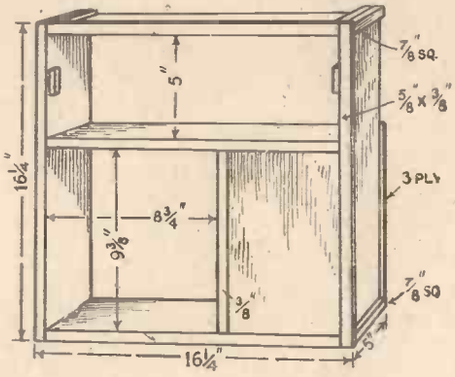
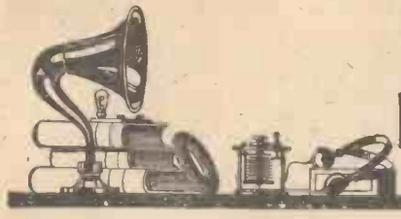
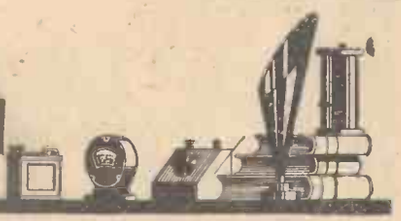


Fig. 4.—Details of Inner Framework.



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 168).

C.W. with Crystal Detector

Q.—*Is it possible to receive C.W. telegraphy on a simple crystal set, no valves whatever being employed ?—P. W. K.* (*Dorset*).

A.—It is possible to do this if some means are provided for making and breaking the circuit at regular intervals within audible frequency. At one time this method of reception was employed commercially, but it is far more trouble to use than a single-valve set and very inefficient.—B.

Filament Touching Grid

Q.—*When the filament of a valve touches the grid and remains in contact with it, thus putting the valve completely out of action, is there any method of curing the trouble without sending the valve to a firm of repairers ?—T. A.* (*Peebles*).

A.—The following procedure is sometimes successful in the case you mention. Remove the valve from the set and connect the end of a flexible lead to each of the filament pins of the valve. Join the other ends of these two leads across the L.T. battery, putting a suitable filament rheostat in series with one of them. The filament will then light up, and the valve should be so turned that the bowed part of the filament is uppermost. By carefully tapping the valve it may then be possible to free the filament and so give the valve a new lease of life. It should be understood, however, that the trouble is due to the filament having stretched or expanded, so that it should occasion no surprise if the trouble should recur after a short interval.—J. B.

An Oscillation Puzzle

Q.—*I have a single-valve detector set with reaction and find that the set will oscillate although the reaction coil is not coupled to the aerial coil. This, however, requires that a coil several sizes larger than the aerial coil be used in the reaction socket. What provides the reaction coupling which I understand to be necessary ?—B. M. S.* (*Dublin*).

A.—The coupling in this case is provided through the self-capacity of the valve electrodes and pins, the valve sockets, and the leads of the plate and grid circuits. You say that a particularly large reaction coil has to be used in order to obtain the effect; you have, in fact, to use a coil which has sufficient inductance to tune the plate circuit, in conjunction with its self-capacity, approximately to the same wavelength as the grid circuit. The oscillation is therefore caused in the same way as that so troublesome when several stages of tuned H.F. amplification are employed on short wavelengths.—J. F. J.

Resistance Windings

Q.—*I should be obliged if you would tell me how much Marco resistance wire will be required to wind the resistances* R1 *and* R3 *in "A Powerful Reflex Circuit" described by C. A. Cleghorn in* AMATEUR WIRELESS, *Nos.* 178 *and* 179.—*W. A. M.* (*Fifeshire*).

A.—The small resistance R, next to the anode, is inductively wound on a 3 in. diameter solenoid former, about 200 turns of the wire being correct. This corresponds to about 170 feet of No. 40 gauge resistance wire.

The main resistance R should have a resistance value of about 80,000 ohms, requiring more than 2,000 yards of No. 40 gauge Eureka or Marco wire. It is not recommended that this second resistance be made up, as it is a tedious job, and in any case there are several reliable commercial non-inductively wound resistances available at a reasonable price.—C. A. C.

OUR WEEKLY NOTE

TRANSFORMER RATIOS

When all the considerations of design are not fully understood the different ratios used in intervalve transformers are rather puzzling. As it would seem that the greater the ratio the greater should be the amplification, it is not easy for a beginner to understand why he should be recommended to use, say, a 3/1 ratio transformer.

As a matter of fact the actual ratio is a subsidiary matter in the design of transformers, the impedance of the primary winding being the most important factor. As the space available for the windings is very limited, it follows that if a high impedance primary is required there will not be much room left for the secondary winding, and consequently the ratio will be low.

THE BUREAU.

High Tension !

Using Soft Valves

Q.—*In what position on the set can a soft valve be utilised to the greatest advantage ?—G. S.* (*Stone*).

A.—These valves are invariably poor amplifiers and should never be used in H.F., L.F., or reflex stages. They sometimes make excellent detectors, but it should not be assumed that every soft valve is necessarily a better detector than a hard valve. They are not very reliable in operation and require critical values of H.T. and filament voltages in order to give best results.—J. B.

Condensers and Variometers

Q.—*Can a variable condenser be added, with advantage, to a variometer-tuned crystal set ?—L. P.* (*Leeds*).

A.—If the set at present tunes adequately to the wavelength desired there will be absolutely no advantage in adding the condenser. In fact, if this is placed in parallel with the variometer, the efficiency of the set will be reduced. However, if the variometer will not tune low enough it would be an advantage to use a variable condenser in series with it, while the condenser may be used in parallel with the variometer when it is desired to raise the maximum wavelength to which the set can be tuned.—J. F. J

Separating Stations

Q.—*In the test report of the "Concert Six" in the May 22 issue of* AMATEUR WIRELESS *it was stated by Mr. J. Hartley Reynolds that it was possible to separate stations whose wavelengths were within a few metres of one another, while 2 L O could be got rid of without the use of any kind of wavetrap. However, in the issue of April 24, in an article, "Silencing the Local Station," by the same author, it was stated that 2 L O came in so powerfully that . . . the transmission was audible over a wavelength band of 40 metres when used with a set containing two H.F. stages. (1) As I cannot reconcile these two statements, I should like to have some explanation. (2) Is this set (the Concert Six) able to separate the high-power stations without a wavetrap ?—N. R. D.* (*Wilts.*).

A.—(1) The explanation is quite straightforward—the set referred to in the article "Silencing the Local Station" was not the "Concert Six." When used a year ago, "The Concert Six" was capable of receiving Bournemouth or Cardiff without interference from London, though I doubt whether it would be able to do so at the present time, since 2 L O is more difficult to cut out now than it was then; also, there have been wavelength readjustments. (2) Separating 5 X X from Radio-Paris depends very much upon where reception is carried out. Thirty miles N.W. of London it did so without difficulty, but Daventry appears to be occupying a larger waveband than was the case a year ago. In any case, unless a receiving set is abnormally selective, which usually means that its reproduction leaves a good deal to be desired, a wavetrap is a most convenient accessory, since it simplifies matters enormously.—J. H. R.

A LISTENER in Northern Ireland reports having picked up good telephony between two Scottish lighthouse keepers. The conversation, he says, was very entertaining, and especially when one of the wives took a hand.

According to the new scheme of wavelengths allotted to Switzerland, the Zurich station from September 15 next will operate on 500 metres, and the wavelength of Berne will be reduced to 411 metres.

The Swiss Broadcasting Association is considering a proposal to erect relay stations in Switzerland which would take their programmes from both Zurich and Berne. In each case the relay transmitter would work on the same wavelength as the mother station.

The Moscow (Popoff) station effects telephony tests on 23 and 90 metres every Wednesday and Sunday between 19.00 and 21.30 B.S.T. on a power of 1 kilowatt. Similar experiments are also being made on 70 metres by the Kharkov station on Sundays, Wednesdays and Fridays at the same time.

Owing to interference from commercial stations, the small station run by the *Radio Club de Liége* has ceased broadcasting on 585 metres and a new wavelength is being sought.

Although it had been hoped to extend the broadcasting of local programmes, the small Antwerp station has been compelled, owing to lack of support, to rely on Radio-Belgique, Brussels, for the bulk of its transmissions.

Reading Town Council has obtained sanction for a by-law making it a punishable offence to operate a loud-speaker in any public place or any place adjoining a street in such a manner as to cause annoyance.

A concession has been granted by the Greek Government to the Eastern Telegraph Company for a period of fifty years for both cable and wireless communication.

The White Star liner *Ionic* recently picked up a wireless message from the American steamer *Chuki*, when in mid-Pacific, asking for medical advice for a seaman who had scalded his hands in boiling tar. Instructions were sent from the *Ionic*, and later it was heard that the man was progressing favourably.

In 1922 the imports of wireless apparatus into this country amounted to £57,000, while in 1925 it was £634,000. The export of wireless apparatus in 1922 amounted to £340,000; in 1925, £1,100,000.

The entire Cardiff programme on August 19 will be relayed from Clarence Park, Weston-super-Mare, in connection with a carnival which will be opened by Capt. P. P. Eckersley. Many radio stars will be present, including the Two Bobs, Miss Doris Vane, and Tommy Handley, and the entertainment given on this occasion, as well as music provided by the Band of H.M. Scots Guards, will be broadcast.

Miss Ivy St. Helier will give some impersonations of well-known artistes from the London studio on August 14.

Following upon the great success which attended the relay of a camp-fire programme from the shores of Loch Lomond recently, a repeat performance has been arranged for August 21. On the first occasion holidaymakers in the vicinity took a great interest in the proceedings, and it is hoped to have several thousand "trippers" joining in the August programme.

A young Glasgow girl is regarded as a "find" in the rôle of announcer. She has the real comedy touch, and is at present engaged to interpose the explanatory part in a series of revues which are being run from the Glasgow station.

The Maker of Dreams, a one-act fantasy by Oliphant Down, will be broadcast from the London studio on August 10. The parts will be played by Ben Field, Robert Harris and Miss Gwen Ffrangcon-Davies.

On August 13 Mr. Edward German will himself conduct the Wireless Orchestra at 2 L O and will include in the programme some of his lesser known works.

Miss Gwen Farrar and Mr. Billy Mayer will appear before the microphone at the London station on August 13.

The new *Saturday Night Revue*, written by Mr. Graham John, part author of *Hearts and Diamonds* and *By the Way*, is down for production on August 14.

In connection with the Church Congress, speeches by the Archbishop of York and the Bishop of Liverpool will be relayed from Southport early in October to many B.B.C. stations.

It is hoped to broadcast from Sandwich the pageant which will be held in that town on September 8.

A massed programme under the title of *London Lads*, dedicated to the London Territorials, will be broadcast from the London studio on August 19. The London Repertory Players, The Roosters, the 2 L O Military Band and Wireless Chorus will take part in the entertainment.

A broadcast performance of the successful revue *By the Way*, with Jack Hulbert and Cicely Courtneidge in the cast, will be given on August 19.

Arrangements have been made with the following seaside towns from which evening programmes are to be relayed to the B.B.C. stations: Blackpool, September 2; Margate, September 10; Eastbourne, September 24.

On the occasion of the production of the new film *Oriental Love* the orchestral selections will be relayed from the Palace Theatre on August 10.

The B.B.C. pays particular attention to the anniversaries of prominent people, and on August 15, the birthdays of both Sir Walter Scott and Napoleon, a special programme is to be submitted.

Prior to commencing their tour of the remote districts of Scotland, the Arts League of Service, which last year was called to a command performance at Balmoral Castle, is to broadcast from the Glasgow station on August 28. Miss Elinor Elder and Mr. Hugh Mackay are among the principals, and the company tours in caravans.

Although the results of the year's trading of Marconi's Wireless Telegraph Co., Ltd., showed a profit, the directors did not consider it possible to pay any dividend on the ordinary share capital.

Some time in the autumn the B.B.C. are to co-operate with ten other stations in the first comprehensive system of international programmes ever organised. Mr. R. R. Burrows, who is secretary of the Geneva Broadcasting Committee, is forming a new society, to be called the Commission de Rapprochement Intellectuel, Artistique et Social (Commission for Intellectual, Artistic and Social Advancement), for the purpose of promoting this scheme.

A contract has been signed between the Government of Bolivia and Marconi's Wireless Telegraph Co., Ltd., whereby the latter will, as from October 1, 1926, control and operate, for a period of 25 years, the postal telegraph and wireless services of Bolivia on the basis of a percentage of the gross receipts of the services as remuneration for management, plus a proportion of the profits when there may be a surplus.

It is reported that Prof. Enthoven has invented a device which will reduce interference from atmospheric disturbances to a minimum.

An analysis of the B.B.C. programmes shows that the percentage of time allotted to the various branches is: Music, 62.17; drama, 1.69; special features, 1.67; talks, 20.30; religious services, 4.18; children's corner, 7.4; and miscellaneous, 2.06.

New Zealand's Dominion Day falls on Sept. 27. This suggests a special national programme on similar lines to that which was broadcast on July 1, Canada's Dominion Day. The B.B.C. is now arranging the matter.

THE BROADCASTING SERVICE FROM THE B.B.C.'s POINT OF VIEW

Being a Statement of General Information Prepared by the B.B.C.

Inception

ON January 18, 1923, the Postmaster-General granted to the British Broadcasting Company a Licence for broadcasting till December 31, 1924.

The Licence stipulated the establishment of eight Transmitting Stations, but, in pursuance of the Company's democratic policy, when action on the recommendations of the Sykes Committee of 1923 had extended the Licence to December 31, 1926, eleven Relay Stations, a new Main Station at Belfast, and a High Power Station at Daventry were added.

Finance

The initial capital required to start the Company, to purchase plant, equipment, etc., was about £60,000. This was subscribed by wireless manufacturers. There are 1,715 members to-day, and the total subscribed capital is approximately £70,000. The dividend is limited to 7½ per cent.

One of the recommendations of the Sykes Committee was "That no part of the cost of broadcasting should fall on the taxpayer, but that the Government should not endeavour to make a profit on the administration of the Service."

Under the original Licence 50 per cent. of the Licence Income was payable to the Company, 50 per cent. being retained by the Post Office, so as to make sure at the beginning that the actual cost of collection should be covered. Subsequently it was realised by the Sykes Committee that 75 per cent. of the revenue could be given to the Service, and it was expected that, as licences further increased, an additional percentage would be handed over. The financial terms of the licence were, therefore, modified by the Supplementary Agreement, and the proportion payable to the Company was revised as follows:

Up to and including 31/12/24—75 per cent. of the total Licence collections.

Thereafter up to and including 31/12/26—"such proportion as the Postmaster-General *in consultation with the Company* should consider reasonably adequate to enable the Company to provide a Broadcasting Service to his reasonable satisfaction."

Acting under this Clause, the Postmaster-General thought it right, in view of the figures then before him, in view of the absence of public representation on the Board of the Company, and in view of the Broadcasting Enquiry then about to begin, to limit the Company's income to £500,000 for the year ending March 31, 1926. The consequent withholding of large amounts has hindered many improvements in the Service which the Company had intended to introduce. The Company has all along agreed that the cost of licence fees and other expenses incurred must be paid for out of the licence money, but, in order to give the licences the best possible return in service supplied, all of the balance should be available for the purpose for which it was intended.

The following table contains details of the total revenue from Broadcast Licences and the proportions handed over to the British Broadcasting Company and retained by the Post Office in the past three years:

Date	*Amount received for licences*	*Licences unexpired at end of periods*	*Paid to B.B.C.*	*Balance retained*
31/3/24	£556,000	£297,000	£177,000	£82,000
31/3/25	689,000	382,000	489,000	115,000
31/3/26	982,000	580,000	500,000	284,000

Licence Figures

Owing to the character of the Service, the number of Broadcast Receiving Licences has increased steadily and rapidly, as shown by the following figures:

Date	*Total licences*
30/9/23	158,871
31/3/24	720,895
31/3/25	1,348,840
31/3/26	1,964,912

The total number of licences in force at the end of May, 1926, was 2,049,549.

Stations and Population

The Stations of the British Broadcasting Company and their dates of establishment are as follow:

LONDON ...	14/10/22	PLYMOUTH ...	28/ 3/24
BIRMINGHAM	15/11/22	EDINBURGH	1/ 4/24
MANCHESTER	15/11/22	LIVERPOOL	11/ 6/24
NEWCASTLE	24/12/22	LEEDS—BRADFORD	8/ 7/24
CARDIFF ...	13/ 2/23	HULL ...	15/ 8/24
GLASGOW ...	6/ 3/23	NOTTINGHAM	16/ 9/24
ABERDEEN ...	10/10/23	STOKE ...	21/10/24
BOURNEMOUTH	17/10/23	DUNDEE ...	12/11/24
BELFAST ...	24/10/24	SWANSEA ...	12/12/24
SHEFFIELD	16/11/23	DAVENTRY ...	27/ 7/25

The population included in the urban areas served by these Stations is 21,943,000. In the urban districts throughout the country there is a Broadcasting Receiving Licence for every third or fourth house.

The population in rural areas, to a total of about 21 millions, cannot be classified as being served by any particular Station, but it is estimated that a large proportion of the 25 million people within the service area of Daventry are regular rural listeners. The new regional scheme of High Power Stations, proposed by the Company, will bring the whole of the population of the United Kingdom and Northern Ireland within a service area of Broadcasting distribution, allowing of a selection of at least two simultaneous programmes, and this on simple apparatus within the means of almost anyone.

The number of licences in urban service areas increased from 354,799 in 1923 to 1,001,805 in 1926.

Correspondence

An interesting sidelight on the growth of Broadcasting is provided by a survey of the rapid increase in correspondence. In 1923 the average number of letters received from listeners on all subjects was not greater than 300 per week. To-day, in London alone, an average of 3,600 letters per week are received; in the provinces, about 3,500 is the weekly average. Thus, about 730,000 letters from listeners are being handled in a year. The Company is receptive to the comments of its audience and has always encouraged constructive criticism.

Staff

The total number of the Staff of the Broadcasting Company (exclusive of Orchestras, etc.) is now 725, including 250 engineers.

Advisory Committees

The B.B.C. has been fortunate in securing the continuous and active co-operation of leaders in almost every department of artistic, educational and religious activity. At each of its twenty centres throughout the country there are various Advisory Committees. In London there are National Advisory Committees, such as that on Music, which includes Sir Hugh Allen, Sir Walford Davies, Mr. J. B. MacEwen and Sir Landon Ronald. A National Committee on the correct pronunciation of English is presided over by the Poet Laureate. The Advisory Committee system as evolved by the B.B.C. is believed to be productive of the maximum benefit to the Service at the minimum cost. Useful advice and suggestions have emanated from these Committees.

Programmes

The Company has endeavoured to provide programmes which shall be representative of the best material available in all lines of activity and knowledge, but which exclude anything likely to be in any way harmful. They present as satisfactory a balance as is possible between the claims of entertainment pure and simple, information and education. An analysis of the programmes is shown on the fourth page.

(*Concluded on page* 166)

BROADCAST TELEPHONY

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to British Summer Time.

London (2LO), 362 m. 1-2 p.m., con.; 3.15-4 p.m., transmission to schools; 3.30-5.45, con. (Sun.); 4.15 p.m., con.; 5.15-5.55, children; 6 p.m., dance music; 7-8 p.m., time sig., news, music, talk; 8-10 p.m., music; 9.0, news (Sun.); 9.30 p.m., time sig., news, talk; 10 p.m., special feature (Mon., Wed., Fri.). Dance music on Thurs. and Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 404 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 306 m. **Stoke-on-Trent** (6ST), 301 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun. and Tues.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily, 7.30 p.m. Sundays, 8.30 p.m. until 10.30 p.m.

CONTINENT

The Times are according to the Continental system; for example, 16.30 is 4.30 p.m., and 08.00 is 8 a.m. B.S.T.

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 531 m. (temp.) (10 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig.; con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 20.10.

BELGIUM.

Brussels, 486 m. (2½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news. Relay: Antwerp, 265 m. (100 w.).

CZECHO-SLOVAKIA.

Prague, 368 m. (5 kw.). Con., 20.00-23.00, daily.

Brunn (OKB), 521 m. (2.4 kw.). 10.00, con., news (Sun.); 19.00, lec., con. or dance (daily).

Kbely, 397 m. (500 w.).

Kosice, 2,020 m. (2½ kw.). 19.00, con.

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays: 10.00, sacred service; 16.00, con.; 20.00 dance. Weekdays: 20.00, lec., con., news, con.; dance to 24.00 (Thurs., Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00, sacred service.

Odense, 810 m. Relays Copenhagen.

Sorö, 1,150 m. (1½ kw.). Relays Copenhagen.

FINLAND.

Helsingfors (Skyddskar), 522 m. (500 w.).

Helsingfors, 440 m. Con., 18.00 (Tues., Thurs., Sat., Sun.).

***Tamafors**, 368 m.

***Jyvaskyla**, 561 m. (200 w.).

***Uleaborg**, 233 m. (200 w.).

* Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. Con.: 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 07.15, 08.00, physical exercises; 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (daily). Relays PTT, Paris: 07.15, 08.00 (daily).

Radio-Paris (CFR), 1,760 m. (about 3 kw.). Sundays: 12.45, con., news; 16.45, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 10.40, news; 12.30, con., markets, weather, news; 16.30, markets, con.; 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 07.15, 08.00, physical exercises (except Sun.); 20.30, lec. (almost daily); 21.00, con. (daily).

Le Petit Parisien, 333 m. (1 kw.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio L.L. (Paris), 350 m. (250 w.). Con. (Mon., Wed., Thurs.), 20.30.

Radio-Toulouse, 432 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily).

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily). Temporarily closed.

Strassburg, 205 m. (100 w.). 21.15, con. (Tues., Thurs.).

Radio Agen, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Tues., Fri.).

***Lyon-la-Doua**, 480 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse**, 280 m. (2 kw.).

***Bordeaux**, 411 m.

* Relays of PTT Paris.

Montpellier, 220 m. (1 kw.). 20.45 (weekdays only).

Angers (Radio Anjou), 300 m. (500 w.). Daily: 20.30, news, lec., con.

Bordeaux (Radio Sud-Ouest), 330 m. Con., 21.00 (Mon., Fri.).

Mont de Marsan, 390 m. (300 w.). Con. (weekdays only), 20.30.

Algiers (N. Afr.) (PTT), 310 m. (100 w.). 22.00, con. (Mon., Thurs.).

Ste. Etienne (Radio Forez); 220 m. (100 w.). Testing.

GERMANY.

Berlin, on both 504 and 571 m. (4 kw.). 06.30, con. Phys. Exer. (Sun.); 09.00, sacred con. (Sun.); 11.00, con. and tests; 12.55, time sig., news, weather; 15.00, educ. hour (Sun.), markets, time sig.; 17.30, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (Sat., Sun., Thurs.). Relayed on 1,300 m. by Königswusterhausen (1,300 m.) and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, con. (Sun.); 15.00, lec. (daily); 20.30, relay of Berlin (Vox Haus) con. (not daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 418 m. (3 kw.). 12.00, con. (daily), Divine service (Sun.); 12.55, time sig. (Sun.), weather, Stock Ex., news; 17.00, con.; 19.00, lec.; 20.30, con., weather, time sig., news, dance (relays Berlin). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (3 kw.). 08.00, sacred con. (Sun.); 11.55, time sig., news; 12.55, Nauen time sig.; 16.00, con. (Sun.); 16.30, con.; 18.00, markets, lec.; 20.00, lec., con., weather. Dance: relays Berlin. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (3 kw.). Relayed by Bremen (279 m.), Hanover (297 m.), Kiel (234 m.). Sundays: 07.25, time sig., weather, news, lec.; 09.15, sacred con.; 13.15, con.; 18.00, con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 05.45, time sig., weather; 07.00 and 07.30, news, weather; 12.55, Nauen time sig., news; 14.00, weather, con.; 16.15 con; 18.00, relays Berlin; 19.00, lec.; 19.55, weather and con.; 22.00, dance (Sun., Thurs., Sat.).

Königsberg, 463 m. (1 kw.). 09.00, sacred con. (Sun.); 12.55, time sig., weather, news; 16.30, con.; 17.00, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news, cabaret or dance (irr.).

Leipzig, 452 m. (3 kw.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 11.00, educ. hour (Sun.); 12.00, con. (daily); 12.55, Nauen time sig., news; 16.30, con., children (Wed.); 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 485 m. (3 kw.) and 204 m. (1½ kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 14.00, time sig., news, weather; 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec.; 19.30, con. (Sun.).

Muenster, 410 m. (1 kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 12.55, Nauen time sig.; 15.30, news, time sig.; 16.00, con.; 17.00, children (Sat.); 19.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 446 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (Sun.); 18.30, time sig., news, lec., con. (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 06.35-15.30 (exc. Mon. and Sat., when 12.30-13.30), news, Stock Ex.

Hilversum (HDO), 1,060 m. (5 kw.). 09.00, sacred service (Sun.); 19.10, con.; 21.00, news, con.

HUNGARY.

Buda-Pesth (Csepel), 560 m. (2 kw.). 09.30, news; 12.00 and 15.00, weather, news; 17.00, dance music; 20.00, con. or opera; dance nightly.

ICELAND.

Reykjavik, 328 m. (700 w.). Con., 20.30.

ITALY.

Rome (IRO), 425 m. (3 kw.). 17.00, children; 17.30, orch.; 17.55, news, Stock Ex., jazz band; 20.30, news, weather, con.; 22.15, late news.

Milan, 320 m. (2 kw.). 20.00-23.00, con., jazz band.

JUGO-SLAVIA.

Belgrade (Rakovitza) (HFF), 1,650 m. (2 kw.). 17.00, news (daily), con. (Tues., Thurs., Sat.).

Agram (Zagreb), 350 m. (500 w.).

LETTLAND.

Riga, 475 m. (2 kw.). Con. daily, 21.00-22.00.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.), Stock Ex. (weekdays); 19.15, news, time, lec.; con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo (22.30-24.00, Sun., Wed., Sat.).

Bergen, 357 m. (1½ kw.). 19.30, news, con., etc.

***Riukan**, 445 m. (50 w.).

***Porsgrund**, 405 m. (100 w.).

* Relays Oslo.

POLAND.

Warsaw, 480 m. (6 kw.). Daily: con., 11.00-13.00; 15.00-23.00, daily.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 12.30 and 17.55, news and con.; 23.00, chimes from Kremlin.

(Popoff Station), 1,010 m. (2 kw.). 10.00, 11.00, lec.; 13.00, 19.00, con. (Tues., Thurs., Fri.).

Radio Peredacha, 410 m. (6 kw.).

Trades Union Council Station, 450 m. (2 kw.). 18.00, con. (Mon., Wed.).

Leningrad, 940 m. (2 kw.). Weekdays: 18.00-21.00 (exc. Thu.).
Nijni Novgorod, 780 m. (1.5 kw.). 16.00-17.30, 19.00-23.00 (Tues. and Thurs. only), con.
Astrakhan, 650 m. (1 kw.).
Kieff, 780 m. (1 kw.). 18.00, con. (daily).

SPAIN.

Madrid (EAJ6), 392 m. (1½ kw.). Daily: con.
Madrid (EAJ7), 373 m. (4½ kw.). Con. daily.
Madrid (EAJ4), 340 m. (3 kw.). 16.00, con. The Madrid stations are again working to a rota, varying time of transmissions daily.
Barcelona (EAJ1), 325 m. (1 kw.). 17.00-21.00, news, lec., con. (Sun.); 18.00-23.00 (daily).
Barcelona (Radio Catalana) (EAJ13), 462 m. (1 kw.). 19.00-23.00, con., weather, news.
Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con. Close down 22.00.
Bilbao (Radio Vizcaya) (EAJ11), 418 m. (2 kw.). 22.00-24.00, con. (daily).
Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00, con., news. Tests daily (exc. Sun.), 01.00.
Cartagena (EAJ15), 335 m. (1 kw.). 20.30-22.00, con. (daily).
Seville (EAJ5), 357 m. (1½ kw.). 21.00, con., news, weather. Close down 23.00.
Seville (EAJ17), 300 m. 19.00-22.00, con. (daily).
San Sebastian (EAJ8), 346 m. (500 w.). 17.00-19.00, 21.00-23.00 (daily).
Salamanca (EAJ22), 355 m. (1 kw.). 17.00 and 21.00, con. (daily). Closes down 23.00.

SWEDEN.

Stockholm (SASA), 430 m. (1½ kw.). 11.00, sacred service (Sun.); 12.30, weather; 14.00, con. (Sun.); 17.00, children (Sun.); 18.00, sacred service; 19.00, lec.; 21.15, news, con., weather. Dance (Sat., Sun.), 21.45.
Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 370 m.; Gothenburg (SASB), 288 m.; Gefle, 208 m.; Joenkoeping (SMZD), 199 m.; Kalmar, 253 m.; Karlsborg (SAJ), 1,350 m.; Karlscrona (SMSM), 196 m.; Kristinehamm (SMTY), 292 m.; Karlstadt (SMXG), 221 m.; Linkoeping, 467 m.; Malmo (SASC), 270 m.; Norrkoeping (SMVV), 260 m.; Orebro, 237 m.; Ostersund, 720 m.; Säffle (SMTS), 245 m.; Sundsvall (SASD), 550 m.; Trollhattan (SMXQ), 322 m.; Umea, 215 m.; Varborg, 385 m.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 20.00, lec., con. (daily).
Zurich (Hongg), 515 m. (temp.) (500 w.). 11.00, con. (Sun.); 12.00, weather; 12.55, Nauen time sig., weather, news, Stock Ex.; 13.30, piano solo; 17.00, con. (exc. Sun.); 18.15, children, women; 19.00, news, weather; 20.15, lec., con., dance (Fri.).
Geneva (HB1), 760 m. (2 kw.). 20.15, con. (daily).
Berne, 435 m. (2 kw.). 10.30, organ music (exc. Sat.); 16.00, 20.30, con.
Basle, 1,000 m. (1½ k.w.), con. daily, 20.30.

Brown's A2-type Phones.—With regard to the descriptive note of the new type of phones made by S. G. Brown, Ltd., of Victoria Road, North Acton, W.3, which appeared on page 104 in No. 215, the makers point out that the A2-type of headphone is not claimed to be an improvement over the original and better known A-type phone, though the A2 phone functions as well as the original A or Admiralty type. The original A-type is much superior in construction, inasmuch as it is primarily built to be robust, and will stand much heavier wear and tear than the newer type.

Mr. Basil Gill, the well-known actor, will give a reading at 2 L O on August 8.

WIRELESS IN GREECE

UP to the present no broadcasting station has been erected in Greece, and there exist but few listeners owing to the very stringent regulations which are being enforced by the Hellenic Government. Authority for the installation of a wireless receiver may be obtained, but it is still subject to laws passed in February and December, 1924. Two classes of licences are issued, (a) for the amateur experimenter, restricting his possession to a wireless receiver or transmitter capable of working on wavelengths up to a maximum of 300 metres, with a radius of not more than 50 kilometres. Permits are granted by the Greek Admiralty, following a full inspection of the apparatus by a special commission, and the naval radio-electric service has the right to visit the holder's station at any time. The cost of such a licence is about 50 francs per annum, and limits the holder to its private use only, the amount being increased five times should it be desired to give public demonstrations. The second (b) class of licence is for listeners, and in this instance frame aerials alone are permissible. No oscillating circuit is allowed, and permits are restricted to persons of Greek nationality. This licence only entitles its owner to apparatus capable of receiving telephony or morse above wavelengths of 2,000 metres, with a view to maintaining absolute secrecy of all traffic on the lower wavelength band.

GRIDDA.

THE TREND OF AMATEUR DESIGN

As revealed by the entries for the International Set Competition

OUR novel competition, the first of its kind which has ever been organised, has already had one extremely very useful result. The sets, of which a very large number have been sent in, are without doubt fully representative of what the better class of British amateur is capable, and at the same time they show the circuits and constructional methods most in favour at the present day.

On the whole the workmanship is distinctly good—in the case of eight or ten of the entries it might be described as perfect—but at the same time a few competitors have so far underrated the level of excellence required by a set to pass it through the elimination competition, that their chances of success were doomed almost from the start. As the receivers sent to America will have to compete against those produced by the best of America's amateur constructors it would obviously have been grossly unfair to British amateurs in general were we to send across the Atlantic any set not fully representative of the best British amateur workmanship.

The Circuits Used

It is, perhaps, not surprising that in the great majority of the sets the circuits used were perfectly straight. The most popular arrangements utilised four valves as H.F., detector, and 2 L.F. and three valves, either as H.F., detector, and L.F., or as detector and 2 L.F. The biggest straight circuits employed five valves, as 2 H.F., detector, and 2 L.F. The majority of the L.F. stages were transformer-coupled.

The super-het. was represented by four entries, dual amplification being employed in the case of one of these receivers, but there was not a single super-regenerative receiver. It is rather remarkable that only two reflex receivers were entered; these employed two valves and a crystal, and one valve and a crystal. A circuit represented by but a single entry was the Cockaday.

The Reinartz circuit, on the other hand, was extremely popular, most of those entered having been built to designs published in AMATEUR WIRELESS.

Constructional Methods

Rather more than half of the sets were of the enclosed type with only the variable controls mounted on the panel and the rest of the components fixed to a base-board. There was a considerable number of cases in which all the components were mounted on the ebonite panel to indicate that this method of construction is by no means obsolete as yet.

A striking feature was the number of sets in which either a glass panel or a glass cabinet were used. When the internal lay-out of components and the wiring has been neatly carried out, such sets present a very attractive appearance.

In a few of the sets employing H.F. amplification attempts had been made to shield the tuning coils with sheet metal. In one case the sides, top, and bottom of the cabinet consisted of aluminium sheets, besides which partitions of the same material were placed between the various stages. These sets possibly indicate what wireless receivers may be like in a year or two.

Of portable sets there are not many. Only one was entirely self-contained, but this included frame aerial, batteries, and pleated paper loud-speaker, being almost identical with that described in the *Wireless Magazine* No. 17.

The size of the cabinets varied enormously. The smallest measured but a few inches each way, while the largest stood about 4 ft. high. Many of them were obviously designed as articles of furniture and must have cost many pounds if purchased ready made. Oak and mahogany seemed about equally favoured as the material.

Looking at the imposing array of entries, which completely fill a large room, it cannot be said that the competition has been anything else but a huge success. There can be no doubt whatever that the number of sets sent in would have been many times as great but for the inevitable disadvantages attending a competition of this kind. For instance, the chosen sets will necessarily be away some time.

But those readers who have not allowed unavoidable disadvantages to deter them, have certainly proved their keenness as amateur constructors. There is no money prize to be won. *Nothing but the honour of having built the best receiver in England and America.* Those who have shown that this is sufficient recompense for their expense, trouble and inconvenience certainly possess the true British amateur spirit to a remarkable degree.

WIRELESS IN PARLIAMENT

FROM OUR OWN CORRESPONDENT

SIR WALTER DE FRECE asked the Postmaster-General if he would state for what reason his department vetoed the proposal to broadcast the speeches at the House of Commons on July 26, on the occasion of the dinner given to celebrate the seventieth birthday of Mr. George Bernard Shaw?

Sir W. Mitchell-Thomson said he should have been glad to give permission for the broadcasting of Mr. Shaw's speech if an assurance could have been obtained that argumentative political controversy would be avoided. Such an assurance could not be obtained and permission was accordingly refused.

Mr. Duckworth asked the Postmaster-General whether he could state the grounds for the decision to veto the broadcasting of a dialogue on the American debt between the editor of a leading London paper and a well-known American journalist in London.

Sir W. Mitchell-Thomson replied that the dialogue dealt with a controversial question in which the policy of the United States Government was keenly criticised by one speaker and defended by the other. He considered that the broadcasting of such a dialogue would indubitably be an infraction of the existing practice and informed the B.B.C. accordingly.

Asked by Mr. Wright whether, in order to safeguard the impartiality of the broadcasting service, the representation of all sections of political opinion would be secured on the body that will conduct that service, Sir W. Mitchell-Thomson said he was not yet in a position to make any announcement as regarded appointments to the new organisation. The need for securing the impartiality of the broadcasting service would not be overlooked.

Replying to Viscount Sandon, Sir W. Mitchell-Thomson said that there were still certain technical difficulties to be overcome before a trans-Atlantic wireless telephone service could be offered to the public, and no definite date could yet be fixed for the opening of such a service. Experiments were still proceeding, and until the results were known and experience had been obtained of the working of a trans-Atlantic service under commercial conditions it was not possible at the present time to make any useful forecast concerning the possibility of extension to other countries.

A Cheap L.T. Battery

SIR,—Perhaps the following scheme for those who are unable to get their accumulators charged easily might be useful.

Get an old, or new, "dry" filament-heating battery; break it up, and, with the aid of 2-lb. jam jars and zinc rods, as used in bell batteries, turn it into a "wet" battery, using sal-ammoniac, of course.

If great care is taken in the breaking-up process, the original positive terminals can be used to connect the negatives of the neighbouring cell.

The results are perfect with my four-valve set.—O. B. R. D. (Devonport).

L.F. Valve Coupling

SIR,—In No. 215 your correspondent "J. B." makes several statements with regard to L.F. coupling which I consider entirely wrong.

Firstly, he declares that if sufficient resistance-capacity coupled valves are used to give the same amplification as two transformer-coupled stages "the difference in the resulting purity of amplification is not such as may be detected by ear." Now, two well-designed resistance-coupled stages, using high values of resistances and high-impedance valves, give almost the volume to be obtained by transformers, and three stages certainly give as much amplification as two transformers.

In the same letter your correspondent criticises my suggestion of combined resistance and transformer coupling, as mentioned in No. 211. May I ask "J. B." to read my letter more carefully, when he will find that the resistance and transformer primary are *not* connected in shunt, the parallel connection being broken by a fixed condenser. When he realises this point he will see that his remarks *re* reducing amplification peaks and reducing the over-all impedance do not enter the question at all.

The same correspondent continues by making a sweeping statement that "R. G. T." in No. 212 is quite wrong. I cannot quite understand "J. B.'s" criticisms, which appear to me to coincide to a large extent with "R. G. T.'s" opinions, in so much as the amplification is potential and not current transformation. I agree that the alternating voltage is produced across the whole system, that is, the valve impedance and external impedance; but this merely proves that the higher the value of external impedance the greater the magnification. Thus, the ideal value of external resistance would be infinity, but in practice it is found that maximum results are obtained when the impedance of the external circuit is from three to five times the impedance of the valves.—F. P. (Keighley).

A NOVEL DEMONSTRATION

A NOVEL display will be given by some American radio clubs in connection with the Radio World's Fair in New Madison Square Garden on the night of September 13.

Out of equipment costing less than $40 the amateur wireless experts will erect a transmitting station that can reach the far ends of the earth, and will send and receive messages that night over a range of 10,000 miles. The apparatus will be assembled in front of the visiting public, and to thousands of them it will be the first manifestation of the mystic power of the short waves. It is expected that this will be the most striking demonstration of its kind ever given in public, and that it will enlist into the army of "hams" a great many who may see and hear the immense possibilities of wireless communication.

"The Care of the Sportsman's Gun" is the title of a seasonable article appearing in the current issue of "The Amateur Mechanic and Work" (3d.). Other articles appearing in the same number are: "A 'Spade-tuned' Crystal Set," "Displaying Embroideries in the Home," "Overhauling a Chest of Drawers," "Mounting a Small Wringer," "How to Stain Floors," "Making an Umbrella Stand," "How to Temper Small Steel Instruments," "The Reflecting Telescope: How to Use It," "The Cycle-tourer's Tent for Two," "Useful Rear-lamp Indicator for Motor-car," "Modelling in Clay and Wax," "Coach Screws in Fence Work," "Overhauling a Motor-cycle for the Summer Tour," "Hints and Kinks Illustrated."

BROADCASTING WIRELESS WEATHER CHARTS

THE broadcasting of pictures by wireless may be said to have begun in earnest. The Munich broadcasting station is now transmitting daily meteorological charts which can be picked up by an amateur who possesses the necessary apparatus. The charts are being broadcast every week-day at 9 o'clock, and on Sundays at 12.15 p.m.

It is interesting to find that in spite of the pioneer work in the way of picture transmission that has been done in England and America, the actual daily broadcasting of these sketches has begun in Germany. To this must be added the fact that the broadcasting of pictures and photographs has also been established during the last few weeks in Vienna by Edouard Belin.

The method employed by the Munich broadcasting station for transmitting weather charts is that of Dieckmann. The chart is drawn in an insulating ink upon a sheet of metal foil, in the manner employed by Bakewell just 80 years ago. The chart is attached to a revolving cylinder, over which a metal stylus traces a spiral path, in the way already described in these pages. The Dieckmann receiver, however, possesses some points of novelty. A cylindrical roller is used, over which is wrapped a piece of paper covered by a thin sheet of typewriter carbon paper. Each wireless signal, after amplification, is caused to charge up a metal needle which traces over the surface of the paper. The needle discharges in the form of a spark through the paper to the cylinder beneath. The heat of each spark melts the colour in the carbon paper, and a dot of ink is left on the paper beneath. This, by the way, is reminiscent of a method employed many years ago by Charbonnelle, in which the stylus was made at each signal to press mechanically upon the carbon paper, and so to cause a mark upon a sheet of white paper placed beneath it.

The transmission of these meteorological charts takes about five minutes. T. T. B.

THE NEW 60-KILOWATT GERMAN BROADCASTING STATION

WORK has already been started on the new high-power Rhineland telephony transmitter to be erected at Langenberg, in the vicinity of Elberfeld. It is hoped to bring the station into operation towards the end of next September, when, if tests are satisfactory, the Münster, Elberfeld and Dortmund transmitters will be transferred to other districts in Germany still outside the crystal range of a broadcasting station.

As the new 60-kilowatt station will be situated on a high hill, it is to be fed by two studios, one of which is to be opened at Dusseldorf and the other at Cologne. The *Westdeutsche Funkstunde,* which is responsible for the working of the Münster group, will be transferred to the Rhineland city, where arrangements are being made to secure regular relays of operatic and dramatic performances from both the Cologne and Dusseldorf opera houses and municipal theatres.

The Langenberg station will broadcast on a wavelength in the neighbourhood of 2,000 metres. J. G. A.

PICNIC WIRELESS

A NOVEL feature of an outing arranged for the Birmingham staff of Cleartron Radio, Limited, on June 25, was a wireless-equipped launch. The launch was waiting for the party at Oxford, and a trip was made down the river to Abingdon, programmes being received throughout the day from British and Continental stations.

On August 16, on the occasion of the anniversary of the landing of the British Expeditionary Force in France, in 1914, a performance of *The White Château* will again be broadcast.

"THE BROADCASTING SERVICE FROM THE B.B.C.'s POINT OF VIEW" (*Continued from page 159*).

Handing Over

The policy of the British Broadcasting Company, during its stewardship of the Service, has led logically and indeed inevitably to the creation of a Public Corporation, as the permanent Broadcasting authority. The affairs of the B.B.C. have been so managed that, by utilisation of income for capital construction and expenditure, its revenue-earning capacity for the future has been greatly increased. At the end of this year, when the Licence terminates, the B.B.C. will be able, after repaying its shareholders at par, to hand over the entire organisation with its considerable capital assets in a high state of efficiency, at absolutely no cost whatever to the new authority.

The Future

The rapidity of the development of the Broadcasting Service in the past three and a half years is admittedly remarkable. Where there was *nothing* before the end of 1922, there is now an established National Institution with enormous power and still unmeasured potentialities. To stultify the growth of this great Service through restricting its scope or withholding the funds which are its due, would be a grave misfortune to the country. There would appear to be a tendency in some quarters to assess the future financial requirements of the Service on the basis of past accounts, the presumption being that Programmes may well be stabilised at their present standard. The B.B.C. maintains that such an attitude is altogether wrong. It feels that however great has been the development of Broadcasting in the past three and a half years, it is still in its comparatively early stages. The next step forward is the substitution of a new system of distribution, which should enable nearly every listener in the United Kingdom to have the choice of at least two Programmes, available simultaneously, on the cheapest and simplest apparatus. On the Engineering side, this step will require the erection of a number of new High Power Stations, and, on the Programme side, will entail the provision of more highly specialised, more varied, and therefore, more expensive Programmes.

The Staff of the Company are motivated by a sincere belief in the potentialities of the Service, and by a keen enthusiasm for those ideals and that standard of attainment which they believe it is destined to interpret and encompass. The affairs of the Company are managed without extravagance and with the economic efficiency which is characteristic of successful commercial enterprises. Dealings with the public and with other organisations are prompt and direct. Bureaucratic methods are excluded. It is of great importance that this spirit and responsibility be maintained.

The B.B.C. feels that the Service cannot stand still. If it does not go forward, it must decline. The saturation point of productive and efficient expenditure on the Broadcasting Service is not yet within sight. Moreover, if it is desirable to make Broadcasting a permanently supplementary source of public revenue, much more satisfactory results may be reasonably anticipated if the Service is more fully developed, particularly in research, equipment, and improved quality and variety of programmes, before its financial resources are curtailed. Lord Crawford's Committee in its Report 9 C (3) is quite clear on this point ". . . . when an adequate service has been assured, *but not until then,* it is expedient that the surplus be retained by the State."

SAVOY HILL,
July, 1926.

STATIC—ONE TYPE AND A CURE

NO doubt several listeners, especially new recruits to the ranks of listeners, have lately experienced trouble by a peculiar form of interference which makes itself conspicuous as a more or less continuous "pattering" sound similar to that of hailstones driven against a window. This kind of interference is extremely annoying, but may be easily remedied as outlined below.

The Cause

The trouble in question is caused by electrically charged raindrops falling on the aerial and consequently giving it a high potential in respect to earth. As may be expected, it is only when any particular district is experiencing thundery weather or when lightning is probable, or, in other words, when the higher atmosphere is highly electrically charged, that the particular difficulty manifests itself. Sometimes the rain gives the aerial such a heavy charge that sparks will jump between the aerial and earth wires if they are close together, and sparks up to one inch in length have been observed.

Fortunately, this charge is of a static type, and so does not affect the aerial in the same manner as do the H.F. impulses composing the signals being received, and so it is only necessary to use insulated wire, instead of bare, for the aerial to cure the trouble. The insulation, of course, has no effect whatever upon the H.F. impulses, but effectively shields the aerial from these static charges.

It is interesting to note that the form of interference under consideration is more pronounced the higher the aerial, and if the aerial is below surrounding objects its effect is slight, since the surrounding objects conduct the charges to earth and so shield the aerial wire. F. P.

Arrangements are being made with the leading seaside resorts with a view to securing from them complete evening programmes, similar to the Brighton night recently broadcast.

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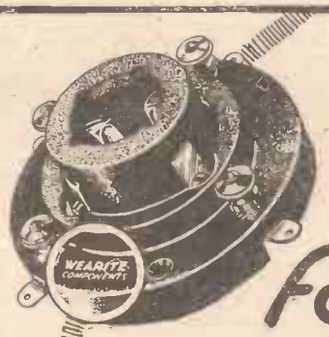

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186-3

TRADE BREVITIES

AN attractive coloured poster illustrating the WJ high-tension battery has been issued by the Chloride Electrical Storage Co., Ltd., of Clifton Junction, nr. Manchester. The battery is sold at 15s. for the 20-volt unit, and has an actual capacity of 2,500 milliampere hours.

The excellent results recently achieved by Mr. J. L. Baird, of Television, Ltd., have been obtained with the aid of a Hart 2,000-volt high-tension battery incorporating twenty units, each consisting of fifty ACR cells, specially assembled by the Hart Accumulator Co., Ltd., to meet Mr. Baird's particular requirements.

A twelve-page catalogue of instruments (sixth edition) has been issued by C. S. Dunham, of 2A, Elm Park, Brixton Hill, London, S.W.2. In it are described the Dunham range of cabinet receivers, "Sweetertone" loud-speakers and other accessories manufactured by this firm.

Particulars of the latest developments of the Igranic supersonic heterodyne outfits are contained in Publication No. 6,224 of Igranic Electric Co., Ltd., of 147, Queen Victoria Street, London, E.C. An important announcement regarding the payment of a royalty on every valve holder appears on page 6 of the publication.

CHIEF EVENTS OF THE WEEK

SUNDAY, AUGUST 8

London	The London Chamber Orchestra conducted by Anthony Bernard.
Birmingham	Requested Favourites.
Bournemouth	Concert relayed from the Royal Bath Hotel.
Glasgow	The Band of H.M. 1st Batt. Scots Guards relayed from Kelvingrove Park.
Newcastle	Light Orchestral Programme.

MONDAY

London	Excerpt from *Lionel and Clarissa*—a Comic Opera.
Aberdeen	Musical Romance (No. 3) a Competition for Listeners.
Cardiff	Lovers' Lyrics.
Manchester	Variety.
Newcastle	A Vocal Concert.

TUESDAY

London	The Geoffrey Goodhart Sextet.
Birmingham	Operatic Programme.
Bournemouth	Music and Playlets.
Cardiff	Music and Humour from Wales.
Glasgow	*What He Won*—a one-act play presented by the London Radio Repertory Players.

WEDNESDAY

London	Variety Programme.
Bournemouth	An Evening at Weymouth.
Belfast	*An Elder of the Kirk*—a play presented by the London Radio Repertory Players.
Edinburgh	Scottish Music and Humour.
Manchester	Round the Camp Fire.
Plymouth	Variety and Chamber Music.
Sheffield	Concert relayed from the Pavilion, Buxton.

THURSDAY

London	The Band of H.M. 2nd Batt. The Queen's Own Royal West Kent Regiment relayed from Granville Gardens Pavilion, Dover.
Aberdeen	Scottish Night.
Bournemouth	*The Blind Beggars*—an Operetta by Offenbach.
Belfast	Northern Ireland District Military Tattoo relayed from Balmoral Show Ground.
Cardiff	A Musical Medley.
Liverpool	Pageant of British Light Opera.
Manchester	Land of the Midnight Sun.
Newcastle	Chamber Music.

FRIDAY

London	Edward German Programme, conducted by the Composer.
Birmingham	*The Missing Link*—presented by the London Radio Repertory Players
Belfast	Favourites—Operatic and Otherwise.
Cardiff	A Light Programme.
Manchester	*A Model of Taste*—a Farce performed by the Station Dramatic Company.

SATURDAY

London	*Saturday Night Revue.*
Bournemouth	Popular Programme relayed from the Winter Gardens.
Glasgow	Empire Slogans (2)—a Competition Programme.
Newcastle	The Lessingthorne Colliery Prize Band.

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged **FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.**

DEPOSIT SYSTEM.

As the Publishers cannot accept responsibility for the bona fides of Advertisers in this publication they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The Deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

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EUROPEAN WAVELENGTHS—OFFICIAL CHANGES

DEVELOPING THE CRYSTAL SET

Amateur Wireless And Electrics

Vol. IX. No. 218 SATURDAY, AUGUST 14, 1926 Price 3d

PRINCIPAL CONTENTS

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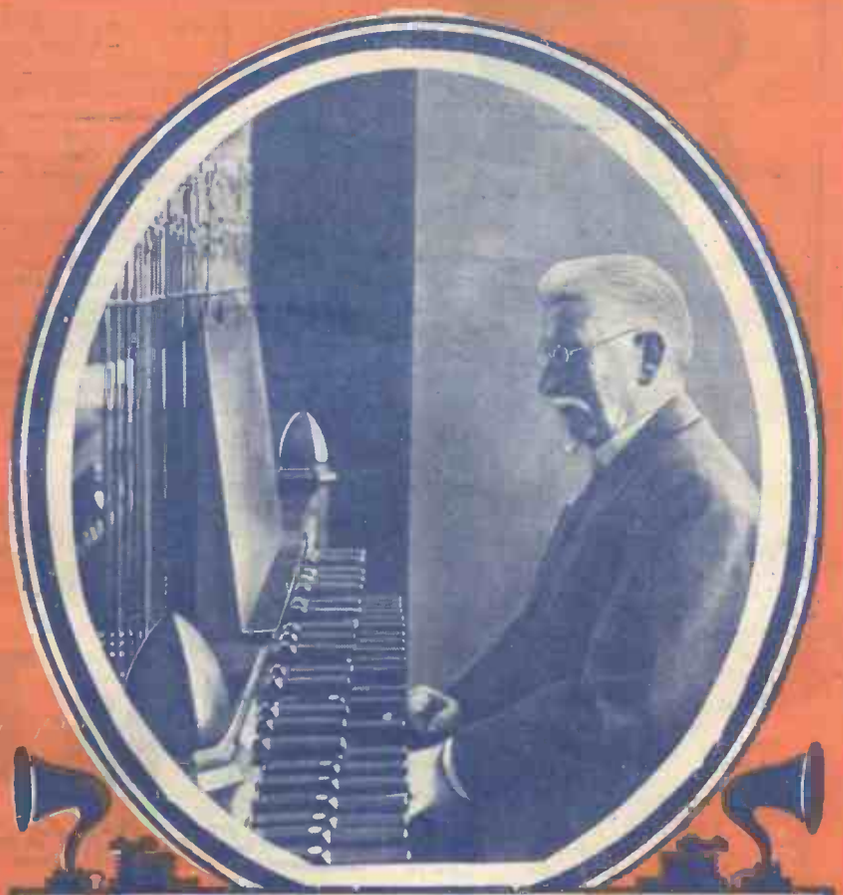

BROADCASTING THE FAMOUS CARILLON AT CROYDON.

The photograph shows M. Le Chevalier Jef Denyn at the carillon-keyboard.

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

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Chief Contents

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell and Co., Ltd.

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DEVELOPING THE CRYSTAL SET

ALTHOUGH excellent headphone reception can be obtained from a crystal receiver when it is used within a few miles of a broadcasting station, the limitations of this simple type of set are realised sooner or later.

It is quite incapable of operating a loud-speaker with any degree of satisfaction (in spite of absurd claims sometimes made), and it is seldom possible to receive any stations other than the local station and Daventry.

When the unaided crystal has ceased to satisfy there are two alternatives. The crystal set can be scrapped and a valve set installed in its place, or valve amplifiers can be added to the original crystal set.

Many people will favour the latter method, as not only does it seem wasteful to scrap a perfectly good set, but the perfection of crystal rectification is proverbial.

If it is not required to increase the range of the crystal set, but merely to enable a loud-speaker to be used instead of headphones, all that is required is a stage or two of L.F. amplification. A suitable amplifier can easily be constructed which can be connected to the telephone terminals of the crystal set at will without in the slightest way altering the original set or preventing its being used alone if desired.

No other coupling than a good transformer should be used between a crystal detector and the first L.F. valve. A second L.F. valve, if one is used, may be coupled to the first by transformer, choke, or resistance-capacity as desired.

To increase the range of the crystal set H.F. amplification is required, and this will usually mean altering the crystal set to some extent. The reason for this alteration is that what was formerly the aerial tuning arrangement will now have to tune the plate circuit of the H.F. valve. Before, the capacity of the aerial to earth was in parallel with the tuner, but in the plate circuit of the H.F. valve the tuner of the crystal set must be capable of reaching the desired wavelength without the addition of the aerial capacity.

The majority of crystal sets consist simply of a tuning arrangement across

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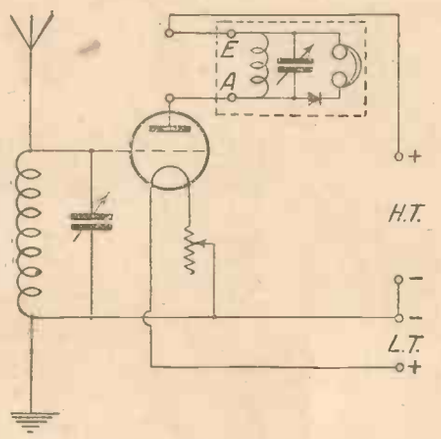

Fig. 1.—Circuit showing Addition of H.F. Valve to Crystal Set.

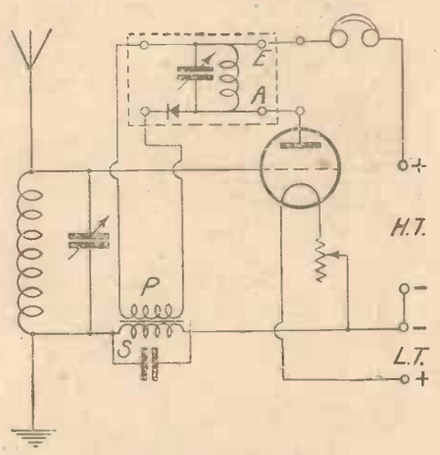

Fig. 2.—Circuit of Reflex Amplifier for Crystal Set.

PICTURE-TELEGRAPHY WAVELENGTHS

Special Article by T. Thorne Baker, "A.W.'s" Adviser in Television and Kindred Matters

ONE of the problems which will have to be faced before long is the further subdivision of the ether, from the wavelength point of view, on account of picture telegraphy and television. One of the early obstacles to wireless telephony was the fact that the spark systems then employed did not produce sufficiently rapid wave-trains to deal with the frequency of the human voice. It was only when many thousands of wave-trains per second could be radiated that any real attempt at telephony could be made.

Picture-telegraphy Wavelengths

All this is ancient history now, yet very much the same problem has cropped up afresh in connection with picture telegraphy and television. The velocity of a wireless radiation is 300 million metres per second, and as the frequency is merely the velocity divided by the wavelength, we find that the frequency with a 300-metre wave is just a million. Now the frequency of a million is easily grouped into any number of frequencies, such as are met with in the transmission of music or the voice, but when we come to television it is quite a different story.

In order to obtain a persistent image, at least ten images per second must be transmitted, and if we are to have anything like a perfect reproduction of even a fairly simple subject, the transmission of each image would involve something like 100,000 signals. We should therefore require ten times this amount, that is, a million signals every second, and therefore if only one wave were used to carry each television signal, the longest wavelength that could be employed would be 300 metres. It is quite probable, however, that something in the neighbourhood of ten times this frequency would be necessary, which means that television would require a wavelength of about 30 metres. The problem is less exacting, as is easily understood, in the case of the transmission of photographs, but as the latter becomes more perfect in character, and is executed with greater speed, the same question will, to some extent, crop up. Both wireless pictures and television will therefore involve the use of short waves, and it is perhaps a fortunate coincidence that the future of short-wave systems seems so abundantly assured.

Short Waves

The allocation of separate wavelengths is, on the other hand, increasingly difficult, owing to the growing tendency to employ short waves. But here again, as it has done before, the physics of wireless may follow in the "footsteps" of the physics of light. The pure colour of a coloured line in the spectrum is due to a light radiation of a definite wavelength, which is usually measured in units of a ten-millionth of a millimetre. Perhaps the most familiar spectrum line is the yellow line seen when examining with the spectroscope the burning vapour of any compound containing sodium, which has a wavelength of 5,893 units. More powerful apparatus revealed the fact that this yellow line consists of two lines, one having a wavelength of 5,890 and the other of 5,896 ten-millionths of a millimetre.

.00000001 mm.

If the flame under examination be submitted to a powerful magnetic field, each of these fine yellow lines is seen to split up into yet finer ones, each of which has its own definite wavelength running into small fractions of a ten-millionth of a millimetre. It may thus be that with very great refinements of tuning it will become possible to use wavelengths differing only by a small fraction of a metre, and yet to keep two transmissions completely isolated. If a large number of stations for the purpose of picture telegraphy and television should ultimately come into use, such refinements may become indispensable for them to maintain independence.

A new society (the Commission de Rapprochement Intellectuel, Artistique et Social) has been formed at Geneva to promote wireless interchange between European countries. One of the proposals is to apportion a special evening to each of the nations interested in broadcasting, the programme to represent the best from a literary and musical standpoint that the nation itself can produce.

"DEVELOPING THE CRYSTAL SET" (*continued from preceding page*)

which are connected the crystal and phones in series with each other. When the tuning is done by means of a plug-in coil and condenser, it will merely be necessary to use a larger coil in the crystal set when this follows a H.F. valve. A simple method of adding a H.F. valve to the crystal receiver which uses a plug-in coil and parallel condenser is shown in Fig. 1.

Here the original crystal receiver is enclosed with a dotted line, and it should be particularly noted that the aerial terminal of the crystal set should be connected to the plate of the H.F. valve and the earth terminal of the crystal set to H.T. positive. Supposing the variable condenser used in the H.F. amplifier to have the same maximum capacity as that in the crystal set, the same coil should be used in the aerial circuit for any given station as was used in the unaided crystal set.

The coil to be used in the crystal set will be a size or two larger. If the crystal set is tuned by a variometer instead of a coil and condenser the loss of the aerial capacity can be compensated for by connecting a .0003-microfarad fixed condenser across the variometer windings. It will suffice, of course, to connect this condenser across the aerial and earth terminals of the crystal set.

Some crystal receivers have the variable condenser connected in series with the tuning coil, and others, tuned by a variometer, have a small fixed condenser in series with the windings. These sets cannot be used in the manner just described, but it will be a simple matter to make the necessary alterations.

Crystal-reflex Receivers

A very useful and economical type of set is the single-valve-and-crystal reflex, as this has quite a fair range with headphones and is capable of working a small loud-speaker up to distances of twenty miles or so from a main station and considerably more from Daventry.

It is not at all difficult to design a reflex amplifier which can be added to a crystal set. All that is necessary is to introduce the secondary of a L.F. transformer between earth and L.T. negative in Fig. 1, to connect the primary of this transformer across the telephone terminals of the crystal set, and to insert the telephones between the earth terminal of the crystal set and H.T. positive. It will usually be advisable to connect a .0003-microfarad fixed condenser across the secondary winding of the L.F. transformer in order to by-pass the H.F. currents in the grid circuit of the valve.

The circuit of this new arrangement is given in Fig. 2, and it is not at all complicated. The chief matter when using either a H.F. or a reflex valve is to make sure that the valve is not rectifying but amplifying only. This can be done if a suitable valve is used, and proper adjustment of the H.T. voltage is made.

The efficiency of both the circuits shown in Figs. 1 and 2 can be greatly increased by introducing reaction. This is most easily done by coupling the two tuning coils together in a two-way holder, which can easily be substituted for the single-coil holder.

G. N.

BUILDING AN AMPLIFYING UNIT

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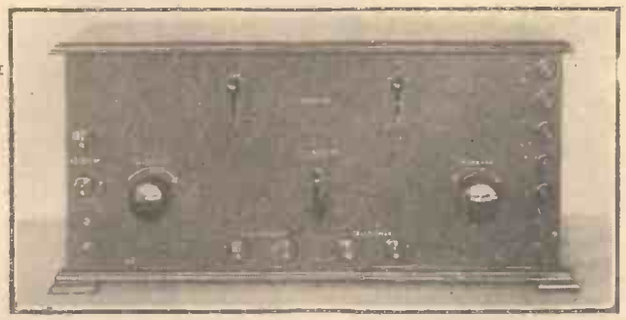


Photograph of Exterior of Power-valve Amplifier.

THE following is a description of a two-valve power amplifier. Although primarily designed to operate in conjunction with a valve rectifier, it is capable of giving enormous volume and really good-quality reproduction from the loud-speaker in conjunction with a crystal set of average strength.

The design is quite straightforward and it should present no difficulty in construction. As will be seen from the photograph, the amplifier is totally enclosed with merely the bare controls and terminals exposed.

If some readers prefer to have the terminals at the back of the instrument, a small slot may be made in the back of the cabinet to take the strip of ebonite.

By means of the switches the number of valves in circuit can be controlled at will, while with both the top switches in the off position the output of the detector passes straight through to the phones or loud-speaker according to the position of the bottom switch.

The Use of Power Valves

As this amplifier is designed to work solely with power valves, 120 volts is used. Care has to be taken to arrange the circuit so that when both valves are switched off the 120 volts does not pass to the plate of the rectifier. For this reason the bottom terminal of the input of the amplifier is marked positive, and should always be connected to the positive H.T. of the preceding set. The first switch then adjusts the H.T. automatically. Reference to the circuit diagram (Fig. 1) should make this clear. Of course, when the amplifier follows a crystal receiver these remarks do not apply.

As stated above, this amplifier was originally designed to follow a high impedance valve rectifier, so that a transformer with a large primary and consequently a low ratio (2.7-1) was chosen for the first input. The second transformer is connected in the anode circuit of the first power valve, which has a low impedance. It should therefore have a high step-up ratio (6-1). This matching of transformers and valves is very important in order to obtain as even an amplification as possible over the range of speech frequencies.

Although the reader can modify the selection of the components to suit himself, he is advised to use the best available. This applies particularly to the transformers and valves.

No details are given for the construction of the cabinet, since it is recommended that this be obtained ready made.

Components

In order to facilitate matters, a complete list of parts is appended below:

One cabinet (to take panel 16 in. by 7 in. by 7 in. deep); one ebonite panel 16 in by 7 in. (Peto-Scott); one Ideal transformer 2.7-1 (Marconiphone); one do. .6-1 (Marconiphone); two antiphonic valve holders (Burndept); one doz. lacquered terminals; two rheostats 7 ohms (Burndept); three D.P.D.T. switches (Utility); one Mansbridge condenser 1 microfarad (T.C.C.); one .001 microfarad fixed condenser (Dubilier); two .25 megohm grid leaks with clips (Marconiphone); two 6 in. panel brackets (Pranco); one 9-volt grid battery with three plugs (Adico); ½ lb. tinned copper wire; screws; transfers, etc.

The panel, after being squared up to the required size, should be rubbed down to produce a matt surface and drilled to the specifications given in the drawing (Fig. 2). The transfers should then be fixed in position.

A fixed condenser (.001) should be connected across the input terminals of the amplifier, if this is not across the telephone terminals of the set used as rectifier.

It may be found necessary to earth the filament battery when the amplifier is connected to a crystal receiver; this is particularly necessary when extended leads for loud-speakers are in use.

The grid battery is fixed by screwing the lid down to the baseboard and wedging the battery into it.

In the amplifier under consideration the L.T.– is joined to the H.T.–, therefore care should be exercised to see that any valve rectifying set used in conjunction with this amplifier is connected similarly, otherwise the filament battery will be shorted.

The power valves used are DE5's, but other makes of similar characteristics may be used. When very strong signals are to be amplified, the last valve may be overloaded. In this case a DE5a may be utilised, and for this purpose an additional terminal is provided for extra grid-bias (bottom right-hand), about 17 volts being suitable with this valve with 120 volts H.T. When this arrangement is being used this terminal should be connected to I S of the 6-1 transformer, then the battery is connected externally between this terminal and L.T.–.

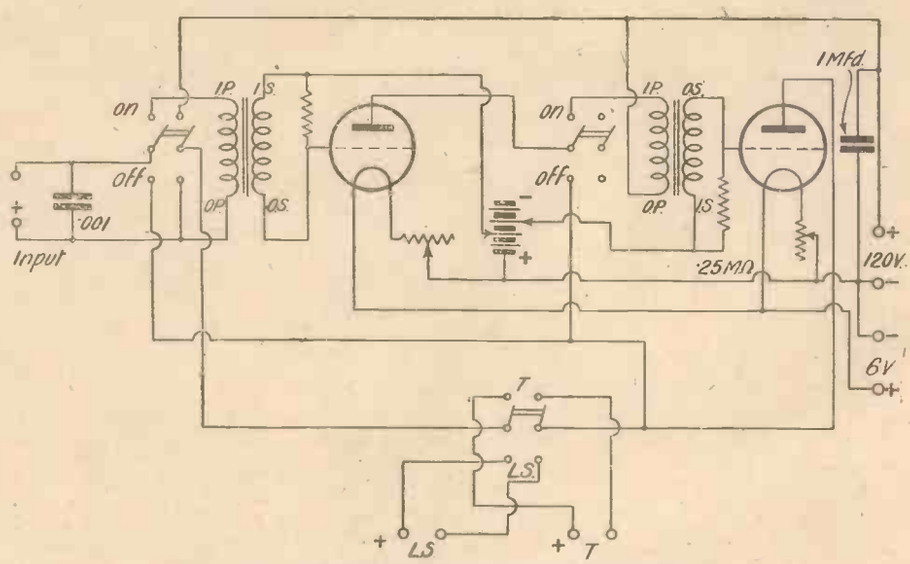
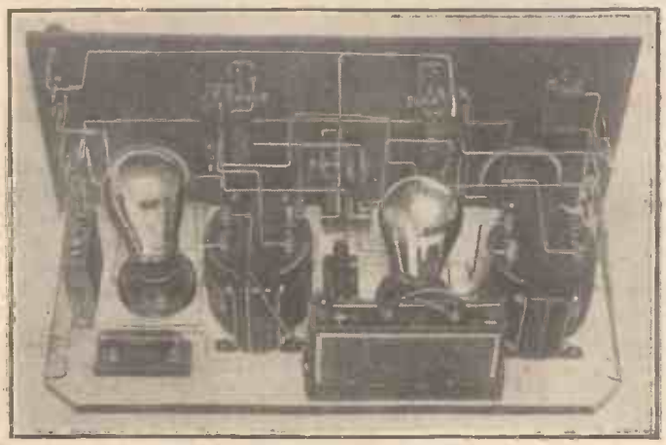


Fig. 1.—Circuit Diagram of Two-valve Amplifier.

The volume obtained in conjunction with a crystal receiver at about twelve miles from a main broadcasting station is too great for ordinary purposes, and for

this reason fixed resistances are connected across the transformer secondaries. This constitutes a very satisfactory method of cutting down volume. Of course, when full volume is desired these may be removed. In either case the quality is excellent.



Back-of-panel View of Amplifying Unit.

When all the components are mounted on the baseboard and panel (the photographs should make clear the positions), the panel should be unscrewed from the baseboard and as much of the wiring done as possible with them separated.

The wiring is quite straightforward, and reference to the photograph and circuit diagram should make it quite easy. The only flexible wires used are for the three wander plugs for the grid-bias tappings, which should be bound at the ends and shellacked to prevent fraying.

It may be helpful to use black-covered wires for the two negative leads and red for the lead from positive GB to L.T. —. It is a good plan also to solder these wires on to the wander plugs to prevent any possibility of them coming undone and shorting on any of the other leads.

Even if there is a condenser across the H.T. terminals of the preceding valve set, it is advisable to include one in the amplifier, as the H.T. voltage applied to the rectifier and amplifier are sure to differ, and it is better to have a condenser across each tapping of the H.T. battery.

It is advisable to employ a choke and condenser or an output transformer in the loud-speaker circuit so as to remove it from direct electrical connection with the high-tension batteries, and also to limit the current flowing through its windings.

Large high-tension batteries are recommended for use with this amplifier, as the total plate current, using DE5 valves, is in the order of 10 milliamperes.

In operation one must take care to adjust the grid bias correctly according to the H.T. potential applied, in order to keep the plate current as low as possible and to eliminate distortion. With DE5 valves and 120 volts H.T., 6 and 7½ volts negative for the first and second valves respectively will be found sufficient.

The panel brackets are screwed to the baseboard and bolted to the front panel with brass bolts. These small brackets are quite strong enough, as there is very little weight on the front panel.

General-purpose valves are as good as useless in this amplifier if purity of tone is to be studied, as these valves are easily overloaded. Also the transformers have not been chosen to suit these valves.

In conclusion, it may be stated that the reader will be amply repaid for his trouble in constructing this amplifier, as the volume and quality are excellent, whilst it is possible to use it in conjunction with any receiving set that has not already any low-frequency amplification. R. G. B.

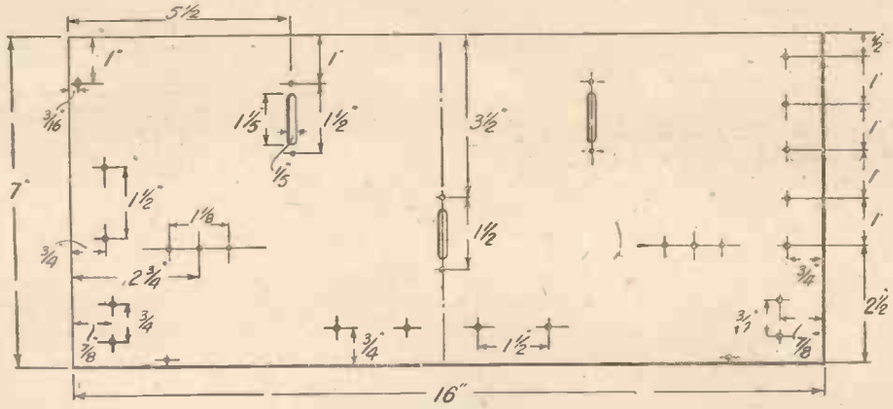


Fig. 2.—Layout of Panel.

BROADCASTING IN FINLAND

OWING to lack of funds broadcasting has made but slow progress in Finland. It has not yet been found possible to establish an organised public service in that country, and most of the transmissions are provided by amateur wireless clubs and small groups of radio enthusiasts.

As far back as 1923, experiments with a view to the erection of a wireless telephony station were carried out by the radio-telegraphy battalion of the Finnish army, and from that date weather forecasts have been sent out daily. To-day this station relays three times weekly musical programmes and lectures provided by the Suomen Radiohydistys and Finlands Radiofoerening, the two principal wireless associations of Helsinki.

Through the courtesy of the Finnish Posts and Telegraphs, land-lines are placed at the disposal of these voluntary organisations for the relay of entertainments to Tammerfors, Bjoerneborg, Jyvaskyla, and other small towns where low-power broadcasting transmitters have been erected by local amateurs.

A further station operating at Helsingfors and run by the Town Civic Guard is one leased from the Western Electric Company since 1925; it also provides wireless entertainments in the same manner. But few restrictions are made by the Finnish Government and considerable facilities are granted to experimenters in wireless telephony.

A new company, the Helsingin Jleisradioaserna, has recently been formed with a view to securing from the authorities a concession for the establishment of a broadcasting service throughout the country. Should sufficient funds be available it is hoped to install a 25-kilowatt transmitter in the capital. The preliminary proposals have already been passed, and a Bill will shortly be placed before the Finnish Parliament to permit the issue of listeners' licences, of which a portion of the revenue would be payable to the organisers. J. G. A.

VALVES FOR PORTABLE RECEIVERS

VALVES in the portable receiver are liable to receive a good deal of rough handling, and for this reason it is advisable to select only those providing sufficient support for the electrodes, particularly for the filament, which is the most delicate of the three electrodes.

The trouble can be minimised by the use of shock-absorbing and anti-microphonic valve holders, which give additional protection to the filaments, but even the best and most resilient holder is not capable of protecting a thin filament loosely supported.

All the best makes of valve are now fitted either with an additional centre support for the filament, or else the wire is mounted between small springs which absorb all vibration. The grid and anode electrodes, too, must be held rigid, or annoying microphonic sounds will be heard in the loud-speaker whenever the set is moved. K.

MAKESHIFT INSULATORS

When it is required to erect a temporary aerial for such an occasion as a picnic, the question of insulation always arises. This article shows how insulators can be improvised from a number of common objects.

IT sometimes happens that the wireless experimenter wants to rig up a temporary aerial in a hurry and finds that he has no proper insulators at hand. The following are a few simple dodges that he can employ quite successfully in such circumstances.

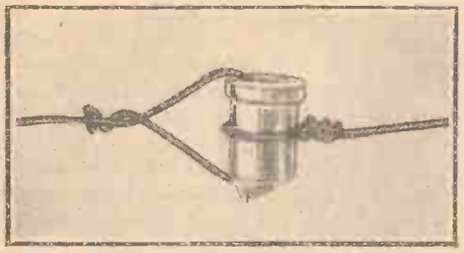


Fig. 3.—The Neck of a Bottle Costs Nothing.

Fig. 1 represents what is perhaps the best of all substitutes for the conventional form of insulator. It is merely a strip of stout ebonite having two holes drilled in it near the ends, through which the aerial wire and the halyard rope are threaded. A piece of dry wood drilled in the same way and well soaked in paraffin-wax may also be used at a pinch. Or the holes may be drilled with a larger drill and short lengths of ebonite tube inserted, in which case the wood insulator becomes practically equal to the ebonite one.

Fig. 1.—The Simplest Insulator.

Fig. 2 shows another excellent emergency insulator. It is nothing more or less than a rubber door-stop with the hole enlarged.

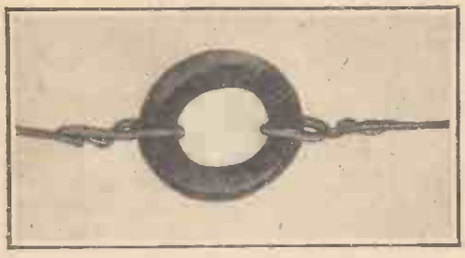


Fig. 2.—A Rubber Door-stop Answers Well.

Fig. 3 shows how a broken bottle may be employed as an aerial insulator. This is an idea that can be tried at a wireless picnic when one has forgotten to include insulators in the package of wireless gear. It forms a very efficient insulator even though its appearance is crude. It is unsuitable for anything but temporary use.

Fig. 4 reveals itself as a piece sawn off a stout ebonite tube, which can always be found in the wireless experimenter's scrap-box, while Fig. 5 shows how even a tea-cup may be used in an emergency; a broken cup would answer as well provided the handle is intact.

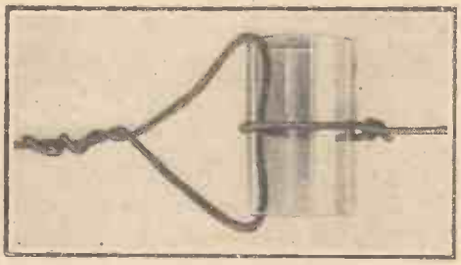


Fig. 7.—A Glass Tube Provides Excellent Insulation.

Fig. 5.—A Tea-cup with Another Use.

A little thought along these lines will suggest many other common objects that can be employed as insulators. For instance, Fig. 6 is a rubber band, and Fig. 7 a short length of glass tube. The writer has even seen a pair of elastic garters used for an indoor aerial!

J. A. L.

Fig. 6.—A Rubber Band as Insulator.

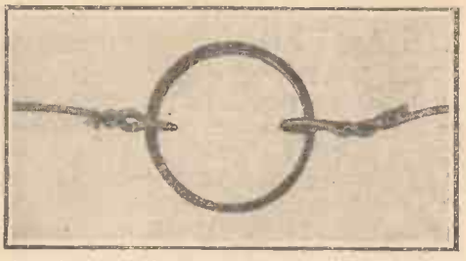


Fig. 4.—An Ebonite Ring Pressed into Service.

A NEW PHOTO-ELECTRIC EFFECT

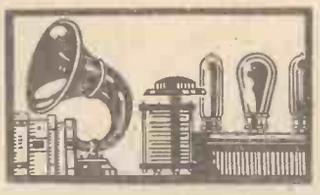
IT has been known for some time that copper oxide when used as an electrode in a voltaic cell generates a feeble E.M.F. under the action of light. This is probably due to some chemical action. But S. Schlivitch has recently reported to the French Academy that some photo-electric effect can be obtained from clean platinum immersed in a liquid which does not attack it. He used potassium or ammonium chromate in water, or even saltpetre, and obtained an electromotive force as high as 12 millivolts between the two platinum electrodes in the liquid.

The interest of this experiment lies in the fact that no external battery is used, as in the case of photo-electric cells or selenium. Intermittent sunlight falling with audio-frequency upon such an electrode should produce an audible note in a telephone connected in series with the cell consisting of two platinum strips immersed in a solution of potassium bichromate. This interesting experiment is quite easy to try.

E. E. F. d'A.

THE B.B.C. AT THE WIRELESS EXHIBITION

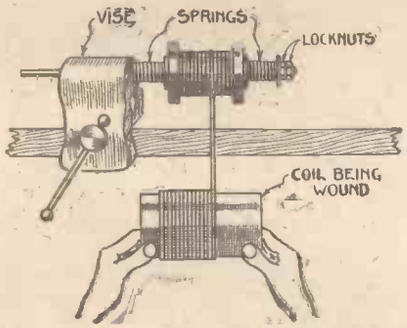
WE understand that the B.B.C. will have a most interesting exhibit and demonstration at the National Radio Exhibition which opens on September 4 at Olympia, London. They propose to reproduce, in the gallery of the hall, their chief 2LO studio and to do almost continuous broadcasting from it. Although the studio will be a replica of that of 2LO, the construction will be such that visitors to the exhibition can see everything that takes place and will be able to form first-hand impressions of actual broadcasting.



PRACTICAL ODDS & ENDS

A Coil-winding Tip

WHEN winding solenoid coils it is usually a difficult matter to keep the wire taut if there is no one available to lend a willing hand. The accompanying sketch shows a method of efficient "one-man" winding. A length of 2 B.A. threaded rod is clamped in a horizontal position in a vice as shown. Over this rod



Simple Method of Coil Winding.

is slipped first a small coiled spring, then the reel of wire, another spring, and finally the top of a terminal or a large nut. By suitable adjustment of this terminal head or nut, the tension on the wire can be varied to suit the gauge of wire used. The thicker the wire the greater must be the tension. A. S. H.

The Aerial Series Condenser

THE insertion of a small fixed condenser in the aerial lead is so definitely an advantage when increased selectivity is desired that its further purpose of extending the tuning range of any given coil is liable to be overlooked. The use of such a condenser is, however, well worth while for both reasons, and if the experimenter

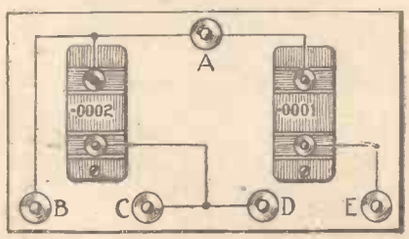


Diagram of H.T. Condenser Connections.

is in the habit of changing his set from time to time, it is a good plan to construct a small subsidiary panel, carrying two fixed condensers, of .0001 microfarad and .002 microfarad respectively, which may be permanently installed near the aerial lead-in, and which will give a choice of four different aerial values.

The diagram shows the wiring of such a panel. The aerial is attached to the terminal marked A, and a lead taken from one of the four terminals marked B, C, D and E to the aerial terminal on the set. When terminal B is used there is no capacity in series with the aerial. When terminal E is used a condenser of .0001 microfarad is inserted between the aerial and the set. If terminal D is used instead of terminal E, the .0002 condenser is substituted for the .0001 condenser. When the lead is taken from terminal C, and terminals D and E are shorted, the value of the series condenser is increased to .0003. H. P.

Diluting Accumulator Acid

THE valve user often finds it necessary to dilute concentrated sulphuric acid for use in accumulators.

It is difficult to remember the manner in which the acid and water should be added—whether it should be water to acid or acid to water. Anyone who has taken the wrong course will recognise the need for caution!

A good mnemonic can be formed from the initials "A.W." (AMATEUR WIRELESS), which, in addition to their usual meaning, can be construed into Acid to Water.

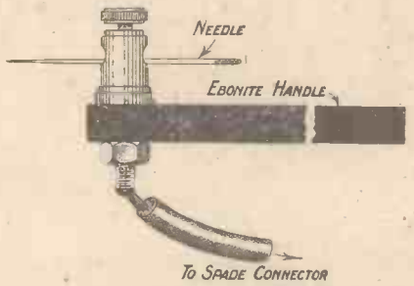
Even when adding the two in this way care should be taken to add only a very little acid at a time. If possible, do the diluting in a large dish, such as is used in photography; there is less chance then of an accident. J. A. D.

Making Trial Tappings

THE efficiency of the so-called "aperiodic" or fixed tuned aerial coupling coil depends almost entirely upon obtaining the correct relationship between its inductance (or more conveniently the number of turns) and other factors, including the aerial dimensions and the waveband on which the coil is required to function. If the coil is wound with spaced bare wire its adjustment is quite a simple matter, but in the case of insulated wire the gadget here described will be found useful, as the correct tapping point can be found without baring any of the wire.

A pillar terminal is bolted through an ⅛-in. diameter hole drilled at the end of a strip of ebonite measuring about 6 in. long by ½ in. wide. To the terminal shank a length of rubber-covered flex terminated by a spade connector is attached. Fastened in the terminal is a small needle, which projects beyond the ebonite handle by about ½ in.

The "aperiodic" coil of the tuner is wound with a few extra turns, the spade connector is fastened to the aerial terminal, and the needle is thrust through the insulation at some point in the coil to make contact with the metal. If the coil is wound with fine-gauge wire, the needle



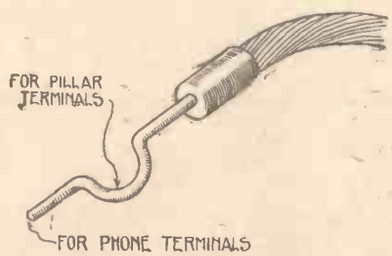
Making Trial Tappings.

can be slanted in order that the point may be steadied against an adjacent turn.

Tuning is now carried out over the whole range of the variable condenser. If it becomes increasingly difficult to make the receiver oscillate as the condenser approaches the minimum position, the "aperiodic" coil is too large, and further points should be tried until smooth reaction control is compatible with good signal strength throughout the whole range. B. H.

Dual Phone Tags

THE diagram illustrates a simple method of converting phone tags so that they may be used with either the screw-down phone-pattern terminal or the plain



Dual Phone Tags.

clamp terminal most generally used. Bend the tag to form a kink or, if it is not long enough, bend a short length of stiff wire and solder it to the tag. Connection can now be made with equal facility to either telephone or clamp terminals. K. N.

On Your Wavelength!

The New Wavelengths

FROM September 15 most of the home and Continental stations will take up their new positions in the broadcasting band, and, providing adequate means are taken to prevent the transmitters from straying from their allotted places, much should be done towards obtaining a clean ether. As to the common wavelength principle to be adopted by the relays, we will wait and see. When some six or seven of these are taking the London programme some curious results in reception may obtain. The only disadvantage I can see for the present is that in cases of separate local programmes, which are given at regular intervals, the neighbouring public alone will be able to enjoy them. But, as you know, the relay is not installed for the pleasure of the DX fan.

I am, however, not quite so happy in regard to the wavelength shared by Birmingham and Aberdeen; to my mind this is unfortunate, as their individual programmes are picked up all over the British Isles by ordinary one- and two-valvers. In London the 5IT transmissions add variety to our daily fare, and it will be regrettable if we are deprived of this station's programmes. Would it not have been possible to give to Plymouth and Aberdeen the same wavelength instead?

Very Awkward

A friend who is not a wireless enthusiast, though he dearly loves to spend an evening listening to the programmes with the aid of somebody else's set, was complaining bitterly to me the other day about the hardships that radio inflicts on the man who goes round to see friends in the evening. This is the sort of thing that he grumbles about. Calling on friends the other night, he found them listening to a rather special programme. There was no loud-speaker and there were but two pairs of telephones for the heads of the party, which now numbered three. My friend wanted at first to talk, but the others wanted to listen. They therefore arranged a kind of turn and turn about business, one of the three sitting out for five minutes at a time. He complained that when it was his listening spell he could not enjoy the concert because the sitter out always insisted on talking; again, when one of his phoneless five-minute periods came round the sight of the other two enjoying something that he could not have was irritating to a degree. He therefore had to talk in self-defence.

Those who use small sets can, of course, provide an extra pair of phones for the benefit of a chance caller, but if they do so it will nearly always happen that not one but two turn up. The best solution of all seems to be to add a valve which can be switched on at will so that a loud-speaker may be operated. Then if you normally prefer the phones, you and your better half can use them whilst you are alone, and the loud-speaker is there as a stand-by in case visitors drop in.

A Demonstration—

And there is another little happening which makes my friend very wroth. This is when his host is seized with a DX fit and decides to show the assembled company how many stations he can tune in. This means, says my friend, that you get two bars of a foxtrot from Madrid, a couple of sentences from the weather forecast from Berlin, and a heap of other fragments from various places interspersed with morse signals. He wants to know why people cannot stick to the local station, and he told me that it was simply ridiculous to try for anything else, because there was absolutely no pleasure in listening to these foreign places.

It occurred to me at once that here was a heaven-sent opportunity of testing out an idea that had been in my mind for some time. Going over to the set I switched on, stuck on a pair of headphones and moved the condensers. Then I flicked over to the loud-speaker. "There you are," said the friend, "that's real music. No station but London can provide stuff that is worth listening to." At the end of the item I switched off, saying that we would have some more wireless later. We did, and again my friend said that it showed more and more clearly how right he was. After a second interval I gave him some more loud-speaker music, after which his enthusiasm knew no bounds. He had spent, he said, just the right sort of evening, a really fine programme with decent intervals for conversation, and no silly messing about with the foreign stations.

—and the Sequel

And then I broke it to him. The first station tuned in was Hamburg, the second Hilversum, and the third Radio-Paris! I maintain that with a good set any of these three will give you loud-speaker reception with a quality that is not noticeably inferior to that of the local station. As they are all particularly strong transmissions they are very easily picked up by even small sets, and they do provide a very excellent stand-by if the local programme, or certain parts of it, does not appeal.

The New Hilversum

Did you know that the old Hilversum plant was out of commission now and that its place had been taken by a brand-new outfit? Hilversum is now able to work up to 20 kilowatts, though so far the full power has not been used except in tests, since local amateurs found that its blotting-out effects upon their reception of other stations were rather serious. The new plant is, however, giving wonderful results, and Hilversum's range has been very greatly increased. If you have not tried Hilversum for some time, you will probably be surprised when you tune it in now. What was quite a good signal earlier in the year is now a very strong one indeed.

One of the great advantages of adding to your equipment a set of coils that will bring in the Dutch station, supposing that you do not already possess them, is that you can be perfectly certain of picking up a foreign transmission at good strength at almost any time, for Hilversum works long hours every day. Interference from morse upon its wavelength is not often met with, and there is no trouble due to heterodynes. Here, then, is the ideal foreign station for those with small or not very selective receivers.

From Sarawak

A few nights ago Mr. J. Partridge, who is so well known for his long-distance work with other amateurs, picked up signals from an amateur in Sarawak who said that he had been trying for six weeks to get into communication with this country. The two managed to exchange news for half an hour or so, at the end of which time they were jammed by two Brazilian stations. It really seems rather queer, when you come to think of it, that a man speaking from Sarawak to another in this country can be interrupted, quite unintentionally, of course, by chatter from South America.

Wireless in the Wilds

Sarawak was, as a matter of fact, one of the first countries to see the possibilities of wireless. Many of the Government posts lie at great distances from the capital, the only means of access to them being by narrow jungle roads or by the rivers. When an attempt was made to link them up by means of the land line, no very great success was met with owing to the little habit which the Dyaks developed of cutting the lines whenever they felt so disposed. Wireless transmitters and receivers were installed many years ago in some of these posts, and they have proved of the greatest service in times of trouble by making it possible for the residents to get into touch at once with headquarters and to maintain communication despite the activities of the head hunters.

On Your Wavelength! (continued)

Try These

I have mentioned before that it is really worth while to furnish your receiver with coils that will allow you to drop down to below 300 metres. At the present moment there is much more to be heard down there than on the 300-500 metre waveband, on which heterodyning and jamming of various kinds often make it impossible to obtain satisfactory reception of any but an odd station here and there. Down below very little of this kind of thing is met with as a rule, though sometimes sparks from the shorter shipping wavelengths may be troublesome down to 290 metres. What really is surprising is the strength of many of these shorter wave signals and their extraordinary good quality. Most of the powerful stations down there are German, and their programmes are generally worth listening to. Besides these, Antwerp is often well heard, whilst the Swedish relays, despite their small power rating, are sometimes amazingly strong.

When you go down to the shorter wavelengths for the first time you may be bothered at first by the tiny adjustments that are needed to tune in stations. A slow-motion condenser dial gets over this difficulty, and I have found such a device as a friction pencil quite satisfactory for the purpose. These lower wavelengths are densely populated, though there are not stations enough to cause mutual interference. If your set is an efficient one you will most likely find that a try round after dark will enable you to add a goodly number of new stations to your log.

Another Adventure

I seem to be having no luck at all with valves just now. Up to about a month ago I could boast—though with thoughts of Nemesis in my mind I refrained from doing so—that I had *never* burnt out a valve owing to a short-circuit or a wrong connection. Then three cherished P.M.3's went up in a fraction of a second owing to a perfectly ridiculous short, and this was followed a few days later by another silly accident. When changing coils I just touched—I will swear that it was no more than a touch—the bulb of one valve with the plug of a coil. There was a loud pop, and that was that. Though the bulb is gone the whole of the rest of the valve is intact, and I am now wondering whether there is any firm of valve repairers that can fit a new bulb.

The Broadcasting Board

We are all rather anxiously awaiting the announcement of the composition of the board which is to be responsible in the future for our wireless entertainments. So far it has been rumoured that various distinguished people have been appointed, that an eminent public man is to be chairman, and that there is to be a woman member; but that is all that we know. One person who would not be a member at any salary is your THERMION, for I cannot imagine any more awful job. Where the B.B.C. was criticised the control board will be criticised far more, for everyone knows that Government departments are simply there to be shot at. If they keep things going on much the same lines as at present they will be criticised for lack of originality; should they make changes everyone will scream that broadcasting is going to the dogs. If they manage to spend less money we shall say with one voice that their lamentable parsimony has ruined broadcasting, whilst if they spend more we shall all point out to one another this new and shocking example of the extravagance of Government departments. Among the outside broadcasts next year I very much hope that we shall have one of the board in session trying to find a programme that will please everyone.

Working Together

There has been in the past a rather lamentable lack of cohesion between those responsible for broadcasting in the various European countries. The International Bureau at Geneva has done splendid work in bringing about a closer union in face of enormous difficulties. One of the most promising signs of an improvement is to be found in the agreement which has been reached with regard to the allocation of wavelengths, and it is to be hoped that other steps in the right direction will follow. I look forward to the time when international programmes will be arranged and when stations will make their programmes fit in with one another so that relaying on a larger scale is made possible. Meantime I would like to see some agreement reached on the question of giving call signs at frequent intervals. Some foreign stations are particularly bad in this respect; in fact, not a few of them never seem to state their identity except at the beginning and at the end of their programmes.

Thermionic Valve Uses

I wonder how many amateurs pause to consider the numerous uses to which the thermionic valve can be and is put to at the present day? It is used for wireless work, for telephone repeater systems, for measuring movements of metal under heat, as a means of synchronising motors and tuning forks for acoustical observation purposes, as an ear tester, as an amplifier of very weak sounds given off by the human body for medical purposes, for aircraft location and directing purposes, as an aid to the landing of aircraft in fog, and a hundred and one other uses, apart from actual wireless work. It is a veritable "Aladdin's Lamp" of science, and there is no knowing where its uses will end.

Shall We Hear America?

I wonder whether during the coming autumn and winter we shall hear the American stations once more. During the last winter period nothing whatever appears to have been heard of them, at any rate I have met no one who managed to get any of them—a surprising fact in view of the big advances in high-frequency circuits that had been made. Myself, I am feeling rather hopeful about the Transatlantic stations this year, because conditions at present for long-distance work are showing such a steady and continued improvement after the midsummer period of deadness. I cannot remember any time so early in the year when distant low-powered transmissions were coming in so strongly or so consistently as they are just now. I have not yet had a try for any of our old U.S.A. friends, though I am thinking of making a first attempt before long.

Some Curious Effects

Many readers must have noticed the curious resonance effects that occur at times when outside broadcasts are being made. Some concert halls emphasise certain notes rather strongly, whilst others make music sound a little dead, and others again seem to be ideal for wireless purposes. One of the very best is that of the Grand Hotel at Eastbourne, and the Free Trade Hall at Manchester is also excellent. Services broadcast from certain churches produce curious ringing effects at times, especially during the sermon, when one particular note in the speaker's voice happens to cause resonance with some part of the building.

One of the most curious results of resonance that I have ever noticed occurred a little time ago, when the diver was speaking from the bed of the Thames. In this case the note was the D immediately above the middle C, and was caused by the microphone being inside his metal helmet. A rather remarkable point is that some listeners noticed it much more than others. One of my friends found the ringing so bad that he could hardly follow a word that the diver said, though personally I had little difficulty in hearing everything. I have no doubt that in cases where the recurring note was so powerful as to drown speech its strength was due to a rather strange cause. Either the loud-speaker horn or some object in the room had this D as its fundamental note, and whenever it occurred it was thus brought out at greatly increased strength. It is possible, again, that the frequency of this note (or its octave) corresponded exactly with the resonance peak in the windings of a low frequency transformer or of the loud-speaker itself.

THERMION.

AMERICAN DOINGS

As Specially Reported by Lloyd Jacquet, who represents "Amateur Wireless" editorially in the U.S.A.

FOLLOWING the lead of the automobile manufacturers, wireless manufacturers have now developed the practice of introducing "yearly models." That is, a set built and designed for the 1926 market is now out of date, and it has not the selling value of a year ago. While this practice is not considered the soundest, it tends to originality and competition, as every year a new crop of very novel ideas are produced with the season's new models.

Each year there is a definite trend towards some particular feature. This year it seems to be towards power and selectivity. The latter, of course, is very essential as the number of high-power stations increases.

The demand for the sets with simplified control has been met, and few of the best class of receivers will have more than two controls for tuning purposes. The single-control receiver, however, is giving way to the two-control set, a tendency which perhaps can be explained by the fact that the single-control receiver still requires to be improved.

Multi-valve tuned radio frequency circuits seem to be as popular as ever, with a falling off in the reflex and regenerative. Super-heterodynes have not "made good," and no new commercial types of any consequence have been brought out.

The art of "shielding" has been developed to a point at which selectivity is simply marvellous. A few days ago I saw an eight-valve set, consisting of two stages of tuned radio-frequency amplification, a detector, one stage of transformer coupling, followed by a three-step resistance amplifier, which would tune in and out any one of the twenty stations in New York City, one of which was little more than half a mile away. The set was completely shielded, each stage being in an individual metal box. The aerial consisted of a piece of bare wire 18 in. long. One could not hear any of the other stations when the one farthest distant (about 18 miles) was tuned in. Practically all sets have elaborate shielding and built-in high-tension battery eliminators.

The development of the battery eliminator is something the American radio fan has been looking forward to for several years, and most 1927 sets will be operated from the electric-lighting mains. Efficient battery eliminators are also to be sold as separate units.

New Loud-speakers

It is a curious fact that the horn-type loud-speaker and headphones are gradually disappearing from the American market. And everyone is wondering who is buying the 5,000 head sets made daily by a certain firm in New England. The cone speaker, originally a European invention, is the favourite in America to-day. The cone speakers, used with well-designed distortionless audio-frequency amplifiers, have brought music to the home as it is reproduced in the studio. A new power valve, capable of handling as high as 700 milliwatts, has appeared, which makes the problem of good audio amplification with volume an easy matter.

Cone loud-speakers have been put on the market which have a diameter of 36 in. The volume from such instruments, when fed by a small four- or five-valve receiver, is such that it can be heard several hundred yards away.

Clever variations of the ordinary cone loud-speaker stand have been developed. One type is arranged to be the centre portion of the top of a tilt-table. Others are hung from the wall in the manner of a picture. I have seen several nicely decorated cones hanging in a large room, and the effect is most pleasing when one cannot directly locate the source of the sound.

Short-wave Work

Amateurs with short-wave receivers have been closely following the investigations of the "skip-distance" phenomena reported upon by R. A. Heising, discoverer of the Heising method of modulation, in a paper which he gave before the Institute of Radio Engineers.

A transmitter of the oscillator-amplifier type, and of between one and four kilowatts output, was used in these tests. It is located at Deal Beach, N.J., and oper-

(*Concluded at foot of page* 184)

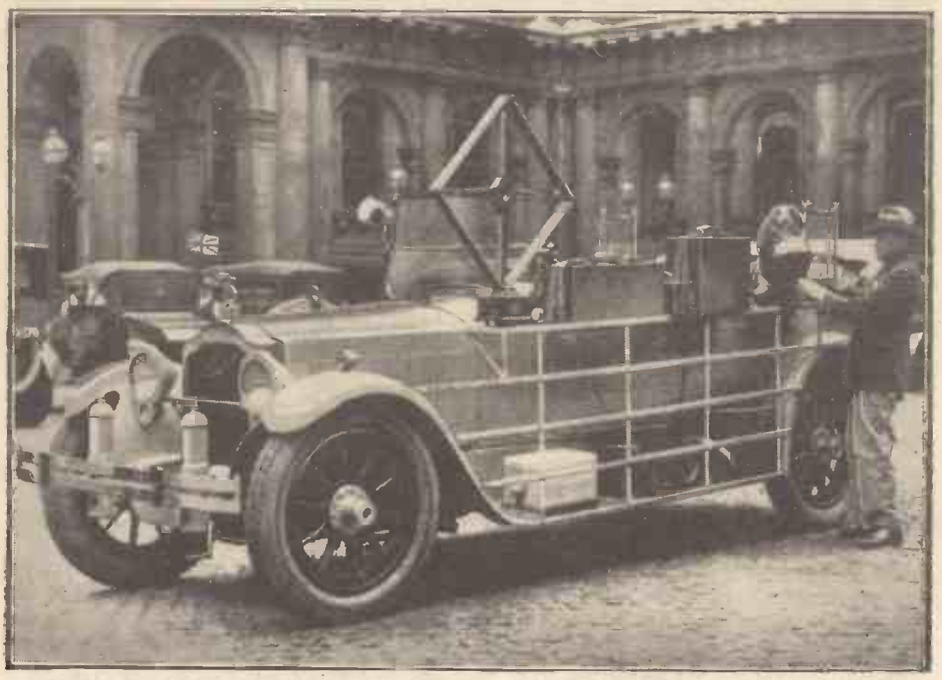
A WIRELESS TOUR—LONDON TO CONSTANTINOPLE

CAPT. L. F. PLUGGE, B.Sc., F.R.Ae.S., who is well-known in professional wireless circles, began an extensive European tour, for the purpose of making wireless tests, on Friday, July 31.

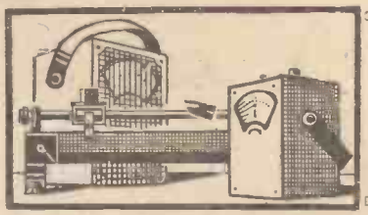
Both transmission and reception tests will be made and all the apparatus is carried upon the large Packard car shown in the photograph. The transmitter is a 50-watt instrument by Standard Telephones and Cables, Ltd., the normal wavelength of which is 200 metres. A Mackie generator is used for power supply.

A seven-valve super-heterodyne receiver is carried, working upon the frame aerial shown. In addition to the super-het is a two-valve power amplifier for operating the Kone loud-speaker. For making a permanent record of the message a specially adapted Dictaphone is installed.

Approximately two months will be occupied by the tour, the farthest point being Constantinople.



Capt. F. L. Plugge with the Wireless-equipped car before starting on his European tour.



TAKE THE "CURVES" OF YOUR VALVES!

AND ENSURE THAT EACH VALVE DOES ITS DUTY

HOW do you make sure that each valve in your set is being worked under the best possible conditions? Do you merely try each in the different sockets until a fairly good combination is arrived at, and then play about with the H.T. and G.B. voltages until reception is more or less satisfactory?

That is one way of attacking the problem, and certainly better results will be obtained thereby than by using any valves in any order with arbitrarily chosen H.T. and G.B. voltages. But a far more scientific method is to draw out the characteristic curves of the valves immediately they are purchased, when it can be seen at a glance for what work each of the valves is especially suited and what voltages must be applied to enable them to do that work with the greatest efficiency.

Necessary Apparatus

The apparatus required in order to be able to do this is not at all expensive, and, in any case, the necessary meters should form a part of every valve user's equipment. The essential instruments are a voltmeter reading up to 6 or 10 volts and a milliammeter reading up to 10 or 15 milliamps. The curves will be all the more accurate if another voltmeter reading up to 100 and an ammeter suitable for measuring the filament current of the valves are available.

The connections for taking the curve of a valve are shown in Fig. 1. The milliammeter is connected in series with the plate circuit of the valve, the high-reading voltmeter across the H.T. battery, the low-reading voltmeter between the grid and L.T. negative, and the filament ammeter in series with one of the filament leads. If the filament ammeter and the H.T. voltmeter are not used one will have to guess at these two values, so that very accurate results cannot be expected.

Plotting the Graph

The curve should be drawn on squared paper. If none is available, squares can be ruled as in Fig. 2. Draw a line vertically down the centre of the paper to represent zero grid-volts and mark the lines to right and left of it 1, 2, 3, 4, 5, etc., to represent positive and negative grid-bias voltages respectively (see Fig. 2). The horizontal lines, starting from the bottom, must be marked to show anode current according to the type of valve which is to be tested. For power valves, for instance, each division should represent a bigger anode current than when an ordinary receiving valve is under test.

Having done this, the filament of the valve must be lighted and the filament current adjusted to a normal value (as given by the maker). The H.T. voltage must also be adjusted to somewhere within the maker's limits.

Next adjust the grid-bias tapping until the grid potential is so negative that no

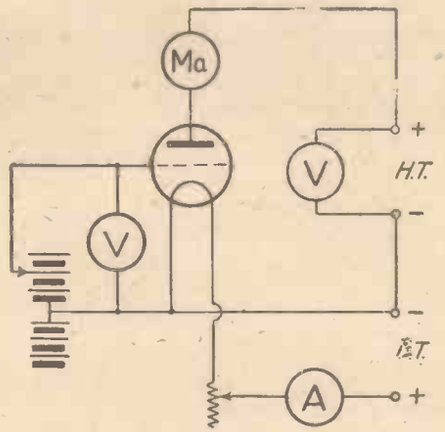


Fig. 1.—Circuit Arrangments for taking Characteristic Curves of Valves.

reading is obtained on the milliammeter. Now move the tapping towards the positive end of the grid battery, a cell at a time until the milliammeter needle is deflected. Suppose that the first milliammeter reading obtained is .25 milliamps. Notice what the voltmeter across the grid and filament of the valve shows. We will assume that this reads 3 volts

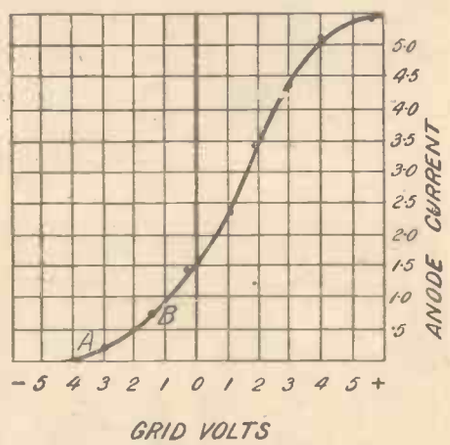


Fig. 2.—Method of Plotting Graph.

negative (unless this meter has a central zero it will be necessary to reverse the connections to it whenever the tapping point passes the cell to which L.T. negative is connected).

We have now ascertained that with a negative bias of 3 volts on the grid the anode current is .25 milliamps. Make a dot on the squared paper at A and move the grid-bias tapping another cell towards the positive end of the battery. Again notice the readings of the meters. This time, perhaps, the grid voltmeter says 1.5 volts negative and the milliammeter .75 milliamps. The next dot in this case will be at B.

Proceed in this way until an alteration of the grid-bias voltage fails to make any difference to the anode current. Saturation point (for the particular filament current and H.T. voltage in use) will have been reached, and any further dots will lie on the same horizontal line.

The various dots which have been made should now be joined by as regular a curve as possible, which will be the characteristic curve of the valve.

The H.T. voltage can now be altered and another curve drawn on the same or on a different sheet of squared paper, and some mark of reference should be made on the paper in order later to identify the valve to which these particular curves pertain.

How the Curves are Read

The curves will be very easy to read after a little practice. For example, when the valve to which the curve in Fig. 2 relates is used as an L.F. amplifier, with the particular H.T. voltage at which the curve was taken, it is obvious that best results will be obtained with a negative grid bias of 1.5 volts. If a greater negative voltage is applied to the grid the valve will be rectifying on the bottom bend of the curve, while if a less grid bias is used there will be a danger of grid current flowing, as strong signals may make the grid positive with respect to the negative end of the filament.

Another use for the curves when the valves concerned are dull-emitters is that it can readily be detected when the emitting properties of the filament are deteriorating. All that is required is to check the curve from time to time in order to see whether the emission remains the same for the different values of grid bias.

J. F. J.

An unusual feature to be broadcast shortly may deal with musical curiosities, including gramophone records running backwards.

In a talk from London and other stations during the week starting August 16, Mr. A. W. Carr, the Test captain, will review this year's Test matches.

WHO INVENTED THE NEUTRALISED CIRCUIT?

IT is not our custom to refer to statements made by our wireless contemporaries, but we feel compelled in the general interest to comment on certain claims set forth in one of them with regard to a so-called "key invention" and "master patent." These claims affect the well-being of the wireless public, and in particular of that big class of amateur constructors that forms the majority of the readers of this paper. Anyone who follows the course of wireless invention knows that development during the last few years has been so extremely rapid and complex, and the number and scope of patent claims has become so great, that the opinion of the ordinary interested person as to who has or who has not the right under the patent laws to do this, that or the other has become of no value whatever, and that it would need the wisdom of a Solomon or, at any rate, of an eminent patent lawyer to give a correct opinion on any particular point involved.

Readers will be aware that either of two courses is followed by an applicant for a patent, namely, filing an application for patent accompanied by either a provisional specification or a complete specification and, if with a provisional specification in the first instance, subsequently filing a complete specification. The provisional specification need only describe the nature of the invention, but the complete specification describing the nature of the invention must also particularly describe the manner of performing the invention and conclude with a distinct statement of claim, clearly distinguishing the exact features of novelty which constitute the invention. In the many thousands of patent claims made by wireless inventors there are many overlapping claims, and it is very seldom that the ambit of the claims of any one patent specification can be properly appreciated without a full knowledge of the prior state of the art, particularly as disclosed in the specification and claims of prior patents.

The Invention of the Neutrodyne

It is only in those very few cases where the inventor has discovered an absolutely novel principle that he can with reasonable safety be dogmatic in his claims, and on the part of everybody else a certain discretion in these matters is consequently to be commended. Certainly from the point of view of the public interest it is to be regretted when claims are advanced in the public press, particularly those relating to priority of invention, upon any but the firmest of grounds. The statements we have in mind are those in which it is alleged that the neutralised circuit ("neutrodyne" means much the same thing, but is a proprietary term) was first invented by Mr. John Scott-Taggart, and is covered by his patent No. 217971, applied for on January 2, 1923, and finally accepted a year and a half later. (For all we know to the contrary this patent is valuable, and none of the contentions in this article is directed against its validity.)

Some Claims

Our contemporary states that the Scott-Taggart patent "covers every modern type of neutralised circuit"; that "the neutralised circuit used in the modern receiver was first invented by Mr. Scott-Taggart in this country and embodied in his British Patent 217971, dated January 2, 1923"; that "the Scott-Taggart invention is the master patent on the neutrodyne in this country: it is the keystone of the position." Also, it reprints the claims with which the patent specification concludes, but not the specification itself, so we took the trouble of looking it up for ourselves, and must admit our surprise when we read the following very early clause: "It *has been* proposed to counteract the tendency to self-oscillation of a single valve amplifier due to inherent capacity coupling between the electrodes of the valve, by the use of a condenser connected so as to produce a reverse reaction effect." (The italics are ours.) Now, in the provisional specification, which is printed as a prelude to the complete specification, the statement is made that "It *is* proposed" (again our italics), and the reason why the present tense became past tense at the time the specification was ultimately accepted was that the inventor must have learned in the intervening eighteen months that he was not the first to hit upon the fundamental idea of counterbalancing the inherent capacity-coupling in a valve amplifier by means of a neutralising condenser.

The Fundamental Idea

As to whom that fundamental idea came from can possibly (but not certainly) be judged by a paragraph in the specification immediately preceding Mr. Scott-Taggart's statement of claims, that paragraph being as follows: "*We are aware of specification No.* 119365, *and we make no claim to anything described or claimed therein.*" Now, any reader with experience of patenting an invention will know that such a statement or "citation" as the inventor here included in his specification is a recognised form of limitation of claim. Why do we take the trouble of drawing attention to it? Not because it matters to us whether anybody has had his claims modified or qualified—that is not our business—but because the publication of the claim that any particular wireless inventor owns a "master patent" becomes immediately of serious moment to our readers and because it is almost impossible to harmonise that claim with the limitating admissions contained in the specification referred to.

Reference is made in our contemporary to the British patents granted to Prof. Hazeltine (U.S.A.) for his neutralising invention, the application date being a few months later than that of Mr. Scott-Taggart's. The Hazeltine patents cover a particular form of the neutralising or balancing circuit to which the registered name "Neutrodyne" has since been applied. In the words of our contemporary these "patents were anticipated by the Scott-Taggart patents," and, we may add, two of them each contain a statutory reference to the Rice or B.T.H. patent mentioned later in this article. Thus they can have no bearing on the question who invented the neutralised circuit since, as the article says, "The question of giving credit to an inventor is . . . a question of . . . the priority of dates."

The Hazeltine Corporation (of U.S.A.) are now the registered sole proprietors of the Scott-Taggart neutralised circuit patent, subject to a free non-exclusive licence enjoyed by Radio Corporation, Ltd.

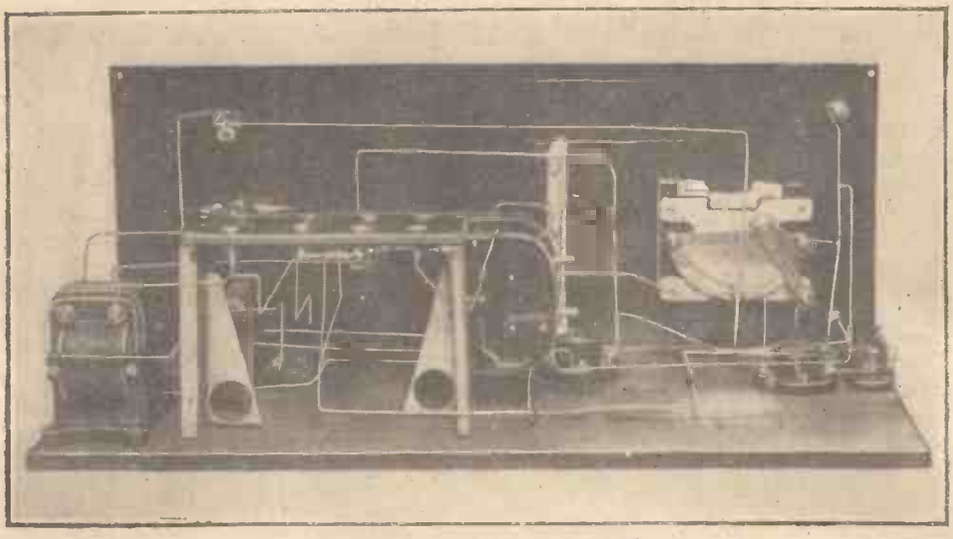
A Limited Claim

Over and over again in his specification Mr. Scott-Taggart claims novelty in relation to sets containing a *plurality* of tuned circuits (our italics). We can only assume that he admits that his claim is limited to applying to more than one stage of high-frequency amplification a stabilising principle already known—indeed, a principle that has already been successfully used in the case of a single-valve amplifier, and which is dealt with in the earlier specification which he particularly cites, No. 119365, describing the use of a stabilising condenser for preventing the effects of inter-electrode capacity-coupling. Patent 119365 was applied for on January 2, 1918, five years to the very day prior to Mr. Scott-Taggart's application, and it was issued to the British Thomson-Houston Co., Ltd., the well-known electrical engineers and manufacturers. It is commonly referred to in wireless literature as the Rice patent, and illustrations accompanying that specification show the application of the invention to both one-valve and three-valve circuits.

The reader will naturally ask how the Scott-Taggart patent can possibly claim to be a "master" or "key" invention in view of the existence of a patent, granted five years previously, to the existence of which it is obliged in its own specification to make special reference and which to all appearance severely limits the scope of its operation.

A GENERA
THREE-V

EFFICIENT :: SIMPL



Photograph of Rear of Set (Out of Cabinet).

The Complete Three

ONE of the most popular circuits for general all-round reception is that consisting of three valves; detector with reaction on the aerial followed by two stages of efficient transformer-coupled note magnification.

In the receiver illustrated by the photograph particular attention has been paid to the design of the amplifier with a view to obtaining good quality loud-speaker reproduction from the local station. The appearance of the receiver is enhanced by the adoption of large-diameter tuning dials, which match the mahoganite panel.

may be used provided that any modification in size is allowed for. The circuit is shown by Fig. 1 (p. 184).

Components Required

One Radion mahoganite panel 18 in. by 7 in. by $\frac{3}{16}$ in.; two Radion mahoganite No. 10 condenser dials; two mahoganite rheostat dials; ebonite strip 6 in. by 2 in. by $\frac{3}{16}$ in.; eight ¼-in. ebonite bushes; ten Tapa plug and socket terminals; one Elwell plug and jack; three Ashley base-board-mounting valve holders; two Lissen Minor rheostats; one Ormond .0005 vari-

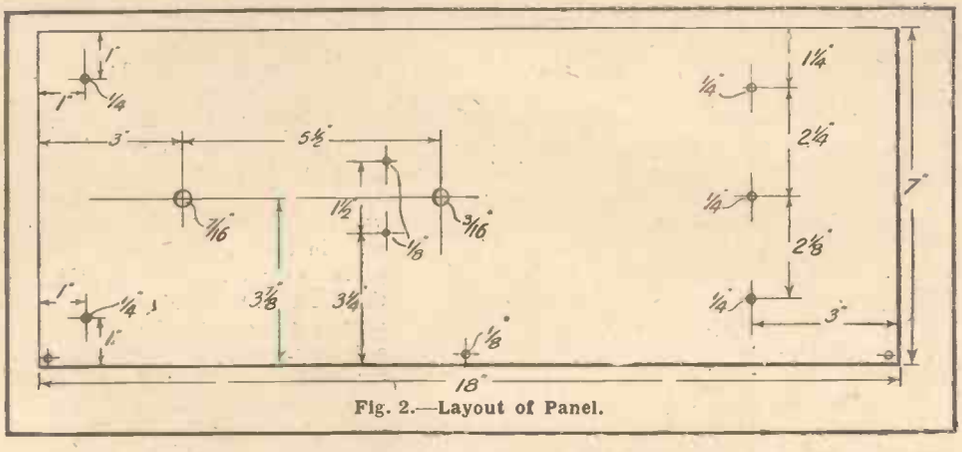


Fig. 2.—Layout of Panel.

A filament switch is included so that the receiver can be brought into operation by unskilled operators without any complications in regard to tuning or battery adjustments, these values being fixed beforehand. The battery terminals are arranged in the interior of the cabinet, the battery leads being brought out through ebonite bushes let into the back of the cabinet. Common negative grid bias is provided for the amplifier valves.

The drilling dimensions given are intended for use with the components specified, but similar good quality apparatus

able condenser with vernier; one Lotus two-way coil holder with extension handle; one fixed condenser (.0003) with clips; one fixed condenser (.006); one Mullard 2-megohm grid leak; one push-pull filament switch; two Pranco 3½-in. panel brackets; one Pranco twin panel bracket; two B.T.H. inter-valve transformers (ratio 1-4); 12-ft. coil Radio-Condit wire; ¼ lb. No. 16 bare tinned-copper wire.

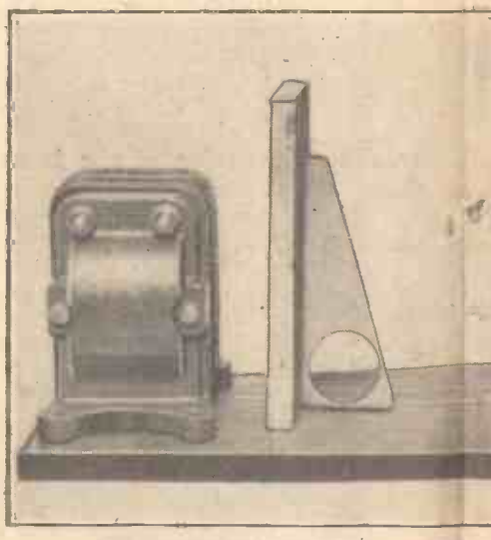
The Panel

The panel drilling diagram (Fig. 2) should be copied full size on to a sheet of

drawing-paper used as a template to mark the drill centres on the panel.

The drilling completed, and the dials laid in their places, the appropriate transfers can be conveniently attached.

It will be noted that the panel supporting bracket is placed rather high, the



Photograph showing Bracket Supports

L-UTILITY VALVER

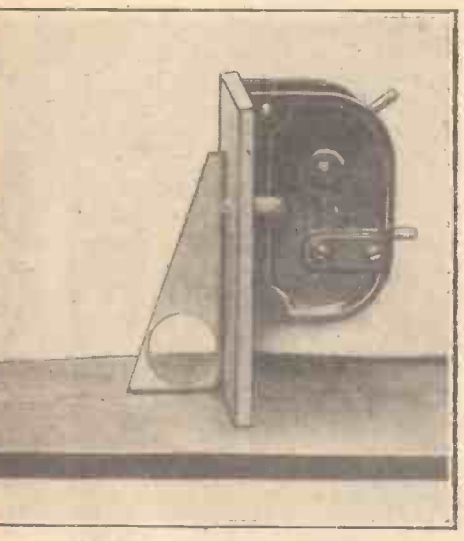
E :: ATTRACTIVE

e-valve Receiver.

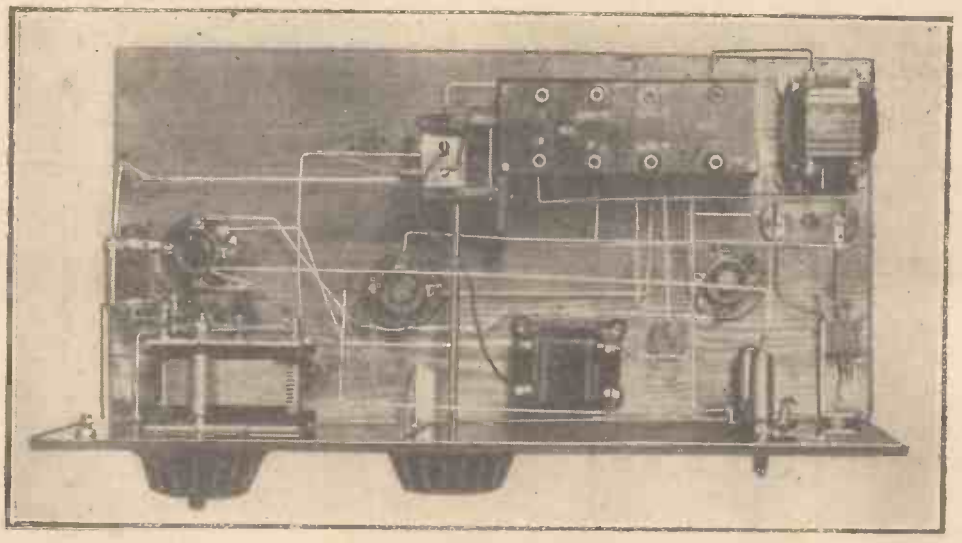
reason for this being that in this position the necessary fixing screws are concealed by the dial which is fixed to the reaction control.

The Terminal Platform

The terminal platform is drilled with a



for Terminal Board and Coil Holder.



Photograph showing Arrangement of Components on Baseboard.

¼-in. bit as indicated in Fig. 3 (p. 184). The four holes for the fixing screws are drilled with a ⅛-in. bit.

Mounting the Components

The panel components are now mounted in position. A rubber washer is slipped on to the fixing bush before the variable condenser is placed in position, as this will prevent the component from moving round when the locknut is tightened up.

The centre of one of the No. 10 dials is drilled out with a $\frac{3}{16}$-in. bit to allow the vernier spindle of the condenser to pass through it. A small ebonite knob, such as is used on crystal detectors, is screwed to this spindle in place of the standard knob supplied with the condenser.

A variable condenser spacing washer is placed on the fixing bush of each rheostat before they are mounted on the panel. This allows the rheostat dials to lie closer to the panel. The spindles of these rheostats are screwed 6 B.A. and the extra bushes supplied with the dials are $\frac{3}{16}$ in. Two auxiliary bushes are therefore required, and these are easily made from two ½-in. lengths of valve-socket brass tube, tapped 6 B.A. and locked to the spindles by means of the locknuts provided with the original knobs.

The coil holder is screwed to a piece of hard wood 4 in. by 3½ in. by ¼ in., drilled as shown in Fig. 4. One of the 3½-in. brackets is screwed to this support with ¼-in. brass wood screws to support it on the baseboard, as shown in one of the photographs. The remaining support for the terminal board consists of a piece of same wood measuring 4 in. by 2 in. This is held on the baseboard by means of the remaining 3½-in. bracket. Reference to the photograph renders the method of mounting these supports quite clear.

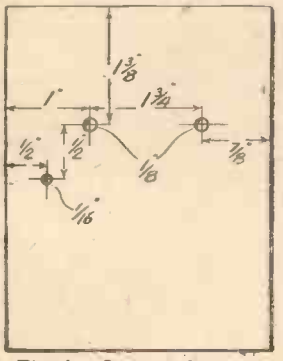


Fig. 4.—Support for Coil Holder.

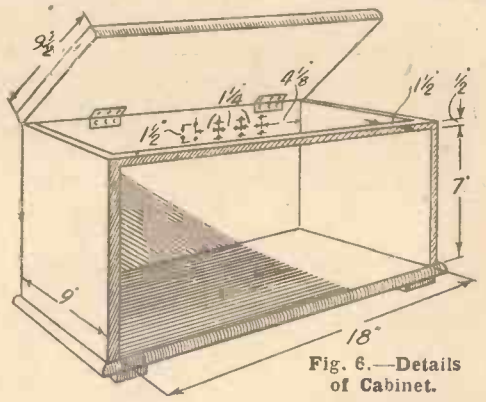


Fig. 6.—Details of Cabinet.

The Baseboard

The baseboard (Fig. 5) is a piece of hard wood 17¾ in. by 8½ in. and ⅜ in. thick, the components being screwed to it as shown in the photographs, which also show the wiring of these parts before the panel is placed in position.

A small block of wood measuring 1¾ in. by ½ in. by 1 in. is screwed to the baseboard from the under side in the position indicated in Fig. 5. The panel bracket

rests on this block and is screwed to it with two 3/8-in. brass screws.

Two 9-in. lengths of Radio Condit are connected to the aerial coil holder through two copper spades soldered to these leads. The panel is then placed temporarily in position and the coil holder aligned carefully so that the spindle passes through the hole in the panel. The spindle should protrude 1 in. from the panel surface to allow the dial to be mounted on it.

The terminal board, which is supported at one end by the coil-holder upright, is fitted into place, the correct distance marked off, and the remaining upright screwed into place.

The other components are then mounted and wired, after which the panel is finally screwed into position.

Wiring

The detector circuit, with the exception of the leads to the moving-coil holder, are wired with Radio Condit. The connections to the moving-coil holder are made with rubber flex. The remainder of the circuit is wired with No. 16 bare tinned-copper wire. Transformer connections and those to the coil holder terminate in copper spades which are firmly screwed under their respective terminals.

All other connections are soldered, any flux being carefully removed after each joint is made. The wiring can be followed by a study of the circuit diagram (Fig. 1).

The Cabinet

The dimensions of the cabinet are given in Fig. 6. The back is drilled as shown with a 1/4-in. drill, and the ebonite bushes fixed into these holes by means of glue. Four pieces of Sorbo rubber 2 in. square are cut from a ball and are fixed by means of rubber solution one at each corner.

Notes on Accessories

The only accessories which call for comment are the valves. To obtain the best results the amplifier valves must be chosen with due regard to the impedance of the particular transformers they are used with. The writer uses B.T.H. B5 in the detector circuit, and two B6's in the amplifier stages.

Operation

A No. 60 coil will be found about right for the reaction circuit and a No. 35 or 50 for the aerial. These coils being plugged into their respective sockets, and the battery, aerial, and earth leads being correctly connected, the H.T. values are set at: detector 40 volts, amplifiers 60 and 70 respectively, with 1½ volts on the grids. The filament switch is closed and the valves lit by adjusting the rheostats. The tuning condenser is then adjusted until the local station is tuned in, when adjustments of the H.T., G.B., and filaments can be made to secure the best results. The use of the reaction coupling should not be abused, and this is not difficult to avoid, as the set is easily maintained just off the oscillating point when it is in its most sensitive condition for the reception of distant stations.

W. A. A.

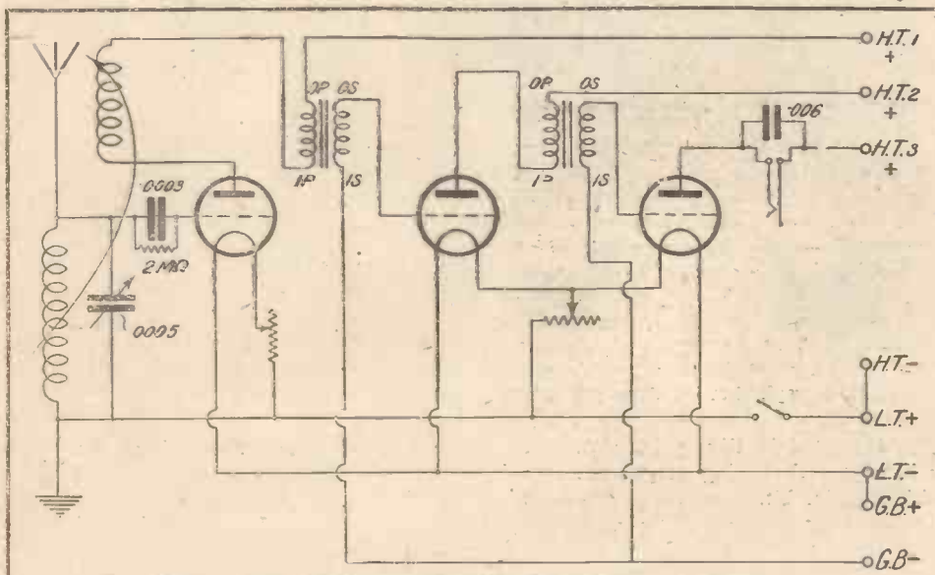


Fig. 1.—Circuit Diagram of General-utility Three-valve Receiver.

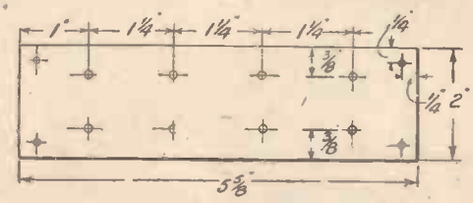


Fig. 3.—Details of Terminal Platform.

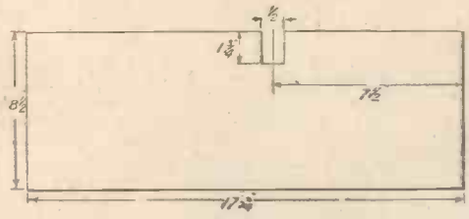


Fig. 5.—Details of Baseboard.

"American Doings" (*continued from p. 179*) ates on wavelengths between 16 and 111 metres. This outfit was used as the transmitting end of a system comprising a number of receiving sets located throughout the eastern section of the United States and in England.

Interesting and definite quantitative data were obtained, which agree very closely with theoretical deductions. Hour by hour observations were made, and fairly constant characteristics were disclosed. It was found, for instance, that long waves are less attenuated than short waves over distances up to 100 miles, and that at longer distances the signal strength of the short waves increases. In short-wave transmission there is a section near the transmitter in which the signal is weak, if not inaudible. The width of this area is known as the "skip-distance." It is generally too far from the transmitter for direct reception and too near for indirect reception by the overhead wave.

Experiment has shown that as the wavelength is decreased the "skip-distance" gets larger and the signals become weaker. For distances between a few hundred miles and 1,000 miles there is little difference between over-land and over-water transmission.

LLOYD JACQUET.

Dr. FOURNIER D'ALBE ON THE "FUTURE OF RADIO"

DR. FOURNIER D'ALBE, speaking on the "Future of Radio," at the Esperanto Congress held at Edinburgh, began by pointing out the limitations under which wireless transmission necessarily takes place. The most important of these is the law of inverse squares, which dominates anything in the nature of radiation projected into space. This law made it impossible to transmit power by wireless in any way likely to be useful as power. The actual power received from a central station by the ordinary receiving set only equalled the power expended by an ant in carrying one of its eggs up a wall.

The wireless "death ray," he said, was an idle fiction. Among real possibilities of wireless progress he mentioned a wireless world clock controlling timepieces everywhere by special signals sent out every minute; wireless weather charts showing the distribution of weather for a hundred miles round the central station; wireless locating code signals for use of air-craft. He believed that Esperanto would be adopted by every larger transmitting station as an auxiliary language.

THE "SUPER-UNIT"

The second and concluding article describing the construction of a Unit that converts an ordinary set into an efficient Armstrong "Super"

THE layout of the panel is shown in Fig. 3, which may be compared with the photograph, while Fig. 4 shows the wiring diagram as seen from the *back* of the panel. In both these figures the same letters and numbers are placed against the various components as in Figs. 1 and 2 in order to remove any possible ambiguity.

Assembling

The two oscillator coils are placed within the box wherever there is room for them; it is advisable to place them at right-angles, as there should preferably be little magnetic coupling between them. It will be seen from one of the photographs that the writer has secured one to the bottom of the box and the other to one of the sides by means of bolts, and this manner of fixing has proved perfectly satisfactory.

In assembling the unit, all connections on the panel should first be made, and then short lengths of flex should be attached to the coils, then soldered to the appropriate points on the wiring already made, and then the panel is placed in position on the box.

When made up the unit should be connected to any ordinary one-valve set with reaction; *any* type of set is suitable, but it is necessary to see that the grid leak is connected as shown in Fig. 1 and not across the grid condenser, while the grid-return lead should be taken to L.T. −, as this determines the grid bias of V2. If the grid leak is unalterably fixed across the grid condenser, in which case the grid-return lead will be to L.T. +, reverse the usual L.T. connections so as to avoid having the grid of V2 positive. This will also, of course, connect the grid leak to L.T. −, but this is of no great importance in this circuit.

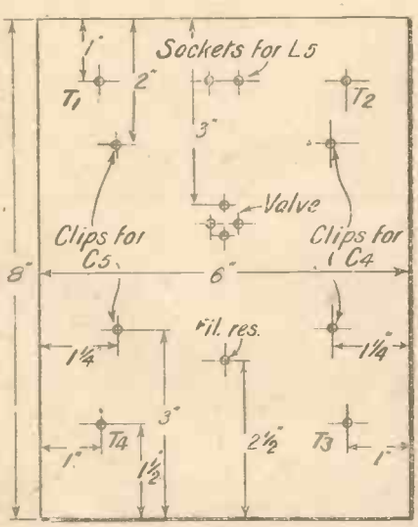


Fig. 3.—Layout of Panel.

Photograph of Front of Panel.

One further addition, this time an external one, should be made to the set: An extra condenser, in addition to that incorporated in the set, should be connected across the telephone terminals to bring the total capacity up to about .005 microfarad.

The unit is very simply connected to the set; it is only necessary to join T2 to the aerial terminal. In addition T3 and T4 should be connected to the accumulator and T1 to H.T. positive. It is absolutely essential for best results to use the biggest power valve available for V1. The high-tension voltage should be not less than 60, and may with advantage be considerably more.

Operating the Unit

Connect the complete receiver to a *small* aerial (preferably a vertical wire about 10 ft. long), using no earth, and light the first valve to full brightness. With it oscillating, search round for a carrier wave, and when that of the nearest station is heard leave the set tuned to it and light up V2 slowly. A high-pitched thin whistle (the quenching oscillation) will be heard, and as the filament of V2 is brightened further, V1 will stop oscillating. Increase the reaction as soon as this happens, and move the tuning condenser slightly. If, as is probable, the carrier wave of the station is heard as a series of heterodyne "bumps" like a number of carrier waves close together, the quenching oscillation is not powerful enough, and the filament of V2 must be still further brightened.

Continue thus, increasing the reaction and the intensity of the quenching oscillation alternately, and keeping V1 *just* oscillating, until the heterodyne "bumps" merge into a series of hoarse breathing noises and finally *just* disappear altogether. On turning the tuning condenser the local station should be heard very loudly, on a nearly silent background, over a range of 10 degrees or so of the condenser, outside which a loud roar is heard. Now the receiver is working properly, though perhaps not yet at its best; it remains only to "fiddle" a little, readjusting the quench intensity and reaction setting by small amounts. Also it is *most* desirable to try different values of H.T. In general, the greater the H.T., the greater the volume of the signals. It is possible also that an alteration of the note of the quenching oscillation may improve matters; to change this, alter C4; the note of the whistle will become higher as the capacity is decreased.

Variation in the grid bias applied to V1 may make some difference, but in the writer's experience no great improvement is to be expected from such alterations, so that if the single-valve set is a permanent one it is hardly worth while to bother about this point.

The *only* difficulty likely to be met with is too feeble a quenching oscillation even when V2 is at full brightness. This will be shown by the persistence of the heterodyne "bumps" and the non-appearance of the "roar." (These terms, puzzling perhaps at first sight, will be clear enough after ten minutes' experience has been gained with the actual receiver.)

The various remedies to try are the following, in this order:

1. Reverse the connections to one of the oscillator coils; the unintentional magnetic

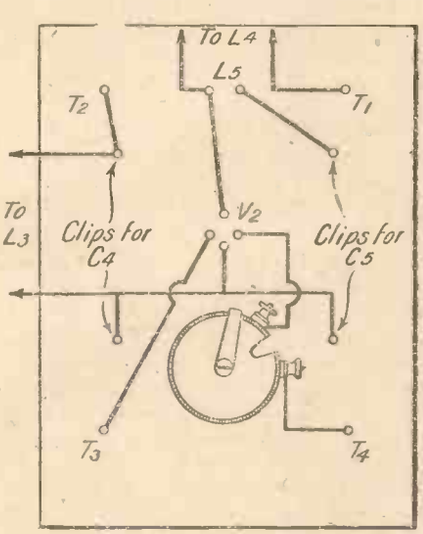
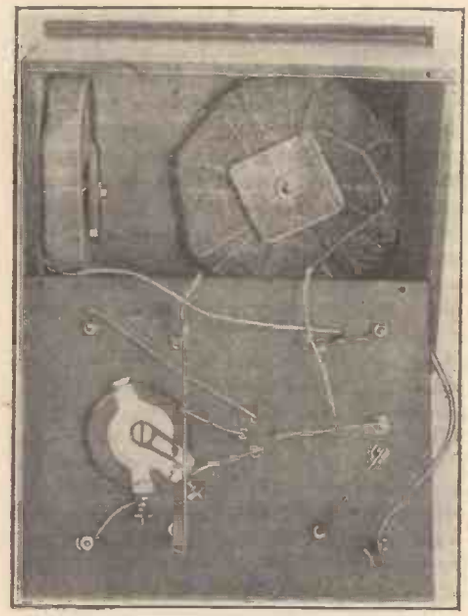


Fig. 4.—Wiring Diagram of Back of Panel.

coupling may be opposing the coupling due to C5.

2. Try a higher value of H.T. for V2 (terminal T1).

3. Try a larger condenser (up to .006 microfarad) for C5; to keep the pitch of



Photograph of Under Side of Panel of "Super-unit"

the quench constant, a *smaller* value for C4 will be simultaneously necessary.

4. Try a different telephone condenser; a faulty condenser or one of too small a capacity will cause the symptoms mentioned.

5. Try a different radio choke (L5). An inefficient or unsuitable coil here will also give rise to these symptoms.

6. Try a larger valve (small power valve) for V2.

The circuit may be considered to be working properly when the local station gives signals at medium loud-speaker strength, but it is necessary that when using V1 alone a distinctly audible carrier wave should be heard. If it is not, satisfactory results cannot be expected from the super-circuit, and a different aerial arrangement should be tried until this minimum of "raw material" for the receiver is obtained. Note that the more powerful the incoming signal, the less is the incidental noise, so that a sufficiently strong signal controls the roar completely. An aerial larger than is necessary to provide enough incoming signal for this should not be employed, and, if the circuit is working properly, will probably *diminish* the signal strength, and in any case will not increase it.

Limitations

This circuit is practically useless for receiving any station other than the nearest, as incoming signals from the more distant stations are usually too faint to control the roar, and though the programme broadcast may be heard, it is usually not worth listening to. Further, the astonishing lack of selectivity shown by this circuit makes it impossible to receive any station within 50 metres or so of the nearest, even though the latter be fifteen or twenty miles away. For all practical broadcast reception, then, the nearest station should be received at reasonable loud-speaker strength, and that is all.

The circuit is useless on long waves, and will not serve for the reception of Daventry (unless on a harmonic), but gives perfectly astonishing results on short waves. KDKA, the well-known American short-wave station, can be received at moderate loud-speaker strength even without an aerial on a good night; and the harmonics of the nearest British station, though enormously less in power than the fundamental, can usually be heard at about the same strength. Certain foreign stations, too (notably the German ones), can be heard quite well on their harmonics somewhere about 80 metres even when they are inaudible on their fundamentals with this receiver.

Short-wave Adjustments

Note that for short waves the radio choke (L5) must be changed; a 70-turn basket coil is satisfactory for wavelengths of 50 to 100 metres. One turn in the choke for every metre of wavelength is a rough guide in the selection of a choke.

In conclusion, the writer would urge those who have failed to get the expected results with the one-valve version of the Armstrong circuit to hunt up their oscillator coils and try this two-valve modification, which is *very* easy to handle. The writer personally feels that the one-valver is almost unworkable for those who have not served an apprenticeship with the two-valve circuit; after that is mastered, the tricky one-valver can be tackled with every prospect of success. A. L. M. S.

WIRELESS IN PARLIAMENT

From Our Own Correspondent.

ASKED by Mr. Day if he would suggest to local authorities the advisability of by-laws being adopted with a view to the nuisance occasioned by the use of loud-speakers in gardens or open spaces being abated, Sir W. Joynson-Hicks, the Home Secretary, said that it would not be proper for him to intervene in a matter of that kind. It was for the local authority in the first instance to consider whether a substantial nuisance existed in their district which could be dealt with by by-law.

Mr. Day asked the Postmaster-General if he was aware of the annoyance experienced by wireless listeners in coastal districts, owing to the use of spark transmitters by ships; and whether any action could be taken with a view to abating this form of annoyance.

Sir W. Mitchell-Thomson replied: "I am aware that wireless communication between ship and shore does at times interfere with broadcast reception, especially when unselective receiving apparatus is used. The abolition of spark transmission from ships would require international agreement, and I hope that it may be possible to achieve this, when financial conditions at home and abroad in the shipping industry improve. Meanwhile, however, improvement can be effected by making receiving apparatus more selective."

Asked further by Mr. Day if his attention had been drawn to the interference occasioned on the south coast to wireless reception owing to the operation of morse signalling from the Newhaven station; and whether he would cause the wavelengths of the Newhaven and Dieppe stations to be raised to 800 metres in order to avoid such interference, Sir W. Mitchell-Thomson said that traffic was already exchanged between the Newhaven and Dieppe wireless stations on the 800-metres wave, although the 300-metres wave was used for obtaining the attention of the Dieppe station, which kept watch on the wave only. Other possible methods of reducing the interference were being investigated.

Mr. Ralph Judson, who was previously with the Radio Communications Co., Ltd., has taken up an official appointment with the B.B.C. as assistant to Mr. Rice, the secretary.

REVIVING EBONITE PANELS

COMPARATIVELY few people realise that ebonite loses some of its excellent insulating qualities in time. This is due to two causes. Place a finger inside the corner of a handkerchief and rub it very hard over the surface of your panel. No matter how assiduously the duster has been applied in the past, it will be found that the handkerchief is blackened and that the ebonite which has been rubbed looks slightly different from the rest of the panel. What has been rubbed off is a film of minute dust particles which have gradually accumulated and become made into a kind of cement by the admixture of moisture from the air. This film is not a good insulator.

The second cause of the deterioration of ebonite is due to the action of light, which gradually changes the nature of ebonite at the surface and for a short distance beneath it. Where insulation is important ebonite should be thoroughly rubbed, not merely dusted, at intervals to remove the dust film, and if discoloration sets in owing to the action of light a fresh surface should be exposed by rubbing off the old one with fine emery cloth. J. H. R.

"A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

Igranic Vernier Balancing Condenser

THIS condenser is specially suitable for balancing out slight differences in circuits which are simultaneously tuned by means of a dual-variable condenser.

It is nearly impossible to obtain two coils which can be tuned by a dual condenser so that each oscillating circuit is tuned to an identical frequency. A slight discrepancy will always make itself evident in the capacities of the two portions of the dual condenser, to say nothing of the coils.

The vernier balancing condenser has three sets of vanes—two fixed sets and one moving set. Each set of fixed vanes should be connected to the fixed vanes in the two sections of the dual condenser, and the single set of moving vanes of the vernier are left unconnected, but when

Igranic Balancing Condenser.

rotated between the fixed vanes a perfect balance in resonance between the two circuits is obtained.

The action, of course, is to increase the frequency of one circuit and, at the same time, to decrease the frequency of the other circuit until they are both in resonance.

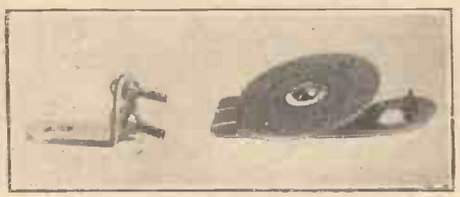
Housed in a moulded casing to prevent the intrusion of dust, the vanes and control knob are adequately spaced, thereby eliminating hand-capacity effects. Screw-type terminals and soldering tags facilitate connections, and a single-hole fixing is provided.

Gambrell Neutrovernia Dial

THE indicating dial which is supplied for use with the Gambrell Neutrovernia condenser is of noteworthy design. It is of the direct-reading type, and no further drilling is required. The position of the moving element of the condenser is indicated, thus showing the approximate amount of capacity in circuit and in reserve.

The dial is pivoted at its centre on a metal bracket, which is clamped to the panel by the one-hole fixing nut of the neutralising condenser. As the control of the condenser is turned a small ebonite friction collet, mounted on the control shaft and pressing against the edge of the dial, causes the latter to rotate. A slit cut in the metal bracket appears behind the dial and is intended to show the reading of the dial.

Some of the uses of the condenser and



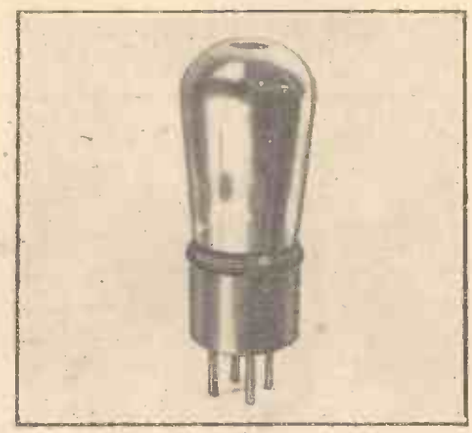
Gambrell Neutrovernia Dial.

dial include a direct-reading reaction control, a neutralising condenser recording the exact capacity required to neutralise a given valve, a vernier condenser, or as a testing condenser.

On test, we found that every revolution of the control knob of the condenser, equivalent to ten degrees of the scale, gives a change in capacity of approximately 6 micro-microfarads. The complete unit is strongly made, the dial being of nickel and the metal bracket of phosphor bronze. We can recommend the instrument where a small condenser is required of which at any setting the approximate capacity is known.

Ediswan G.P.4 Valve

IN a recent issue of this journal we gave a test report of the new 4-volt power valve, type P.V.4, produced by The Edison Swan Electric Co., Ltd., of Ponders End, Middlesex. As a companion to this valve the same firm are producing the G.P.4, a general-purpose valve, the salient features of which are



Ediswan Power Valve.

economy of consumption, clear reproduction, and a large output.

The G.P.4 has a very neat appearance with its silvered pipless bulb and polished black insulating cap. A small "window" on the top of the bulb enables an inspection of the electrodes to be made, and the valve can be instantly recognised by the wafer disc floating inside the valve bulb.

The electrical characteristics of the valve are as follows: Filament voltage, 3.5 to 4; filament current, .15 ampere; amplification factor (average), 12; impedance, 22,000 ohms; slope of anode current—grid volts curve, .55 milliamp. per volt; suitable anode voltage, 60 to 120 volts.

It will be seen at once from the fairly high amplification factor that the valve will meet fully the demands of high-frequency amplification, whilst the slope

Burne-Jones Coil Shield.

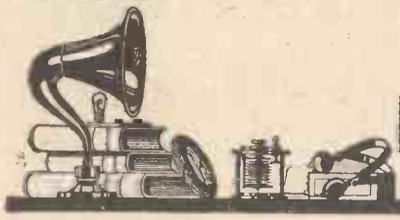
makes it suitable for the *first* stage of low-frequency amplification. The form of the grid-current curve ensures good rectification, and for this purpose and as a first-stage L.F. amplifier the valve has our commendation. For the last stage of L.F. amplification the P.V.4 should be used.

Burne-Jones Coil Shield

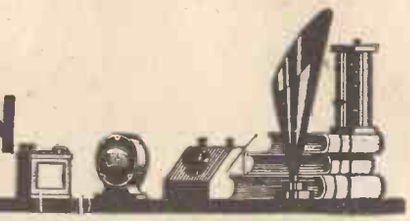
FOR those who care to experiment in the matter of shielding coils, or where trouble is experienced due to the interaction of H.F. circuits, the use of metal shields totally enclosing the coils will make an interesting study.

Special spun-aluminium shields are made by Burne-Jones and Co., Ltd., of Magnum House, 296 Borough High Street, London, S.E.1. The dimensions of the shields are 3 in. in diameter and 4 in. in length, and each is provided with an aluminium cap, through the centre of which a hole is drilled for screwing to the baseboard, or for mounting a terminal to earth the shield.

The dimensions of the coil which the shield covers should not exceed 2 in. in diameter and 3 in. in length, otherwise it will be found that the tuning is considerably flattened.



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 196).

Earthing the L.T. Battery

Q.—*In most valve receivers one side of the L.T. circuit is connected to earth. Sometimes it is L.T. positive and sometimes L.T. negative. Which is the better arrangement?—C. D. R.* (*Sunderland*).

A.—This depends, to some extent, upon the circuit used. If the first valve is the detector and the grid leak is directly connected across the grid condenser, L.T. positive should be earthed in order to put a slight positive bias on the grid, which will cause the grid current (necessary for rectification) to flow. If the first valve is an H.F. amplifier the normal potential of the grid will depend upon which L.T. terminal is connected to earth. When you have a free choice in the matter it will be safer to earth that L.T. terminal which is connected to H.T. negative, when there will be less risk of the valves being burnt out by some part of the H.T. circuit accidently coming into contact with an earthed object.—J. F. J.

Buzzer and Valve Wavemeters

Q.—*What are the more important points in deciding whether a wavemeter should be of the buzzer or heterodyne type?—F. N.* (*Cambridge*).

A.—A buzzer wavemeter is to be preferred for all ordinary purposes, as it is simple to make, can be easily calibrated, is constant in operation, and can be made to occupy a very small space. It is sufficiently accurate for most purposes. A heterodyne wavemeter, on the other hand, costs more to make as a valve is required, batteries are needed, calibration is more difficult, and it is not constant with different valves or even with the same valve used under different conditions with regard to current supply. When calibrated with one particular valve and always used under the same conditions, however, a heterodyne wavemeter allows very accurate measurements to be made, and is, therefore, to be preferred for scientific work.—B.

Phone "Burn-outs"

Q.—*A pair of high-resistance phones, which are used in conjunction with my two-valve receiver, have developed a fault in the windings and now give no results. I have been told that the windings have burnt-out and I should be glad if you could tell me exactly what is meant by this. The windings have never felt warm, even after two or three hours continual use.—F. R.* (*Bolton*).

A.—It is now an accepted fact that the actual melting of the copper wire (due to the magnitude of the current passed through it) is a very rare occurrence. What really causes the break in the windings is that the wire is fractured owing to a sudden mechanical movement. When the current fluctuates in the coils, there is a tendency for them to move out of position owing to an interaction of magnetic fields. If the coils are loosely mounted or badly wired a slight movement may actually take place and the wire may be fractured. The only cure is to send the phones back to the makers for re-winding.—P.

Adjusting Crystals with Buzzer

Q.—*I understand that a buzzer (such as an electric bell with the hammer removed) may be used as an aid to setting the catwhisker to a sensitive spot on the crystal. Can you tell me how to do this?—N. A.* (*Hull*).

A.—When a station is being received, the above method is, of course, unnecessary, as it is simpler to adjust the crystal contact until reception is at a maximum. However, when no station within range is transmitting, and it is desired to put the set into a sensitive condition so that no part of the next transmission will be missed, the buzzer is very useful. It is connected up in series with a small battery so that the buzzer commences to work upon closing the switch. One of the contacts of the make-and-break is connected to earth, and a few feet of wire are connected to the other terminal. This short wire acts as an aerial, and when the buzzer is in operation feeble electro-magnetic waves are radiated by the improvised transmitter. The catwhisker is merely adjusted until the sound of the buzzer is heard in the phones with the greatest intensity.—R. W.

OUR WEEKLY NOTE

INTERFERENCE CAUSED BY CRYSTAL RECEIVERS

Many crystal-set users heartily condemn those valve-set owners who make the night hideous with howls and screams, at the same time having the fixed belief that their little crystal sets could not possibly interfere with anybody's reception.

While it is true that a crystal set cannot cause anything like the trouble for which an oscillating valve set is so often responsible, it is not true that a crystal set is incapable of causing interference.

The aerial of any set, valve or crystal, is in an oscillating condition whilst signals are being received, the oscillations, of course, being caused by the waves from the transmitting station.

A portion of the energy oscillating in the aerial will be re-radiated in the form of feeble electro-magnetic waves, the amount so radiated depending upon the constants of the aerial circuits. If the damping of the latter is varied, the amount of energy re-radiated will also be varied. Now the damping of the aerial circuit is altered whenever the catwhisker is moved to a different part of the surface of the crystal, and when a crystal-set user is adjusting his catwhisker a scratching noise is often heard by all listeners for a considerable distance round him.

In fact, cases have been known where sound waves due to people speaking have caused a catwhisker to vibrate and so caused the crystal set to act as a transmitter and enable other listeners to hear what was being said in the room in which the crystal set was being operated.

THE BUREAU.

Maid:—"Do you know that it is lightning, Master Bobby?"

Vulcanised Fibre for Panels

Q.—*Can you recommend the use of vulcanised fibre, instead of ebonite, for the panel of a wireless set?—O. E.* (*Barnet*).

A.—This material cannot be recommended except, perhaps, for simple crystal sets where great efficiency is not required. The insulating properties of vulcanised fibre are quite high enough for wireless purposes as long as the material is *thoroughly dry*, but in damp weather it absorbs a great deal of moisture from the atmosphere, which lowers its resistance considerably. It is, of course, much cheaper than the best grades of ebonite, but it is not so easy to work, and has a tendency to warp.—R. W.

Transformer Terminals

Q.—*I have an L.F. transformer, the terminals of which are not marked in any way. How can I tell which is the primary winding and which is the secondary?—R. W. D.* (*Gloucester*).

A.—Connect a pair of phones in series with a small battery and place the battery and phones across each pair of terminals in turn. If a click is heard in the phones on making and breaking contact it indicates that the pair of terminals under test are connected one to either end of one of the windings. As a louder click will be heard when testing the primary it will thus be easy to distinguish between the primary and secondary connections.—B.

Long Distance with a Frame Aerial

Q.—*Which do you consider the best type of circuit to use in order to cover very long distances in conjunction with a frame aerial? The number of valves used is of no importance.—B. C. D.* (*Ripon*).

A.—We have no hesitation in advising you to use a powerful super-heterodyne circuit with seven or eight valves. A large number of valves will be absolutely necessary to give results such as you require, as several H.F. stages will be essential. Assuming that reception is intended on the broadcast band between 300 to 500 metres a super-heterodyne is the only circuit in which several H.F. stages could be employed with reasonable ease of operation.—J. F. J.

Perikon Detector

Q.—*What are the two crystals used in a "perikon" detector?—B. S.* (*Stroud*).

A.—This term is usually applied to a two-crystal combination in which zincite and bornite are used, but it is sometimes extended to apply to other combinations.—B.

CHIEF EVENTS OF THE WEEK

SUNDAY, AUGUST 15

London	Royal Tank Corps Band.
Birmingham	Symphony Concert.
Glasgow	Notable Anniversaries.
Manchester	Symphony Concert.
Newcastle	Sidonie Goossens, Harp.

MONDAY

London	*The White Chateau*, by Reginald Berkeley.
Aberdeen	Joseph Farrington, Bass.
Bournemouth	*What He Won.*
Cardiff	Folk Songs and Tunes.
Glasgow	Shakespearean Programme.

TUESDAY

London and Daventry	Radio Dance.
Bournemouth	Light British Programme.
Cardiff	A Welsh Medley.
Manchester	"Lest Auld Acquaintance Be Forgot."
Newcastle	Frank Gomez and Municipal Orchestra.

WEDNESDAY

London	Poetry Reading.
Bournemouth	Military Band Night.
Belfast	Moments Musicaux.
Cardiff	*An Elder of the Kirk.*
Dundee	Band of Royal Naval Volunteer Reserve.
Hull	Second Birthday.
Manchester	Buxton Gardens Night.
Newcastle	"Electric Sparks" Concert Party.

THURSDAY

London	Programme devoted to London's Territorials.
Birmingham	5IT Radio Players.
Bournemouth	English and French Light Opera.
Belfast	"South America."
Cardiff	5WA's Sunshine Carnival.
Manchester	The Henley Concert Party.

FRIDAY

London	*Rigoletto.*
Manchester	Recital of Robert Herrick's Songs.

SATURDAY

London	Piano Recital by Leff Pouishnoff.
Birmingham	Park Concert.
Bournemouth	Scottish Programme.
Belfast	Revue.

A NOVEL WIRELESS DEMONSTRATION

READERS living in the counties of Hereford, Gloucester, Wiltshire, Somerset, Devon, Cornwall, Dorset, and Hants should make a point of hearing the Mullard wireless demonstration to be given from a specially equipped van which is touring these counties until September 11.

The arrival of the van in various towns will be advertised in the local Press and by posters. Special attention will be paid to the relaying of local talent.

Mullard valves of the famous P.M. type will be used in the receiver and amplifier, and special-power type Amplion loud-speakers will be installed.

At a meeting of prominent Irish radio manufacturers and wholesalers, held on July 26, it was unanimously decided to form an Irish Association of Radio Manufacturers and Wholesalers for the purpose of promoting and protecting the interests of the radio trade in the Irish Free State.

Lustrolux Valve Repairs.—Owing to an error in the advertisement of Lustrolux, Limited, West Bollington, Macclesfield, on page 81 in No. 214, the price for repairing dull-emitter valves was wrongly given at 7s. 6d. As a matter of fact, the price for repairing this type of valve is 7s.

THE NEW EUROPEAN WAVELENGTHS

IN accordance with the new scheme adopted at the recent Paris conference of the Union of European Broadcasting Stations, the Geneva plan by which both exclusive and common wavelengths have been allotted to individual countries will come into operation on September 15 next.

As regards the transmitters owned by the B.B.C., the plan provides for nine main stations to work on separate *exclusive* wavelengths, the eleven relay stations to transmit on nine wavelengths *common* to other European stations.

From the following table, which gives both the new and the present wavelengths of all European stations in regular operation, it will be found that the B.B.C., with the consent of the *Union Radiophonique*, have somewhat altered the scheme to the advantage of the British Isles.

A complete redistribution of wavelengths has been made to the main stations, by which seven of these will operate on wavelengths exclusive to the B.B.C., the remaining two, namely Birmingham and Aberdeen, to share one between them.

Of the relays, two will use the common wavelength allotted to them, and the remaining nine will share one "exclusive" amongst themselves and with which no interference should be caused by a Continental transmission.

On September 15, therefore, the stations will take up their new positions in the broadcasting band, but the B.B.C. reserves itself the right, in the matter of the relay stations, to revert to the use of the allotted European common wavelengths should this eventually prove of benefit to British listeners.

To the sixty odd broadcasting stations which are in course of installation, or of which the erection is proposed on the Continent, wavelengths have also been allotted; in the majority of these cases the stations will work on one common to other broadcasters. Their distribution has been carefully thought out, taking distances into consideration.

REVISED LIST of WAVELENGTHS for EUROPEAN BROADCASTING STATIONS

Frequency x 10,000	New Wavelength	Station	Country	Actual Power (watts)	Present Wavelength
51	588·2	Vienna	Austria	750	530
,,	,,	Linkoeping	Sweden	250	467
,,	,,	Grenoble	France	500	475
52	577	Madrid (EAJ6)	Spain	1,000	392
,,	,,	Joenkoeping	Sweden	25	199
53	566	Berlin	Germany	1,500	505
,,	,,	Orebro	Sweden	250	237
,,	,,	Saragossa	Spain	—	—
,,	,,	Bloemendael	Holland	100	315
54	555·6	Buda-Pesth	Hungary	2,000	560
55	545·6	Sundsvall	Sweden	1,000	545
56	535·7	Munich	Germany	4,000	485
57	526·3	Riga	Latvia	1,200	480
58	517·2	Vienna	Austria	5,000	531
59	508·5	Antwerp	Belgium	100	265
60	500	Zurich	Switzerland	500	513
,,	,,	'Helsingfors	Finland	500	522
,,	,,	Karlstad	Sweden	250	221
61	491·8	Aberdeen	Great Britain	1,500	496
,,	,,	Birmingham	,,	1,500	479
62	483·9	Berlin	Germany	4,000	504
63	476·2	Lyons (PTT)	France	1,000	480
64	468·8	Elberfeld	Germany	750	259
65	461·5	Bergen	Norway	1,000	350
66	454·5	Boden	Sweden	1,000	1,200
67	447·8	Paris (PTT)	France	500	458
68	441·2	Brünn	Czecho-Slovakia	300	521
69	434·8	Bilbao	Spain	500	415
70	428·6	Hamburg	Germany	4,000	392·5
71	422·6	Rome	Italy	3,000	425
72	416·7	Stockholm	Sweden	1,500	430
73	411	Berne	Switzerland	1,500	435
74	405·4	Glasgow	Great Britain	1,500	422
75	400	Mont de Marsan	France	300	390
,,	,,	Cadiz (EAJ3)	Spain	550	357
,,	,,	Warsaw	Poland	1,500	480
,,	,,	Koszice	Czecho-Slovakia	750	2,020
,,	,,	Aalesund	Norway	250	515 ?
,,	,,	Bremen	Germany	750	279
76	394·7	Frankfort a/m	Germany	4,000	470
77	389·6	Toulouse(Radio)	France	2,000	433
78	384·6	Manchester	Great Britain	1,500	378
79	379·7	Stuttgart	Germany	4,000	446
80	375	Madrid (EAJ7)	Spain	1,500	373
81	370·4	Oslo	Norway	1,500	382
82	365·8	Graz	Austria	750	402
83	361·4	2LO (London)	Great Britain	3,000	363·5
84	357·1	Breslau	Germany	4,000	418
85	353	Cardiff	Great Britain	1,500	353
86	348·9	Prague	Czecho-Slovakia	5,000	372
87	344·8	Seville (EAJ5)	Spain	500	357
88	340·9	Paris (Pt. Parisien)	France	500	333
89	337	Copenhagen	Denmark	700	34
90	333·3	Naples	Italy	1,000	350
,,	,,	Reykjavik	Iceland	500	328
91	329·7	Nuremberg	Germany	750	340
92	326·1	Belfast	Great Britain	1,500	440
93	322·6	Leipzig	Germany	4,000	452
94	319·1	Dublin	Ireland	1,500	397
95	315·8	Milan	Italy	1,000	320
96	312·5	Newcastle O/T	Great Britain	1,500	404
97	309·3	Marseilles	France	500	351
98	306·1	Bournemouth	Great Britain	1,500	386
99	303	Muenster	Germany	1,500	410
100	300	Bratislava	Czecho-Slovakia	500	300
101	297	Agen	France	250	318
,,	,,	Hanover	Germany	750	297
,,	,,	Carthagena	Spain	500	335
,,	,,	Jyvaskyla	Finland	100	301·5
,,	,,	Leeds	Great Britain	200	321·5
102	294·1	Dresden	Germany	750	294
,,	,,	Bradford	Great Britain	200	310
,,	,,	Trollhattan	Sweden	250	322
,,	,,	Bilbao (EAJ11)	Spain	500	418
,,	,,	Liege	Belgium	100	280 ?
,,	,,	Innsbrueck	Austria	500	—
103	291·3	Lyons (Radio)	France	1,500	280
104	288·5	Dundee	Great Britain	200	330.5
,,	,,	Edinburgh	,,	200	324·5
,,	,,	Hull	,,	200	335·5
,,	,,	Liverpool	,,	200	318
,,	,,	Nottinghan	,,	200	323·5
,,	,,	Plymouth	,,	200	338
,,	,,	Sheffield	,,	200	301
,,	,,	Stoke O/T	,,	200	306
,,	,,	Swansea	,,	200	482
105	285·7	Reval	Esthonia	500	350
106	283	Dortmund	Germany	1,500	283
107	280·4	Barcelona (EAJ1)	Spain	2,000	324
108	277·6	Caen	France	200	332
,,	,,	Barcelona (EAJ13)	Spain	1,000	462
,,	,,	Seville	,,	500	300
109	275·2	Angers	France	250	300
,,	,,	Madrid (EAJ4)	Spain	1,000	340
,,	,,	Eskilstuna	Sweden	250	243
,,	,,	Zagreb	Jugo-Slavia	250	350
110	272·7	Cassel	Germany	750	273
,,	,,	San Sebastian	Spain	1,500	343
,,	,,	Norrköping	Sweden	250	260
113	265·5	Brussels	Belgium	1,500	487
115	260·9	Gothenberg	Sweden	1,000	290
118	254·2	Kiel	Germany	750	234·5
119	252·1	Montpellier	France	200	220
,,	,,	Stettin	Germany	750	241
120	250	Gleiwitz	,,	750	251
122	245·9	Toulouse (PTT)	France	500	260
124	241·9	Koenigsberg	Germany	4,000	462
125	240	Helsingfors	Finland	250	318
126	238·1	Bordeaux	France	500	411
131	229	Malmo	Sweden	1,000	270
133	225·6	Belgrade	Jugo-Slavia	1,000	1,650
134	223·9	Leningrad	Russia	1,000	940
137	219	Kovno	Lithuania	—	—
138	217·4	Luxemburg	Luxemburg	250	1,200
142	211·9	Kiev	Russia	500	780
147	204·1	Gefle	Sweden	250	208
,,	,,	Salamanca	Spain	500	355

RADIOGRAMS

TRANSMISSIONS from the new high-power Hilversum station have resulted in more than a thousand letters being received during the first week from England alone, and many more from Holland, France, Belgium, Germany, and Czecho-Slovakia, expressing appreciation at the clearness of the broadcasts.

Most of the space at Olympia for the coming exhibition has already been allotted, and the number of exhibitors to date is more than twice the number in the Albert Hall Exhibition last year.

The Polski Radio, the Polish Broadcasting Company, in conjunction with the Government Posts and Telegraphs Department, proposes to erect new broadcasting stations at Posen, Kattovitz and Vilna. Towards the end of the autumn work will be started on a new high-power transmitter at Warsaw, on the completion of which the present plant will be transferred to the city of Cracow.

At the London headquarters of the B.B.C., letters received average 3,600 weekly.

There will be a world longitude determination by radio signals, beginning on October 1 and ending on December 1, 1926, from the United States Naval Observatory, for the purpose of determining the differences in longitude with great accuracy, and to re-determine at intervals sufficiently separated in time the permanency of their relative positions, and certain possibilities as to movement of the earth's crust.

A message was recently broadcast in an attempt to get into touch with a witness urgently required in the Law Courts.

The financial success of the B.B.C. as a company is shown by the fact that when, at the end of the year, the B.B.C. is transferred to the new national authority to be created, it will be able, after repaying its shareholders at par, to hand over the entire organisation with its considerable capital assets in a high state of efficiency at no cost.

On August 15 the Rev. F. A. Jarman, of Goring-on-Thames, will broadcast an address from 2 L O dealing with the derelicts of London who find nightly both material and spiritual help and comfort at St. Martin-in-the-Fields.

Captain L. F. Plugge, the wireless expert, who left about a fortnight ago for an experimental wireless tour through Europe to Constantinople, has equipped a large touring car with both transmitting and receiving apparatus for this purpose.

At Vera Cruz, the principal port of entry into Mexico, a broadcasting station with a wavelength of 337 metres and an output of 50 watts (call letters C Y C) has been recently installed.

The B.B.C. is endeavouring to make arrangements with a dramatic school for the establishment of a special section for training microphone artists. Contests are also being organised with prizes to discover and encourage dramatic talent suitable for broadcasting.

At the National Physical Laboratory, Teddington, a unique room which is proof against wireless waves has recently been completed. It is to be used for carrying out important and delicate wireless experiments that would be spoilt if outside transmissions could find a way inside the room.

Among some recently completed Latin-American installations are a broadcasting radio-telephone station at Port-au-Prince, Haiti, and a receiving station at the city of Paraguari, in the Republic of Paraguay, where programmes, broadcast from stations in Buenos Aires and North America, have been heard very clearly.

Wireless has been successfully used to direct a goods train of 116 wagons, over the New York Central lines from Englewood (Illinois) to Elkhart (Indiana), a distance of 100 miles, and back. During the entire trip voice communication between the locomotive and the guard's van was carried on over the mile-long train.

At a station near Vienna an apparatus has been fixed up for the wireless transmission of pictures, and it is hoped that in the near future London will be one of the receiving cities.

Mr. Roger Quilter will conduct the Wireless Orchestra during a programme of his music, to be broadcast from London and other stations on August 23.

On Tuesday, August 17, from 8 p.m. till midnight, with the exception of the interlude for news and a talk, there will be a continuous programme of fox-trots, waltzes, and tangoes from the London and Daventry stations.

The Paris University Council has sanctioned the foundation at the Sorbonne of a wireless-telephony institute to enable listeners to study in their own homes.

The B.B.C. are keenly interested in the suggestion that the teaching of physical culture be broadcast, and are willing to try the experiment if the financial obstacles can be surmounted.

An analysis of listeners' written comments on the recent debate between Sir Landon Ronald and Mr. Jack Hylton, on classical music versus jazz, shows an overwhelming preponderance of listeners' opinions in favour of the classics. The actual figures were as follows: Classics 568, jazz 172, indefinite 88.

As the result of the broadcasting of information regarding fishing from the Aberdeen station, Scots fishermen are complaining that it is detrimental to their interests. Their contention is that foreign fishing boats pick up the information which is supplied to the B.B.C. by the Fishery Board, and when the Scottish fishermen return to the grounds where they had located lucrative shoals the night before, they find them in the possession of the foreigners, many of whom understand English.

The band and concert party relays from Glasgow public parks are proving an unqualified success. Some of the finest combinations in the country—including the Grenadier Guards on Sunday, August 29—are broadcasting under the scheme. Inclement weather, such as a recent cloudburst over Glasgow, will not cause an abandonment of any of these relays, as it has been arranged that in such a contingency the performance will be given from the studio.

It is probable that an approaching instalment of the *Whiffs* revue series, now being given from the Glasgow station, will also form part of Daventry's programme.

Falkirk Choral Union, in reporting a loss of £196 on last season's operations, placed the blame largely on broadcasting. It was stated that people, by getting good music without leaving their homes, were inclined to cease paying their Choral Union subscriptions.

On the night of the arrival in the Clyde of 1,200 members of the Order of the Scottish Clans of America on a visit to the homeland, the Chief, Mr. Duncan McInnes, broadcast from 5 S C a special message from his New World associates to their brothers in Scotland.

The Oslo Broadcasting Company is entitled to devote 15 per cent. of its programme time to the broadcasting of advertisements.

Signor Lenghi Cellini, the Italian tenor, will give a recital of Italian art songs from 2 L O on August 18.

It is reported that the French Government will shortly take control of broadcasting in France. It is possible that a State appropriation may be made for its development.

The B.B.C. will relay from the Crystal Palace on August 28 the massed band programme of the Metropolitan Police Band Championship Festival.

Mr. Allan Aynesworth will broadcast a translation of the story of *The Monster Cannon*, by Victor Hugo, on August 15.

William Primrose.

NEXT WEEK AT 2LO

By "THE LISTENER"

Poulshnoff.

ON Sunday afternoon a programme of music by the Royal Tank Corps band is to be broadcast. Two famous artistes, Miss Kate Winter and Mr. Percy Heming, of *Lilac Time* and operatic fame, are the singers. Mr. Heming has arranged a group of songs under the title, "Songs My Father Sang," and he will render songs familiar to amateur vocalists of thirty years ago. In the evening a programme, by Albert Sandler and his orchestra, with Spencer Thomas as vocalist, will be relayed from the Grand Hotel, Eastbourne.

Mr. Reginald Berkeley's popular play, *The White Chateau,* will be revived on Monday with the cast, as far as possible, the same as at its first production last year. It will be followed by a popular orchestral programme, conducted by Stanford Robinson, and the vocalist Watcyn Watcyns the Welsh baritone.

A full dance evening is promised for Tuesday from London and Daventry. Commencing at 8 o'clock, from one or other of the stations, dancing will be possible till midnight. From 8 to 8.45 on Daventry, and 8.45 to 9.30 on London a light programme will be carried out by Stanley Holt's Octet. Vivien Lamelet and E. Cuthbert Smith, a new-comer to broadcasting, will be the vocalists.

Lovers of chamber music will welcome the reappearance on Wednesday of the Modern Trio, which comprises William Primrose, Manucci and Serge Krish. The chosen works are Beethoven's trio in D major, Hure's suite of Breton airs, 1st movement of Schubert's E flat trio No. 2, and the finale from Saint-Saens' trio in F major. The vocalist is the well-known Italian tenor, Lenghi Cellini, who will sing some of the modern Italian songs, and also give a reading of poems by Burns. The variety feature at 10 o'clock includes solos by Gabrielle Hope and stories by Tex McLeod, from the Coliseum.

A programme will be given on Thursday night in honour of the London Territorials, arranged by Amyas Young. The 2LO Military Band, the London Radio Players, and members of the Territorials, past and present, will take part. Later will follow an excerpt from *Yvonne,* relayed from Daly's Theatre.

Variety and opera rub shoulders on Friday, when the former commences the evening, with the Two Bobs and Ray Wallace, both well-known broadcasters, and a new-comer in Zachary Tan, a novelty instrumentalist. From 8.30 will be given a second broadcast of Verdi's opera, *Rigoletto,* which was given at the Chenil Galleries recently.

Mr. S. Kneale Kelley, the brilliant leader of the Wireless Symphony Orchestra, will act as conductor on Saturday night for a short popular programme in which May Willis will be the singer. The Folderol Concert Party will be relayed from Westcliff at 8.45, while at 10 a short classical recital will be given by Leff Pouishnoff, the well-known pianist.

The 7.25 pianoforte recitals of the week will be by Edith Barnett, and the composer chosen is Weber. The works chosen include the fourth of the Pianoforte Sonatas.

Correction.—On page 153 in our last issue a typographical error was made in attributing the left-hand photograph to Mr. Reginald Whitehead. Actually the artiste shown by the photograph is Mr. Samuel Kutcher. Our apologies are made to both artistes.

BROADCAST TELEPHONY

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to British Summer Time.

London (2LO), 361 m. 1-2 p.m., con.; 3.15-4 p.m., transmission to schools; 3.30-5.45, con. (Sun.); 4.15 p.m., con.; 5.15-5.55, children; 6 p.m., dance music; 7-8 p.m., time sig., news, music, talk; 8-10 p.m., music; 9.0, news (Sun.); 9.30 p.m., time sig., news, talk; 10 p.m., special feature (Mon., Wed., Fri.). Dance music on Thurs. and Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 379 m. **Newcastle** (5NO), 404 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 306 m. **Stoke-on-Trent** (6ST), 301 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun. and Tues.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily, 7.30 p.m. Sundays, 8.30 p.m. until 10.30 p.m.

CONTINENT

The Times are according to the Continental system; for example, 16.30 *is* 4.30 *p.m., and* 08.00 *is* 8 *a.m. B.S.T.*

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 531 m. (temp.) (10 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig.; con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 20.10.

BELGIUM.

Brussels, 487 m. (2½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news. Relay: Antwerp, 265 m. (100 w.).

CZECHO-SLOVAKIA.

Prague, 368 m. (5 kw.). Con., 20.00-23.00, daily.

Brnnn (OKB), 521 m. (2.4 kw.). 10.00, con., news (Sun.); 19.00, lec., con. or dance (daily).

Kbely, 397 m. (500 w.).

Kosice, 2,020 m. (2 kw.). 19.00, con.

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays: 10.00, sacred service; 16.00, con.; 20.00 dance. Weekdays: 20.00, lec., con., news, con.; dance to 24.00 (Thurs., Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00, sacred service.

Odense, 810 m. Relays Copenhagen.

Sorö, 1,150 m. (1½ kw.). Relays Copenhagen.

FINLAND.

Helsingfors (Skyddskar), 520 m. (500 w.).

Helsingfors, 440 m. Con., 18.00 (Tues., Thurs., Sat., Sun.).

***Tamafors,** 368 m.

***Jyvaskyla,** 561 m. (200 w.).

***Uleaborg,** 233 m. (200 w.).

* Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. Con.: 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 07.15, 08.00, physical exercises; 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (daily). Relays PTT, Paris: 07.15, 08.00 (daily).

Radio-Paris (CFR), 1,760 m. (about 3 kw.). Sundays: 12.45, con., news; 16.45, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 10.40, news; 12.30, con., markets, weather,

news; 16.30, markets, con.; 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 460 m. (800 w.). 07.15, 08.00, physical exercises (except Sun.); 20.30, lec. (almost daily); 21.00, con. (daily).

Le Petit Parisien, 333 m. (1 kw.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio L.L. (Paris). 350 m. (250 w.). Con. (Mon., Wed., Thurs.), 20.30.

Radio-Toulouse, 433 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily).

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily). Temporarily closed.

Strassburg, 205 m. (100 w.). 21.15, con. (Tues., Thurs.).

Radio Agen, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Tues., Fri.).

***Lyon-la-Doua**, 480 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse**, 260 m. (2 kw.).

***Bordeaux**, 411 m.

* Relays of PTT Paris.

Montpellier, 220 m. (1 kw.). 20.45 (weekdays only).

Angers (Radio Anjou), 300 m. (500 w.). Daily: 20.30, news, lec., con.

Bordeaux (Radio Sud-Ouest), 332 m. Con., 21.00 (Mon., Fri.).

Mont de Marsan, 390 m. (300 w.). Con. (weekdays only), 20.30.

Algiers (N. Afr.) (PTT), 310 m. (100 w.). 22.00, con. (Mon., Thurs.).

Ste. Etienne (Radio Forez); 220 m. (100 w.). Testing.

GERMANY.

Berlin, 504 m. (4 kw.). 06.30, con., phys. exer. (Sun.); 09.00, sacred con. (Sun.); 11.00, con. and tests; 12.55, time sig., news, weather; 15.00, educ. hour (Sun.), markets, time sig.; 17.30, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (Sat., Sun., Thurs.). Relayed on 1,300 m. by Königswusterhausen (1,300 m.) and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, con. (Sun.); 15.00, lec. (daily); 20.30, relay of Berlin (Vox Haus) con. (not daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 418 m. (3 kw.). 12.00, con. (daily), Divine service (Sun.); 12.55, time sig. (Sun.), weather, Stock Ex., news; 17.00, con.; 19.00, lec.; 20.30, con., weather, time sig., news, dance (relays Berlin). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (3 kw.). 08.00, sacred con. (Sun.); 11.55, time sig., news; 12.55, Nauen time sig.; 16.00, con. (Sun.); 16.30, con.; 18.00, markets, lec.; 20.00, lec., con., weather. Dance: relays Berlin. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (3 kw.). Relayed by Bremen (279 m.), Hanover (297 m.), Kiel (234 m.). Sundays: 07.25, time sig., weather, news, lec.; 09.15, sacred con.; 13.15, con.; 18.00, con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 05.45, time sig., weather; 07.00 and 07.30, news, weather; 12.55, Nauen time sig., news; 14.00, weather, con.; 16.15 con; 18.00, relays Berlin; 19.00, lec.; 19.55, weather and con.; 22.00, dance (Sun., Thurs., Sat.).

Königsberg, 463 m. (1 kw.). 09.00, sacred con. (Sun.); 12.55, time sig., weather, news; 16.30, con.; 17.00, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (3 kw.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 11.00, educ. hour (Sun.); 12.00, con. (daily); 12.55, Nauen time sig., news; 16.30, con., children (Wed.); 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 485 m. (3 kw.) and 204 m. (1½ kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 14.00, time sig., news, weather; 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec.; 19.30, con. (Sun.).

Muenster, 410 m. (1 kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 12.55, Nauen time sig.; 15.30, news, time sig.; 16.00, con.; 17.00, children (Sat.); 19.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 446 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (Sun.); 18.30, time sig., news, lec., con. (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 06.35-15.30 (exc. Mon. and Sat., when 12.30-13.30), news, Stock Ex.

Hilversum (HDO), 1,060 m. (5 kw.). 09.00, sacred service (Sun.); 19.10, con.; 21.00, news, con.

HUNGARY.

Buda-Pesth (Csepel), 560 m. (2 kw.). 09.30, news; 12.00 and 15.00, weather, news; 17.00, dance music; 20.00, con. or opera; dance nightly.

ICELAND.

Reykjavik, 327 m. (700 w.). Con., 20.30.

ITALY.

Rome (IRO), 425 m. (3 kw.). 17.00, children; 17.30, orch.; 17.55, news, Stock Ex., jazz band; 20.30, news, weather, con.; 22.15, late news.

Milan, 320 m. (2 kw.). 20.00-23.00, con., jazz band.

JUGO-SLAVIA.

Belgrade (Rakovitza) (HFF), 1,650 m. (2 kw.). 17.00, news (daily), con. (Tues., Thurs., Sat.).

Agram (Zagreb), 350 m. (1 kw.).

LETTLAND.

Riga, 475 m. (2 kw.). Con. daily, 21.00-22.00.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.), Stock Ex. (weekdays); 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo (22.30-24.00, Sun., Wed., Sat.).

Bergen, 357 m. (1½ kw.). 19.30, news, con., etc.

***Riukan**, 445 m. (50 w.).

***Porsgrund**, 405 m. (100 w.).

* Relays Oslo.

POLAND.

Warsaw, 480 m. (6 kw.). Daily: con., 11.00-13.00; 15.00-23.00, daily.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 12.30 and 17.55, news and con.; 23.00, chimes from Kremlin.

(Popoff Station), 1,010 m. (2 kw.). 10.00, 11.00, lec.; 13.00, 19.00, con. (Tues., Thurs., Fri.).

SPAIN.

Madrid (EAJ6), 392 m. (1½ kw.). Daily: con.

Madrid (EAJ7), 373 m. (4½ kw.). Con. daily.

Madrid (EAJ4), 340 m. (3 kw.). 16.00, con. The Madrid stations are again working to a rota, varying time of transmissions daily.

Barcelona (EAJ1), 324 m. (1 kw.). 17.00-21.00, news, lec., con. (Sun.); 18.00-23.00 (daily).

Barcelona (Radio Catalana) (EAJ13), 462 m. (1 kw.). 19.00-23.00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con. Close down 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (2 kw.). 22.00-24.00, con. (daily).

Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00, con., news. Tests daily (exc. Sun.), 24.00.

Cartagena (EAJ15), 335 m. (1 kw.). 20.30-22.00, con. (daily).

Seville (EAJ5), 357 m. (1½ kw.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. 19.00-22.00, con. (daily).

San Sebastian (EAJ8), 346 m. (500 w.). 17.00-19.00, 21.00-23.00 (daily).

Salamanca (EAJ22), 355 m. (1 kw.). 17.00 and 21.00, con. (daily). Closes down 23.00.

SWEDEN.

Stockholm (SASA), 430 m. (1½ kw.). 11.00, sacred service (Sun.); 12.30, weather; 14.00, con. (Sun.); 17.00, children (Sun.); 18.00, sacred service; 19.00, lec.; 21.15, news, con., weather. Dance (Sat., Sun.), 21.45.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 20.00, lec., con. (daily).

Zurich (Hongg), 515 m. (temp.) (500 w.). 11.00, con. (Sun.); 12.00, weather; 12.55, Nauen time sig., weather, news, Stock Ex.; 13.30, piano solo; 17.00, con. (exc. Sun.); 18.15, children, women; 19.00, news, weather; 20.15, lec., con., dance (Fri.).

NIDK

SIR,—I expect many of your readers who are interested in short-wave signals have received the call-sign NIDK. On a two-valve receiver I logged this station some weeks ago, and have received the following information from the United States Coastguard Headquarters:

The call NIDK is used by the International Ice Patrol off the coast of Newfoundland. There are two ships assigned to this patrol, the *Tampa* (call NITC) and the *Modoc* (call NIVD). The call NIDK is a special call used only by the ship actually on patrol. At other times these ships use their own calls. Both vessels are equipped with 500-watt crystal-controlled C.W. transmitters, with a range of approximately 25 to 75 metres. At the present time only two crystals are being used, which gives them four wavelengths: 71.2, 70.0, 35.6, and 35 metres.

At the time I heard NIDK, the *Tampa* was on patrol near the tail of the Grand Banks, and I am informed that reports on these transmissions will be welcomed by the Radio Electrician, U.S. Coastguard, Treasury Department, Washington, U.S.A.—G5TD (Harrow).

A Grumble

SIR,—I do not often quarrel with my favourite paper, but a note in the article "A Really Distortionless Intervalve Coupling," in No. 216, does raise my ire!

You state that transmission is now well-nigh perfect, but reception lags behind. I think most provincial listeners will agree with me when I say that transmission, as far as provincial stations are concerned, is practically where it was two years ago. We still get 50 per cent. of our programmes from London, via land-line, the result being a muffled and distorted travesty of music which is intolerable even on a crystal set. Local relays are mostly failures (witness the attempts to relay the Bournemouth Winter Gardens), and the balance is made up of mediocre orchestral music from, apparently, a padded cell. About once a month we get a perfect transmission. You lucky patrons of 2LO can have little idea of the utter futility of the average local station.

Daventry, as regards quality, is little, if any, better than Chelmsford used to be, and the contrast between the former station and, for instance, the high-power station at Königswusterhausen is simply pathetic.

I maintain that this state of affairs is having a very detrimental effect on the wireless industry. A simple crystal set is at present the best instrument to use when one is near a local station, as this will bring in the news and other information and one can hang up the phones when the alleged music commences.

—H. B. (Southbourne).

Thunderstorms and Aerials

SIR,—The reports of damage by lightning in recent storms should be taken as a "Safety First" warning to householders.

Aerial erection may be classified as follows: (1) From pole to chimney; (2) from high tree to wall of house; (3) two poles with wire the length of the garden. The risk is probably in the order noted. Only one report is to hand of a tree being struck, and consequent fire and damage to the set. That a wire of small area will take a large current is shown by a report from Cornwall; the lightning left the conductor side, flashed to a lead roof and rain-water pipe, and then passed along a small wire used for *training plants*, back to the conductor and earth.

The usual plan of earthing to a water-pipe is fairly safe if there is direct connection to the water main; this should be in a nearly straight run; lavatory or bath pipes should not be used as the danger is in the joints of the pipe.

If the ground is suitable, a small spike, plate, or perforated tube is efficient as an earth; but all these devices are not so good as the standard lightning conductor earth. A copper plate, 3 ft. by 3 ft., buried in wet earth and surrounded with charcoal, or a tubular earth packed with granulated carbon and driven into moist ground, are reliable.

—K. H. (London, S.W.).

"Holiday Photographs: What to 'Snap'" is the title of an illustrated article appearing in the current issue of THE AMATEUR MECHANIC AND WORK (3d.), and deals specially with ship pictures. Other articles appearing in the same number are: "A Chemical Rectifier for Alternating Current," "A Cheap Workshop Floor," "Making a Drilling Jig," "Shoe Repairing: The Treatment of Crepe-rubber Soles," "Making a Deck-chair with Canopy," "Setting Out East and West Sundials," "Practical Lathework: Micro-division," "Hints and Kinks Illustrated," "A Garden Wheelbarrow of the Right Pattern," "Making a Palm and Flower Stand," "Overhauling the Motor-cycle Cylinder."

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YOUR SET AND THE NEW WAVELENGTHS

THE ECLECTIC CRYSTAL SET

Amateur Wireless
And Electrics

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PRINCIPAL CONTENTS

WELL ILLUSTRATED

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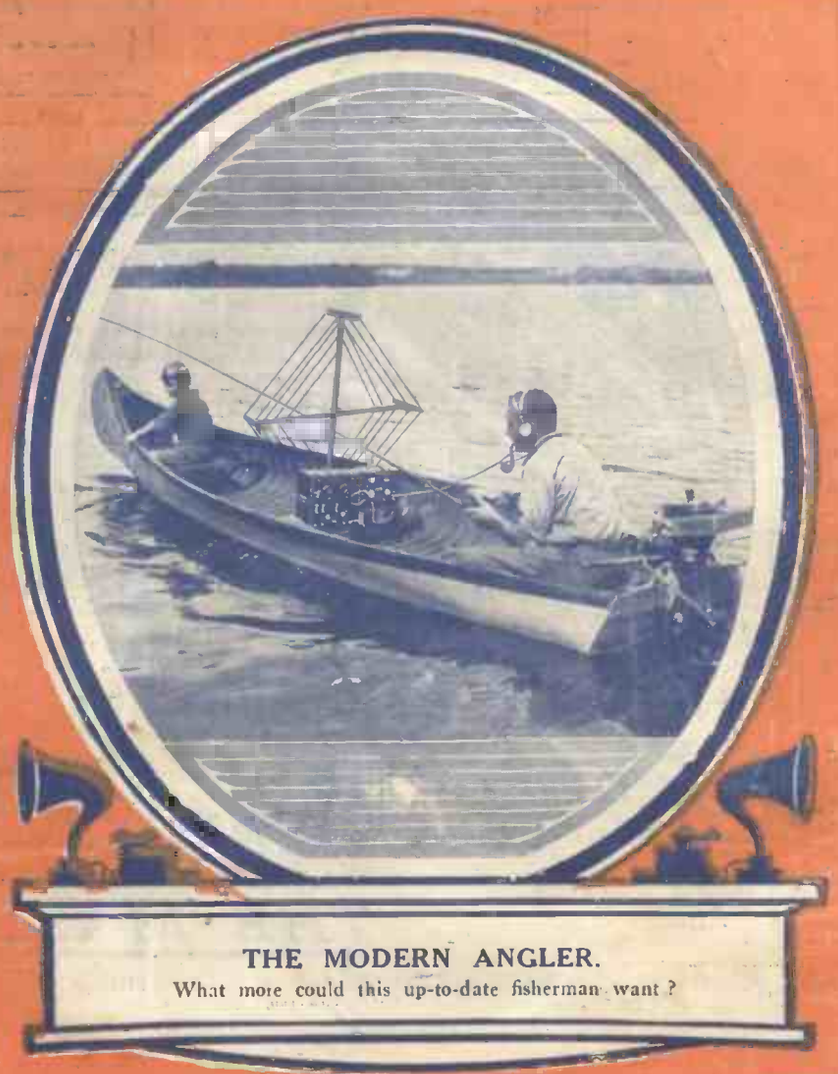

THE MODERN ANGLER.

What more could this up-to-date fisherman want ?

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

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Chief Contents

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell and Co., Ltd.

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

YOUR SET AND THE NEW WAVELENGTHS

THE general redistribution of European wavelengths would not seem, at first sight, greatly to affect the British stations. The only main stations whose wavelengths will be altered to any considerable extent are Belfast, Bournemouth, and Newcastle, each of which suffers a reduction of the order of 100 metres, or about 25 per cent.

The few metres difference in the wavelengths of other stations will only mean that these will be received with the tuning dials a few degrees from their present positions, but in the case of the three stations mentioned, and also Dublin, it may be impossible to get them with the present tuning arrangements.

The following are the wavelengths allotted to the broadcasting stations of the B.B.C. as a result of the recent conference at Geneva. It will be observed that Birmingham and Aberdeen work on the same wavelength, while all the relay stations but Leeds and Bradford have also a common wavelength. It is expected that the change will be made on September 15.

BRITISH WAVELENGTHS

Aberdeen } Birmingham }	491·8 metres
Glasgow	405·4 "
Belfast	326·1 "
London	361·4 "
Newcastle	312·5 "
Manchester	384·6 "
Bournemouth	306·1 "
Cardiff	353 "
Leeds	297 "
Bradford	294·1 "
All other Relays	288·5 "

Of course, if plug-in coils are used it may only mean using a smaller coil, and in some cases the present coil will do if the tuning condenser is placed in series with it instead of in parallel.

Variometer Tuning

If the tuning is done with a variometer two methods are available. Either a small (say .0003-microfarad) fixed condenser can be connected in series with the aerial lead or a few turns can be taken off both rotor and stator.

In any but the simplest receivers it will, of course, be necessary to attend to the tuning of more than one circuit. Every tuned circuit must be capable of getting down to the new wavelengths. In tuned-anode circuits, for instance, a smaller coil will be required if plug-in coils are used, or a few turns must be taken off the anode coil if this is a permanent fixture and not suitably tapped.

One of the most striking features of the new wavelength distribution is the experiment of allocating the same wavelength to two main stations—Birmingham and Aberdeen. This seems to be a pity, as these are two of the most popular stations, and it will now become impossible for anyone living about half-way between them to receive either of them. In fact, it would seem that the reception of the programmes from both Aberdeen and Birmingham are to be spoilt for anyone living at a fair distance from either. It will be extremely difficult to adjust a powerful receiver so that it is sensitive enough to pick up one station at a fair strength at a considerable distance and yet not receive the slightest vestige of the other.

Selectivity will, of course, be utterly useless to separate these stations if, as is presumed to be the case, they keep accurately to their common wavelength.

It also seems a pity that long-distance "fiends" should lose all the relay stations except Leeds and Bradford. Any self-respecting DX merchant can go the round of the main stations with too much ease to make this feat anything of a real test, and the relays were just the thing for trying out a new set. It is a good set, if less than five valves are used, that can pick up all the relays in one evening under the existing scheme.

Long-distance experts, however, are a very small minority, and it is becoming more and more apparent that from the point of view of reproduction it is wise to confine oneself to the reception of a few stations only—these being the nearer or higher-powered stations.

T. T.

WHA — WIRELESS HAPPENINGS ABROAD

WHEN the sun has set for about an hour, and you look up into the cool, clear atmosphere and see the stars just beginning to peep out, and you seem to feel by instinct that conditions are going to be simply perfect, that is the time to wander about through the ether all over Europe and enjoy yourself. Yes, and educate yourself, too, for even when static and C.W. interference is bad the Continental news bulletins come through all right, and are always full of interest. After all, it does not demand a very profound knowledge of a language to catch the gist of an exciting bit of news.

Foreign News

The news bulletins at foreign stations are well worth paying attention to; if you make a list of the various times at which they come on at the different stations you will find them on the whole very punctual, and it is surprising what a lot of interesting topics for conversation one can pick up during a day.

The B.B.C. is not permitted to give Press news before the evening, but Radio-Paris gives a very interesting news bulletin in the morning, punctually at 10.40. If you have tuned in for the weather forecast from Daventry at 10.30 you can catch the Paris news easily by a small adjustment of the condenser. Then at the same Paris station you get a little bit of news again just after the morning concert, about 1.55, but you will have to wait till the announcer has fought through rather a long list of commercial and financial figures, which, in my opinion, they would do well to shorten.

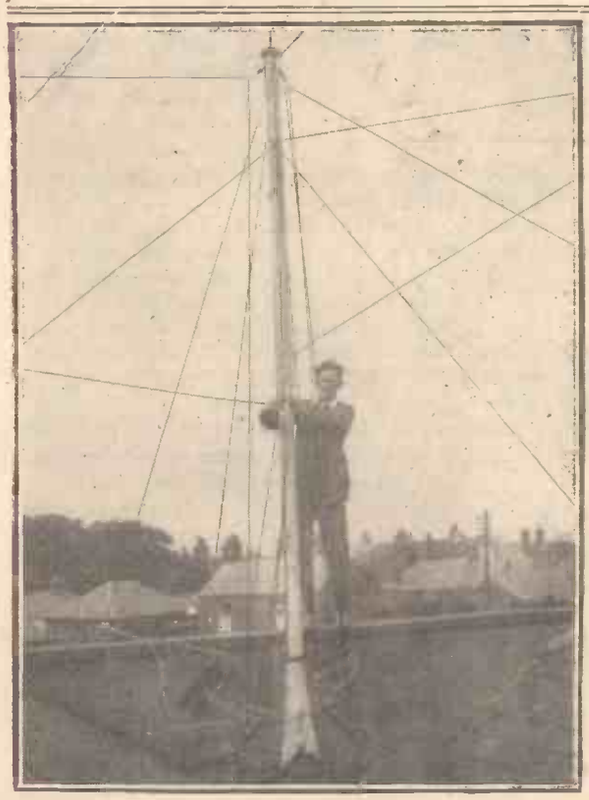
Berlin station gives morning news at 10.15; and Hamburg starts as early as 5.45 with a weather forecast and time signal. Late in the evening German news comes through wonderfully clear; racing news, for example, where they usually describe some thrilling motor accident; or the police news, more exciting still, where the villain at large whom the polizei are chasing is usually a Frenchman or an American "last seen leaving the hotel in a cowboy hat and check trousers, with blue eyes, large spectacles, and a yellow beard."

Then when there is an election or any event of great national importance abroad the excitement of listening to the foreign news becomes absolutely intense. During the night, for example, when they were giving out the referendum results on the fate of the Kaiser at all the German stations, it was very exciting dodging about from one to the other—Hanover, Muenster, Leipzig, Breslau, Berlin, they were all at it—but you had to be pretty smart at your figures to learn how the thing was going. Like a general election they, of course, gave the figures out for districts, and this was the sort of thing you heard in a serious, official tone: "Volksentscheid, Berliner Ergebnis, Berlin-Mitte, Stimmberechtigt, 227,751. Ja, 127,371. Nein, 4,735. Ungültig, 5,994. Volksbegehren, 109,763." I managed it for a long time, but those strings of figures knocked me groggy at last, and I was carried up to bed without knowing yet whether we had lost or won the war! But it was grand sport! French figures are very confusing, too, when they are rattled off like greased lightning. I believe even a Frenchman himself gets giddy when he has counted up to fifty thousand million, or somewhere about there.

The Journal Parlé

The Journal Parlé, at half-past six every day, at the Eiffel Tower station, is always full of interest to anyone who loves Paris; you feel as though you were sitting in one of the brilliant Boulevard cafés chatting with a friend, or, at any rate, the friend is chatting to you, which comes pretty much to the same thing, for French friends always do talk all the time. Yes, the Journal Parlé alone is worth all the money you have ever spent on radio, and even at that it works out considerably cheaper than a journey to Paris, even for a few days. They give you in a most pleasant manner all sorts of news concerning what's on in the Gay City, literary, theatrical, political, society scandal, terrible tragedies and street accidents, it really is a regular Spoken Newspaper.

LYONS.



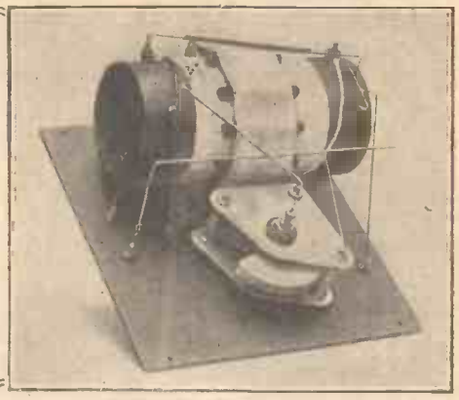
A WIRELESS EXCHANGE

By paying a weekly sum of one and sixpence twenty subscribers to a novel wireless exchange in Hythe have been enabled to hear the broadcast programmes picked up by Mr. Maton, a local wireless dealer, on his 5-valve set. Telephone wires are led from a pole in his garden to various houses and thence to plug arrangements in the walls. The subscriber places his plug in the wall, and by means of an ingenious automatic device the programmes then come on of their own accord. The left hand photograph shows the distribution wires, while on the right is Mr. Maton with his apparatus.

The Finished Receiver.

THE ECLECTIC CRYSTAL SET

"Eclectic" means "picking at will"—exactly what this set allows of your doing. It is something out of the ordinary.



Photograph of Underside of Panel.

IN a crystal receiver it is a most difficult matter to obtain loud signal strength and at the same time to maintain a reasonable degree of selectivity. The receiver described below and illustrated by the accompanying photographs will, with a good aerial, give results equal to those obtainable with a single valve, and yet the sharpness of tuning is in no way impaired. No jamming from shipping morse signals or harmonics is ever experienced, and 2 L O can be tuned in and out in 20 degrees on the scale of a small .0002-microfarad condenser. Such sharp tuning, consistent with loud signal strength, is most unusual in a crystal receiver. For good reception of the local station this set approaches very near to the ideal.

Components

The following few components are required: Ebonite panel, 7 in. by 7 in.; wooden cabinet to fit, 5 in. deep; one .0002 variable condenser of any good "low-loss" make; crystal detector of the catwhisker type; 6-in. length of ebonite tube, 3 in. in diameter; four nickel-plated terminals; two countersunk 4 B.A. bolts and nuts; ¼ lb. of No. 20 d.c.c. copper wire; ¼ lb. of No. 16 d.c.c. copper wire; odd wood screws, solder, lengths of systoflex, etc.

As the good results obtainable with this receiver are due almost entirely to the type of coil used, the construction of this component will be described first. It is recommended that the constructor should not deviate in any way from the particulars given here, as the correct number and spacing of the turns was found by careful experiment, and it is not likely that better results can be obtained by a different method of construction. The necessary holes for the supports and terminal connections are first drilled in the ebonite former and the two terminals fitted so that the ends of the coil may be joined.

Winding the Coils

The secondary is wound on first, seventy turns of No. 20 d.c.c. copper wire being put on the former. This is the correct number of turns for 2 L O, and is also suitable for wavelengths fifty metres either side of 2 L O's wavelength, as a slight correction can be made by means of the condenser.

The primary, which is to be wound on next, is spaced well away from the secondary by short lengths of solid ebonite rod about 4 in. long and ¼ in. in diameter. These should be spaced equally round the former in the manner shown in the photograph, and should be held temporarily in place by means of electrician's adhesive tape. The act of winding the primary will tend to displace these spacing rods if they

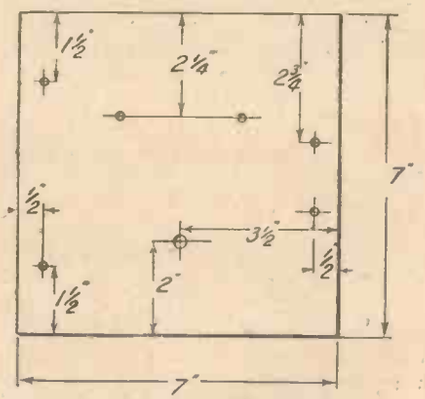


Fig. 1.—Layout of Panel.

are not held tightly, and the coil will be very loosely mounted if this should happen. Twenty turns of No. 16 d.c.c. copper wire constitute the aerial coil, and, when the winding is complete, the ends should be fastened to the connecting terminals.

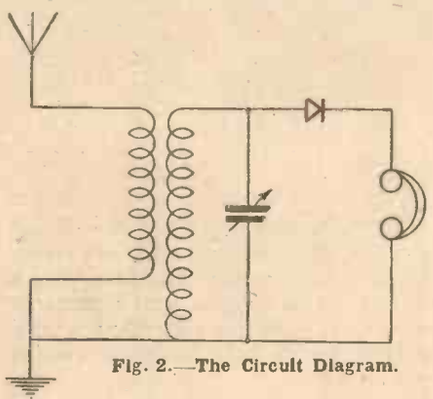


Fig. 2.—The Circuit Diagram.

The coil is now complete and may be mounted as soon as the panel is drilled. A drilling diagram is given in Fig. 1. A very neat appearance may be given to the surface of the panel by matting it with fine emery-paper and rubbing off the greenish deposit with oil. There is no real need to matt the surface, as the polished surface of all guaranteed ebonite is quite "safe" from the point of view of insulation. In the writer's opinion, however, the matt surface gives a better appearance to the complete set than does the highly polished surface; the trouble involved is very slight.

Wiring

When the drilling is completed the various components may be mounted and connected up according to the theoretical circuit diagram Fig. 2. The only matter that calls for any explanation is the mounting of the aerial coil. This is held in position by two ¾-in. countersunk 4 B.A. bolts and four nuts, and, if properly fixed, is supported about $\frac{9}{16}$ in. away from the surface of the panel. A small air-gap here is essential, or the proximity to the ebonite will increase the losses of the coil.

It will be seen that only a .0002-microfarad variable condenser is used in parallel with the secondary coil for tuning (this, of course, is the only tuning control), and it really is essential to use as small a value of condenser here as possible.

The aerial circuit is self-tuned by reason of its close coupling to the secondary, and for this reason it is scarcely correct to call it an "aperiodic" tuner. With a tuner of this type all the advantages of the loose-coupled tuner in the way of selectivity are obtained, together with the simplicity of control of the single-circuit tuner. P.

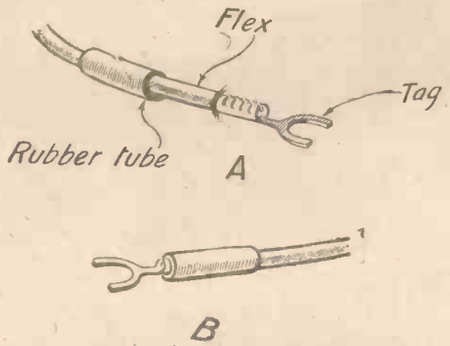
BROADCASTING FROM OLYMPIA

SAVOY HILL will be practically silent on September 4, 6 and 7, for on those days practically the whole of the London and Daventry programmes, including the "Children's Corner" and a revue, are going to be performed in the "glass-case" studio at the National Radio Exhibition at Olympia. After the first three days of the exhibition until its close on September 18 substantial portions of the daily programmes will be performed at Olympia, and the rest at Savoy Hill as usual.

PRACTICAL ODDS & ENDS

Protecting Flex Leads

THE ends of flex leads should always be tagged, otherwise the fine strands are sure to become untwisted and to break away in time. The tags, however, are not



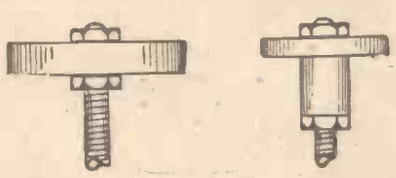
Method of Protecting Leads.

satisfactory by themselves, for if the lead is subjected to much bending, a break soon occurs just at the neck of the tag where the wires are unprotected by the covering. An excellent tip is that shown in the drawing.

Obtain from any chemist a short length of the rubber tubing that is used for sprays. Cut off one inch of this and slip it on to the flex, as shown at A, before attaching the tag. It is quite easy to do this if the outer covering of the flex is first bound at the end with two or three turns of silk or cotton. When the tag has been firmly fixed, work the rubber tubing down until it is in the position shown at B, covering both the end of the flex and the neck of the tag. J. H. R.

Knob Substitutes

A WOODEN disc, such as a "draughtsman," may be drilled through the centre and clamped between two nuts to the end of a spindle when an ordinary



Improvised Knobs.

ebonite knob is not available. Such an arrangement is shown on the left in the sketch. The right-hand figure shows how an ebonite panel bush, as used for insulating holes in baseboards, etc., may be arranged to serve the same purpose when a smaller knob is required. O. J. R.

Aerial Insulation

IT is not generally realised that when a wireless wave strikes an aerial the voltage induced in it is greatest at the *free* end. It is a mistake, therefore, to take elaborate precautions with regard to the insulation of the lead-in and yet to neglect the insulation of the distant end of the aerial.

Actually the induced voltage (caused by the incoming signal) is one and a half times as great at the free end as it is at the receiver, and it is therefore not for theoretical reasons alone that an extra insulator should be connected at the free end of the aerial. A slight increase in signal strength may result, and selectivity will certainly be improved. P.

Testing Accumulator Charge

WHEN in doubt as to the correct procedure to adopt in testing the condition of a L.T. accumulator the following hints will prove useful: Always test the voltage of the battery during working conditions, that is to say, when the filaments of the valves are drawing "juice" from it. In this way any falling off in the nominal voltage value may be easily detected, in which case the battery obviously needs recharging. This test works all right, providing a good voltmeter is used, and more particularly where 6-volt accumulators are used. When using the .06-ampere type of valve the voltmeter test is not always to be recommended, and use should be made of a hydrometer, which, by indicating the value of the specific gravity of the acid, provides an infallible test for the state of charge of accumulators. A point to be noted with this test is the evaporation of water from the acid solution, which causes an alteration in its specific gravity, *not due to the state of charge*. Be careful, therefore, to see that the acid level in the cells of the accumulator is correct. A. S. H.

An Accumulator Hint

IT is sometimes found that the accommodation of an accumulator in a drawing-room brings disastrous results in its train when the acid is inadvertently spilt. The following may help to prevent this in cases where the accumulator is charged from the mains. The accumulator is kept near the charging board, and is connected to a D.P. change-over switch. Two poles of the switch are taken to the L.T. terminals of the set, and the opposite two are connected to the charging board, while the battery is connected across the two centre poles. The accompanying diagram makes this clear. Thus the battery

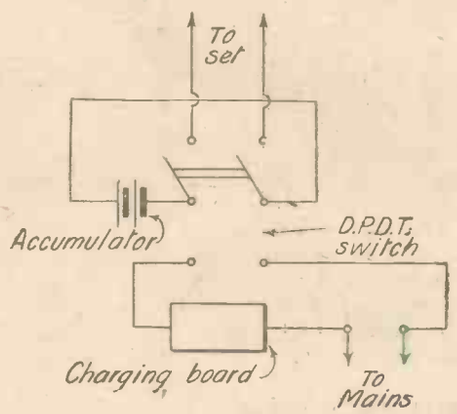
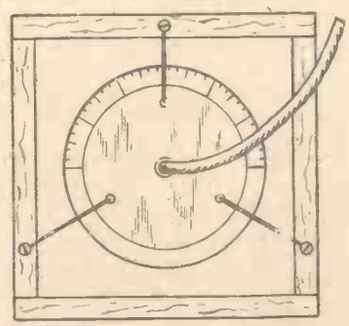


Diagram of Switch Connections.

can be used for supply or charging without being carried from one spot to another. W. M. G.

Novel Lead-in Insulator

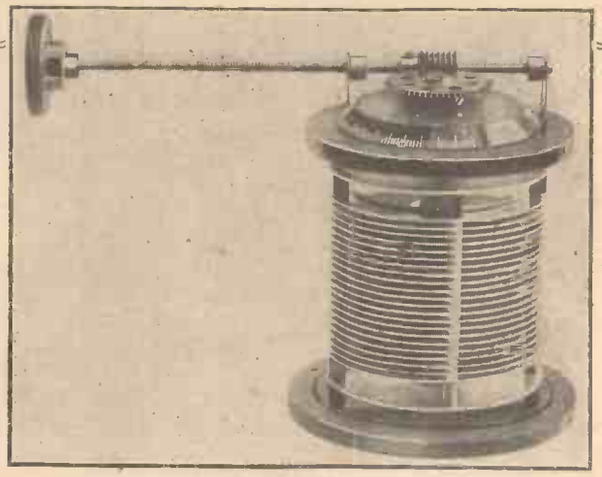
A VERY efficient aerial lead-in insulator for an outdoor workshop can be made from an old ebonite condenser dial, as shown in the sketch. The dial is suspended, by means of three or four wire supports, in a simple wooden frame, and the aerial lead-in is passed through the centre hole, which should be enlarged if necessary. The size of the frame is adapted to suit existing conditions; it may be made about 5 in. square (assuming a 3-in. diameter dial) and screwed over a



Condenser-dial Lead-in.

hole cut specially for the purpose, or it may be made larger and fitted into an existing window frame or other aperture. Allowance may be made for the swaying of the lead, caused by wind, by using torsional springs in place of the wire supports. S. T. R.

IMPROVING YOUR TUNING CONDENSERS



Photograph of Improved Variable Condenser.

IF you have ever gone in for long-distance reception, as most probably you have, you know the difficulty that one experiences in making the exceedingly fine adjustments of capacity that are required for tuning in the weak signals that come from far away. Ordinary tuning of broadcast stations should not, of course, be done by the far too popular method of first of all picking up the carrier wave and then finding the silent point between squeaks. The experience that most of us have when we sit up until the small hours of the morning in an endeavour to tune in W G Y or W B Z is that we can get their carrier waves, but that no adjustment we can make with our condensers is fine enough to hit upon the exact point needed to resolve into speech or music.

Recently I have been trying, with very great success indeed, a simple appliance which renders almost incredibly fine adjustments possible. You might find it hard to believe that at a cost of under two shillings a condenser you can easily convert those on your set so that adjustments of the one-fiftieth part of a degree can be made without the slightest trouble.

You will see from the photograph that it is done by means of gearing; we require, in fact, a gear wheel containing fifty teeth and a worm to mesh with it. But, you may ask, where and how on earth can I obtain components of this kind? The answer is: At any toyshop which stocks Meccano parts!

Fig. 1 gives a plan view of the gearing. It will be seen that the gear wheel takes the place of the condenser's own knob at the top of the spindle. A worm is mounted upon a length of 2 B.A. studding which is supported by bearings, of which more later. Two small collars with set-screws, obtainable also from the toyshop at twopence apiece, act as thrust blocks and prevent the worm from disengaging itself from the gearwheel. At the end of the studding the condenser's own knob is placed, being locked with a nut.

Now it will be found that this arrangement gives a 50 to 1 gear reduction—that is to say, you must turn the knob round twenty-five times to produce a 180-degree movement of the condenser plates. You will realise at once that this gives very fine adjustment indeed.

As the gear ratio is 50 to 1, a movement of the knob of 5 degrees turns the plates through one-tenth of a degree. We can leave the condenser's own dial in place for coarse readings and make a fine-reading dial, attached as previously described to the bearing bracket nearest the knob. With the aid of a protractor this is divided into seventy-two divisions of 5 degrees each.

Now let us see how this works out. Fig. 2 shows an imaginary position of the two dials when a station has been tuned in. On the main dial the reading is between 96 and 98 degrees (I am supposing that this is graduated into divisions of 2 degrees each), and on the fine dial the pointer is just past the 60-degree mark. As the eye can be trusted to guess the fifth part of a division, representing 5 degrees, we take the reading of this scale as 61 degrees. What is the actual reading from the two scales? The easiest way of finding out is to turn the knob until the 96- or 98-degree mark on the main dial is precisely opposite the arrow, and to count the number of whole divisions on the fine dial traversed by the pointer when this is done.

Let us suppose that on turning back to 96 degrees we find that the pointer on the fine dial registers 10; that is to say, we have turned back 51 degrees. Fifty-one degrees on the small dial are equivalent to 1 degree plus the fiftieth part of a degree on the main dial. The actual read-

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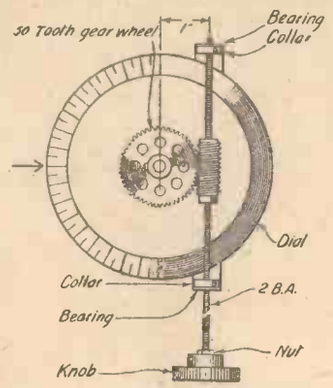


Fig. 1.—Plan of Gearing Device.

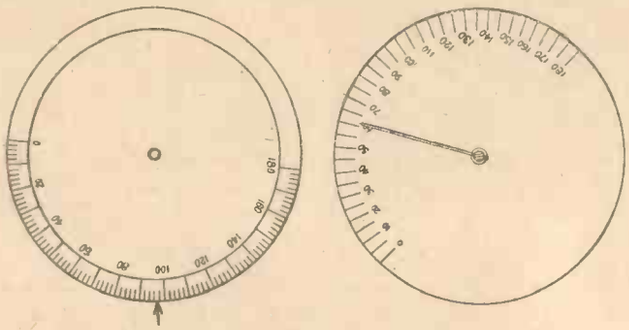


Fig. 2.—Example of Setting of Condenser Dials.

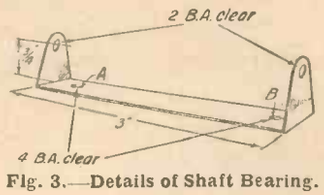


Fig. 3.—Details of Shaft Bearing.

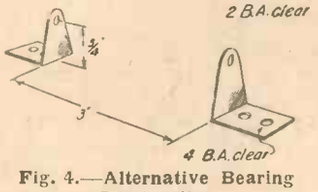


Fig. 4.—Alternative Bearing Construction.

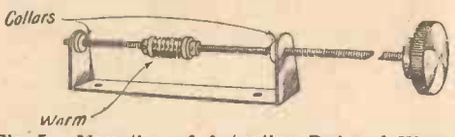


Fig. 5.—Mounting of Actuating Rod and Worm.

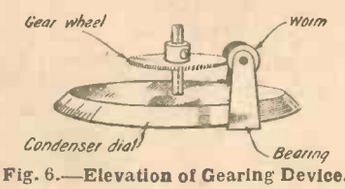


Fig. 6.—Elevation of Gearing Device.

NEW IDEAS IN TELEVISION

By T. THORNE BAKER, F.Inst.P., F.R.P.S.

MOST of the recent experiments in television have been to explore the light reflected from every fractional part of an image—such as the face—every tenth of a second or less, and by means of high-speed signals to transmit them to the receptive apparatus in succession in exactly the same way as the successive small parts of a photograph are telegraphed.

In the case of wire connection between the instruments, ten telegraph wires would, of course, make the problem ten times as easy to solve, and so on. The similar use of ten wavelengths would have the same effect of simplification in a wireless method.

A Novel Suggestion

The difficulty and cost of resorting to either means prevent its adoption, but a suggestion made by Dr. Fournier d'Albe offers some scope for thought. He has discovered that he can make use of intermittent light of different musical frequencies, and can reflect from separate portions of the image narrow pencils of light of the different frequencies. The whole of the intermittent rays are made to affect—simultaneously—one selenium cell, and the currents are impressed upon one carrier wave.

Numerous Signals

Even then, if we remember that the simplest picture would involve transmitting at least two or three thousand signals each tenth of a second, it becomes obvious that with the use of a practical number of musical frequencies, only a portion, that is, a band or strip, of the picture could be dealt with at once, and a cycle of signals would still have to be transmitted.

That such a system of using a number of light-detecting devices instead of one, and dividing the work of transmitting one image by that number, is a possibility is evidenced by a new U.S. patent in which the inventor proposes to employ a bank of photo-electric cells working on different radio wavelengths.

The tremendous speed of the moving parts, which have to work in exquisite synchronism, is the real obstacle at the moment in several partially successful systems of television, and this method of dealing with the image in bands instead of particles, although it may seem a retrograde step, may actually prove to be the solution of the present difficulty.

A MASTER RHEOSTAT

FIXED resistors are becoming increasingly popular for multi-valve sets, because they reduce the number of panel controls, and at the same time make it possible to give each valve its correct voltage. There is one drawback, however, which is very annoying. When the voltage of the accumulator begins to drop there is no means of reducing the resistance in circuit, and signal strength falls off in consequence.

This difficulty can be obviated by including a master rheostat, which may be used to compensate the inevitable voltage drop which occurs when the accumulator has been in use for some time.

D. H.

"IMPROVING YOUR TUNING CONDENSERS".

(*continued from preceding page*)

ing shown in Fig. 2 is therefore 97 and one-fiftieth degrees, or 97.02 degrees. With a little practice it becomes the simplest matter to take readings to the fiftieth part of a degree which can be recorded for future use.

Construction of "Vernier" Device

The actual construction details of the "vernier" arrangement are quite simple. Fig. 3 shows the kind of bearing that I used for the purpose. This is made from a piece of sheet brass ½ in. wide and 4½ in. in length, the ends being bent up at right angles as shown. In its ends are drilled 2 B.A. clearance holes (No. 12 drill) to take the studding which carries the worm. In the horizontal member of the bracket two 4 B.A. clearance holes (No. 27 drill) are made for the screws which fix the bearing direct to the panel. These should be placed quite close to the turned-up ends. When a bearing of this kind is used it passes beneath the main dial of the condenser. If you prefer to employ two separate bearings you can make them, as shown in Fig. 4, from sheet metal.

If you look for a moment at Fig. 1 you will see that the distance between the centre of the condenser spindle and the centre line of the studding carrying the worm must be 1 in. It is most important to get this exact.

To mount the bearing, rule the two straight lines shown in Fig. 1 on your panel. The first must pass exactly through the centre of the hole made for the condenser spindle, and the second is parallel to it and 1 in. away. On the latter punch centres to correspond with the holes in your bearing bracket and make 4 B.A. tapped holes. Should you doubt your powers of measuring quite accurately, the holes for the fixing screws (A and B in Fig. 3) may be turned into slots. This will allow the bracket to be adjusted laterally should any mistake have been made.

Mounting the Gear Wheel

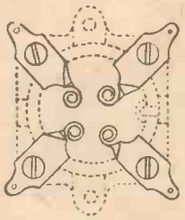
The next problem that arises is how to mount the gearwheel, the worm and the collars on 2 B.A. studding, for it will be found that the existing holes in these parts are too small for the purpose. There are two ways of dealing with them. The first is to enlarge the holes to 2 B.A. clearance. As all the parts are provided with set-screws they can be fixed quite well if this is done. A better method, though, is to turn a 2 B.A. tap through each. As the existing holes are about $\frac{3}{16}$ in. in diameter they are theoretically too large to be tapped 2 B.A.; actually, however, it will be found that quite a good thread can be put on. By threading the worm and gearwheel we make them a very good fit for the studding, and they can be securely fixed in their proper places by means of their set-screws. The collars are best drilled out to 2 B.A. clearance size. Fig. 5 shows how the actuating rod and its worm are mounted in the bearing. In Fig. 6 is seen an end view showing the mounting of the gearwheel on the spindle and the way in which it engages with the worm. If a fine reading scale is fitted it can be made from a small disc of ivorine, marking being done in indian ink. Or a small circular protractor may be used for the purpose. The pointer may consist of a piece of stiff copper wire, which is fixed to the studding by drilling a hole with a very small drill and applying a little solder when the wire is in place.

It will not, as a rule, be necessary to treat all condensers of the set in this way. I found it sufficient to fit the gearing to the closed-circuit condenser. The tuning of the aerial condenser is never very critical if a double-circuit tuner is used, as it should be for long-distance work, and if the anode condenser or condensers are set as correctly as possible by ordinary methods, the most obstinate carrier wave can often be resolved.

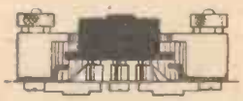
J. H. R.

Although both German and British broadcasting stations receive favourable criticism in the Spanish Press, the radio fans in that country are strongly opposed to any scheme by which the Spanish broadcasting service would be worked upon either German or British lines.

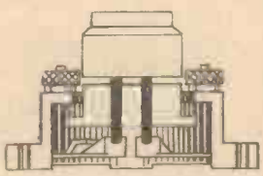
Valve sockets and springs are stamped in one piece. Thus there are no rivetted, soldered or clamped joints to work loose and cause microphonic noises.



The four one-piece springs allow the valve to move in every direction, and absorb both lateral and vertical vibration.

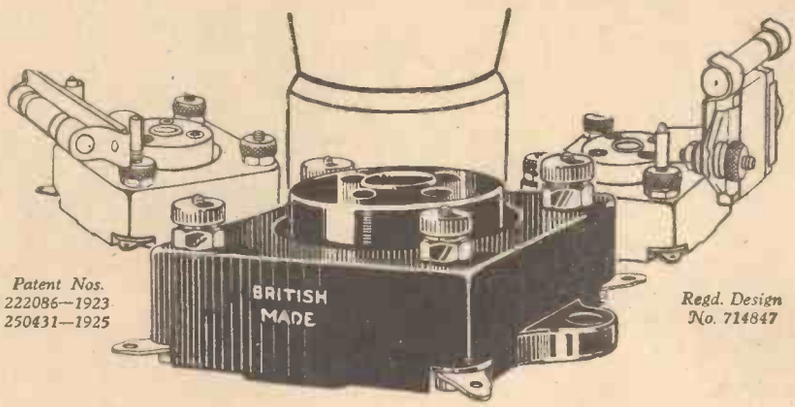


Suitable stops control spring movement, making it easy to insert valves and without risk of damaging either the springs or the valves.



Valve legs, however far pushed home, cannot possibly foul baseboard and thus destroy the springing.

Both terminal and soldering tags are provided for temporary or permanent connections.



Patent Nos. 222086—1923 250431—1925

Regd. Design No. 714847

Certified Sales.

44, Gresham Street,
19-7-1926. E.C.2.

"We have examined the records of the Company and certify that during the ten months from 1st September, 1925, to 30th June, 1926, the Benjamin Electric Limited have manufactured and sold 351,455 Benjamin Clearer Tone Valve Holders."

(*Signed*) G. N. Read, Son, Cooke & Watson,
Chartered Accountants.

The explanation of this amazing popularity as compared with other valve holders lies in the five vital constructional features outlined on the left.

Benjamin Valve Holders are now offered either alone or with the following attachments. Constructors will instantly appreciate what an enormous saving of space and wiring these ingenious attachments mean.

Benjamin Clearer Tone Valve Holder - - -	complete	2/9
Equipped with Dubilier Dumetohm Grid Leak - -	complete	5/3
With same Grid Leak and also Dubilier Grid Condenser (.0003) (series or parallel) - - - - - - - -	complete	7/-

From your Dealer or direct from the Manufacturers:

BENJAMIN

CLEARER TONE, ANTI-MICROPHONIC

VALVE HOLDER

THE BENJAMIN ELECTRIC LIMITED
Brantwood Works, Tottenham, London, N.17

STAND No. 105 AT THE NATIONAL RADIO EXHIBITION

On Your Wavelength!

The Rearrangement

BEFORE many weeks have passed the new wavelength scheme for British and Continental stations will be in operation, let us hope with the much-wished-for result of eliminating heterodynes between broadcasting stations. The scheme is based upon the generally accepted idea that for all practical purposes the side bands accompanying a telephonic transmission may be taken as extending for a maximum of five kilocycles on either side of the frequency of the carrier wave. Hence in the new list wavelengths are so chosen that each is separated by ten kilocycles from its immediate neighbours above and below.

The Reason for the Decimals

It is for this reason that we get those queer-looking decimals. Riga, for example, will transmit on 526.3 metres, and Dublin on 319.1 metres. Experiments have shown that when two stations are transmitting upon wavelengths with a frequency difference of ten kilocycles, heterodynes do not occur, or at any rate if they do so they are inaudible. If, therefore, the new wavelengths are strictly adhered to, it should be possible to tune in any of the hundred and fifty stations, with the exception, of course, of those working upon common wavelengths, without finding anywhere the heterodyne whistles that we know too well at present.

As regards the common wavelengths, these have been allotted generally to stations of small or medium power situated at great distances from one another. Local listeners will therefore experience no interference from other stations so long, anyhow, as they do not use too much high-frequency amplification. All the British relays except Leeds and Bradford have been given the wavelength of 288.5 metres. It remains to be seen whether this part of the experiment will be successful. Personally, I have certain doubts as to what will happen in some parts of the country; at my own station, for example, Stoke, Nottingham and Hull come in at about equal strength.

A Strange Position

The partnership which seems to me likely to cause most difficulty is that of Birmingham and Aberdeen upon 491.8 metres. In many parts of this country both of these stations are strongly received, and their adoption of a common wavelength will mean that it will not be possible to tune in either of them, except perhaps when a frame aerial is used. Does anybody know why Leeds and Bradford, both of which work from the same studio, should have occupied different wavelengths in the past and should be selected for the same treatment in the future? One would think at first sight that if both transmitters worked upon exactly the same wavelength they would be mutually useful, with a consequent all-round increase in range. Possibly, however, there is some technical snag.

Some Results

Not a few people are wondering at the present time whether their existing receiving sets will enable them to deal with the local station if it is to undergo a big wavelength change. With the exception of Birmingham, every home station that is to have a change at all is to drop to a somewhat lower wavelength. Existing receiving sets should be able without alteration to tune in any of the main stations, for the lowest wavelength amongst these is that of Bournemouth (306.1 metres), and most broadcast receivers have a tuning range that covers the band between 300 and 500 metres. All of the relays are to be put below 300 metres, though the shortest of the wavelengths will be only 14.5 metres less than this figure. In some cases it may be necessary to provide new tuning coils, though in single-circuit sets the difficulty can be got over by placing a small fixed condenser in series with the aerial lead-in.

Since the new scheme is based upon frequencies rather than wavelengths, it seems possible that the straight-line frequency variable condenser may in time to come oust the now popular straight-line wavelength component. With the latter there is a steady increase in the wavelength of a tuned circuit as the capacity is increased; with the former there is a steady change in the frequency; but the frequency *decreases* as you mesh a greater and greater portion of the moving plates with the fixed. It all sounds a little complicated, but what it comes to is that under the new arrangement an S.L.F. condenser will space out all settings equally.

A Blessed Relief

Anyone who goes in for long-distance work at all will welcome the new wavelength scheme, for as things are at present the state of the broadcast waveband is so chaotic that there are comparatively few stations between 350 and 500 metres that can be tuned in on a given night without an accompaniment of whistles. It will come as a relief also to many of those who rely upon their local stations only, since heterodynes have interfered seriously with these on numerous occasions in the past. No so long ago 2 L O was suffering in this way, and only the other night I was unable to receive the Birmingham programme owing to a poisonous whistle, for which Frankfort, who was rather off its nominal wavelength, appeared to be responsible.

The whole success of the scheme depends upon the stations keeping exactly to their allotted wavelengths. If this can be done, and it could if crystal control became universal, there will be such peace in the ether as we have not known since the days when Writtle was the only station sending out programmes within the limits of the present broadcast band. We must not, however, imagine that every ill is going to be cured by the new wavelengths. There will still remain with us both spark signals and mush. I have noticed rather less of the former lately, but mush is still appalling between 400 and 500 metres. Mush is due to harmonics from continuous-wave and arc stations, and until some means of suppressing these is found, and its use enforced, I am afraid that we shall have to go on grinning (or cussing) and bearing it.

Those Neighbouring Aerials!

Those who are fortunate enough to possess fairly lofty aerials are inclined to view with contempt their neighbours' erections of less ambitious magnitude, but a friend of mine has had an experience which no longer allows him to discount the presence of a somewhat insignificant conglomeration of wood and wire in close proximity to his own hundred-footer. He was perfectly satisfied with the results obtained until recently, when a hoisting rope parted and the little aerial came to earth in a confused heap. It was then that he experienced an agreeable shock, for his broadcast reception doubled itself in volume and he had a perfect orgy of long-distance reception such as he had not experienced for many years.

For some days he did not give the collapse of the aerial a thought, and was inclined to the opinion that at last he had attained that extremely sensitive receiver for which he had striven for many years. Alas, one evening the little aerial was reinstated and my friend's wonderful reception departed. It was then that he realised that the insignificant aerial which was almost inside his own was causing him considerable loss in signal strength despite its small proportions.

A Curious Accident

I had cause to overhaul one of my receivers a few days back, and in so doing carelessly left a dud valve in the bottom of the cabinet and, being called away, forgot to remove it later. Shortly after, a

On Your Wavelength! (continued)

friend visited me and asked for a demonstration of the set, which of course I eagerly prepared to give him. H.T. and L.T. were duly switched on, and—bang! a brilliant flash in the interior showed that something unusual had happened. A hasty examination showed that the metal ring on the base of the worn-out valve had sandwiched itself between the H.T. positive lead and the L.T. negative leads, with the result that two perfectly sound and honest dull-emitter power valves had permanently lost their usefulness.

One Knob

I read that another genius has devised the perfect one-knob all-station receiver. I wonder how many times this claim has been made since the inception of broadcasting? Yet still we plod along with umpteen gadgets, knobs and dials to twist and twiddle if we dare aspire to the reception of remote broadcasting stations. A year or so ago I explained in these columns that the less gadgets appearing on a set the better its performance generally; but I did not forecast that the ideal set is one in which we have only to set one, or at the most two, dials in order to hear any station under the sun. I believe that the proper use of a multi-valve H.F. set is only possible if the best possible tuning control is available for each stage.

Quality and Quantity

Have you ever attempted to analyse the results given by your favourite loud-speaker? If you have not done so you will find that it is an interesting occupation, especially if you have somebody else's instrument to use as a standard of comparison. You will note from the very first that there is a marked difference in the tone of loud-speakers of different types, and the one which you possess probably differs considerably from any other which you have heard. It may have a very round mellow tone almost amounting to the echo effect experienced when music is played in a large, empty and uncurtained hall, or it may at the other end of the scale give results which are verging on extreme sharpness similar to that obtained when speaking in a room which is heavily carpeted and curtained. The choice of the two tones or the intermediates is largely a matter of personal taste, although the echo tone is generally preferable.

As regards quality, although this is closely associated with tone, yet at the same time it is not quite the same. At one end of the scale the higher frequencies, such as high notes or sounds such as the "s's" of the spoken word, are almost entirely absent, whilst the lower frequencies are predominant. The sounding of the sibilant "s" in the spoken word is a good test for a loud-speaker, and if it does not sound like "f" the loud-speaker is generally a safe speculation as regards quality.

Quantity is difficult to gauge. The effect of a medium-sized loud-speaker in some rooms is equal to that obtained with a large one in another room. The only sure test is to place the instrument out of doors or test them all in the same room and in the same spot under the same conditions. It is possible to overload both the trumpet system and the magnetic system of a small loud-speaker, whilst some types of large loud-speaker will not do justice unless supplied with relatively strong signal impulses. The design of the receiver supplying the loud-speaker with the signals is of course a controlling factor of tone, quality and quantity—but that is a different story.

The New B.B.C.

There are, I notice, signs of a growing uneasiness with regard to the future of broadcasting in this country when it passes out of the hands of the British Broadcasting Co. into those of the Broadcasting Board of Control. Myself, I have always been opposed to any such change unless it involves no alteration in the personnel. If it merely gave the broadcasting authority real Government backing, then the change would be all to the good, for it would strengthen the hands of those responsible for the programmes. If, however, the result is to be that we are to lose the services of some of those who have got to know the wireless public and its needs after more than three years of devoted work, then a change is unlikely to be very beneficial.

I am a little apprehensive over the proposals to appoint a committee of seven on a ten years' contract with nice fat salaries, for the combination of a long contract and a large cheque each quarter-day is apt to produce a complacent and unprogressive frame of mind which ignores suggestions and regards all complaints as purely frivolous.

Bells

An exceedingly popular item in the Sunday evening programmes nowadays is the relaying of some famous peal of bells. The sounds of these now come through with extraordinary purity and with a complete absence of all harshness. Bells are, as a matter of fact, exceedingly difficult customers to deal with wirelessly owing to their queer over-tones. In the early days of broadcasting they often sounded very poor, and not infrequently it seemed as if the whole peal was out of tune. Now that we have improved our microphones and our loud-speakers so enormously, as has been the case during the last two years or so, bells come through to perfection. Nothing could have been finer, for instance, than those of Croyland Abbey some weeks since. Perhaps the reason why the land-line wires were cut last year and the year before was that someone felt that wireless could not do the bells justice; this year, at any rate, he made no further attempt, and if he was listening in he must have been fully satisfied with the way in which their sounds came through. If you want to realise the enormous strides that have been made in transmission of the sound of bells, just try to remember what Big Ben used to sound like when his boom was first broadcast and compare this with the wonderful rich notes that now issue from your loud-speaker.

Valve-holder Troubles

The other day a new set that I was trying out appeared to be almost dead, bringing in the local station at quite poor strength and refusing absolutely to have anything to do with others. The source of the trouble was soon traced to the single high-frequency valve employed in the circuit, though the reason why it was failing to function properly was not at first sight apparent. While tests were still in progress I happened to push the bulb slightly in one direction, when suddenly in came the local station at about ten times its previous strength. There was nothing whatever wrong with the valve pins or with the connections to the legs of the valve holder. The fault was simply that the valve holder was a poor fit.

A Suggestion

I have often wondered why the makers of low-frequency transformers continue to adhere to the markings IP, OP, IS, OS for their components; it would be so much simpler if they were marked Plate, H.T.+ Grid and Grid Battery. You see, various makes of transformer require different primary connections to give the very best results. When you are trying out a new instrument, you can be pretty sure that the grid should be connected to OS and the grid battery to IS, but you cannot be certain that the old rule "Plate to IP, H.T.+ to OP" will hold good. In some cases the plate must go to OP, and the change-over makes an extraordinary difference, both to the degree of amplification available and to the quality. Makers of the various resistance-capacity and choke-capacity units on the market mark the terminals clearly to show the connections to be made to them, and it would be an excellent thing if transformer manufacturers would take a leaf out of their book. One other thing that I would like to see is the provision of a terminal or tag connected to the core or to the iron sheathing so that one could earth these without trouble. Several makers provide these, but there are many transformers without them.

THERMION.

THE A B C OF THE REINARTZ

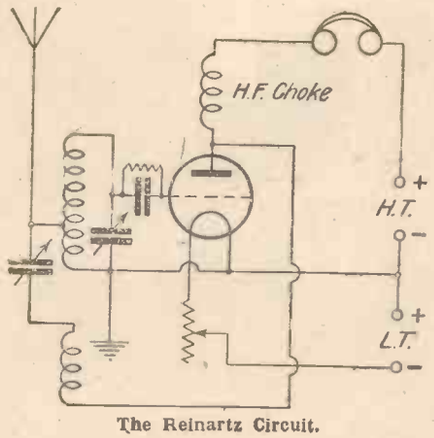
THE reasons for the present great popularity of the Reinartz circuit in its various forms are undoubtedly due to the qualities of good selectivity and ease of adjustment it possesses. Selectivity is becoming increasingly important in every receiving set, saving only those intended solely for the reception of the local station, as the number of transmitting stations is increasing almost daily. Ease of operation is essential in order to tune rapidly to a desired station. As the wavelengths used for broadcasting are now so crowded it may be necessary to tune in two or three stations working on similar wavelengths before the desired one is finally located.

Obtaining Selectivity

Loose-coupling was the old method of making a set selective, and it is still very valuable when interference is more than usually serious. But loose-coupling and ease of adjustment do not go together, for the use of loose-coupling means the addition of another circuit to be tuned.

Again, a variation of the relative positions of two coupled coils means an alteration of their mutual inductance and also of their capacity one to the other. Thus when loose-coupling is employed it will be found necessary to readjust the tuning of each circuit whenever the degree of coupling is altered, as the mere altering of the coupling detunes both of the circuits.

In the Reinartz circuit, of which one form is shown in the diagram, both these disadvantages are almost completely eliminated. The coupling between the aerial and grid circuit is fixed, and, indeed, these two coils are often wound with a continuous length of wire on the same former. With this arrangement there cannot possibly be any variation in the capacity effects between the two circuits. The difficulty of tuning is overcome by using so few turns in the aerial circuit that this is practically aperiodic over the wavelength range on which it is desired to receive. It is then only necessary to tune the grid coil to the desired station, the simplicity of control being equal to that of a direct-coupled circuit.



The Reinartz Circuit.

The selectivity obtained is not quite so great as would be possible were loose-coupling used, but it is quite sufficient for most purposes. The coupling between the two coils, of course, depends upon the number of turns included between the aerial tapping and earth.

Reaction

Another matter which makes the Reinartz circuit easy to adjust is the method of applying reaction. The disadvantage of the old method of using two coils, one in the grid and the other in the plate circuit, coupled variably together, is that the grid-circuit tuning is affected by the degree of coupling owing to the variation of the mutual inductance of the two coils and the capacity between them, as is the case with the two coils of a loose-coupler.

In the circuit shown, the coupling between the reaction coil and the other coil is fixed, and the degree of reaction is controlled by a variable condenser connected in series with the reaction coil. The H.F. energy flowing in the plate circuit of the valve has two paths open to it—through the phones or through the reaction coil and condenser. Some portion will take each path, the proportion in either branch depending upon their relative impedances.

Impedances

The impedance of the path through the phones is made fairly high by including a H.F. choke coil between the phones and the plate of the valve. Sometimes this choke can be omitted, as the windings of some phones themselves provide a high enough impedance. In no case, however, should a condenser be connected across the phone terminals in a Reinartz circuit.

The impedance of the other branch of the plate circuit, through the reaction coil and condenser, is, of course, controlled by altering the capacity of the variable condenser. When this is increased the impedance will be lowered, and consequently a larger proportion of the plate circuit energy will pass through the reaction coil, thus increasing the reaction effect.

It will thus be seen that the adjustment of reaction does not result in either an alteration of the mutual inductance between the reaction coil and the coil to which it is coupled or of the capacity between the two coils.

In actual practice it will be found that the set is very slightly detuned when the reaction coupling is altered, but so little that the effect is almost negligible. In any case it is not sufficient to prevent the Reinartz circuit being very much easier to adjust critically than any other circuit of similar capabilities with regard to reception.

J. W.

HIGH-RESISTANCE PHONES

THERE are some amateurs who regard high ohmic resistance in their phones as a necessary adjunct to sensitiveness. Actually, however, phones can have a high resistance and yet be insensitive owing to the relatively poor conductivity of the wire used. The resistance of a pair of phones is therefore no criterion of their sensitiveness, but it can be safely assumed that the greater the number of turns in the phone windings per ohm resistance, other things being equal, the greater will be the sensitiveness of the phones. This is because the magnetising effect of the current flowing through the windings of the phones is proportional, not only to the value of that current, but also to the number of turns in the coil windings.

Owing to the smallness of the currents flowing through the windings it is necessary, in order to obtain a reasonable response from the diaphragms, to have a large number of turns in the windings. The great length of fine wire necessary for this purpose naturally has a fairly high resistance, even when the most expensive H.C. copper wire is used.

H. A.

A NOVEL POTENTIOMETER

WHEN it is desired to apply a bias to the grid of a valve (of a voltage not greater than that of the L.T. accumulator) the following may prove useful.

Connect two variable grid leaks in series, join the two free ends to the two poles of the filament battery, and connect the grid-return lead to the common wire between the leaks. To apply the desired bias to the grid, either positive or negative, simply reduce the resistance value of the leak connected to the corresponding terminal of the accumulator.

P

"A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

A New Aerial Insulator

IT would surprise many wireless enthusiasts to learn how much surface leakage exists in the majority of aerial insulators. In a town where the atmosphere is full of smoke a thin layer of carbon brought down by rain is soon deposited on the insulator, providing a comparatively low-resistance leakage path.

The Sarbolt insulator, which we have examined and tested, possesses many points of great interest, while it practically eliminates the leakage caused by rain-deposited soot. Indeed, almost perfect insulation is provided against rain and dust, and at the same time it incorporates an ingenious device by which a heavy atmospheric charge or lightning is taken direct to earth through a spark gap and the metal straining halyard.

Owing to its design it will be seen that the insulator naturally tends to remain vertical, as most of its weight falls below

Sarbolt Aerial Insulator.

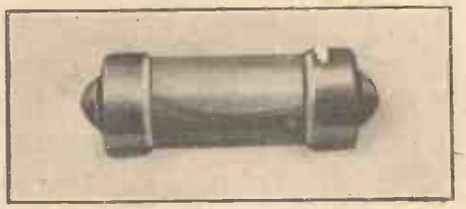
the axis of the aerial. Thus the undersurface of the porcelain "petticoat" remains dry even in the stormiest weather. The position of the swivel hook may be adjusted to suit the slope of the aerial.

The safety spark gap exists between the pointed shank of the aerial terminal mounted on the side of the insulator and the galvanised rust-proof stem to which the halyard is attached. The makers are the Hatton Supply Co., of Hatton, Middlesex.

A Novel Grid Leak

OPERATING on an entirely new principle the Nonoise variable grid leak, manufactured by the American Radio Corporation, Ltd., of 18, Conduit Street, Bond Street, London, W.1, possesses a unique and efficient means of varying the resistance. The component consists of a glass tube having metal caps, each end of which is fitted in between metal clips. Inside the tube is contained a viscous liquid into which a metal wire dips. As the tube is mounted horizontally it may be rotated by the fingers, the rotation causing a variation in the length of the electrical path through the liquid.

The action is good, and once the correct resistance has been found the value remains constant. On a short test the variation in resistance was found to lie between .6 and 8 megohms.



Nonoise Grid Leak.

A Carborundum Crystal Detector

So far as constancy in action and ruggedness in construction are concerned, the carborundum crystal detector is in a class by itself. Carborundum has a comparatively high resistance, and therefore exerts a smaller damping effect on the tuning circuit than crystals having a lower resistance. Greater selectivity is thus obtained.

The Carborundum Co., Ltd., of Trafford Park, Manchester, are the manufacturers of a carborundum detector and a carborundum stabilising detector unit which contains the former, and which is illustrated.

The manufacturers claim that they have experimented for some considerable time on the best variety of carborundum to be used, the correct pressure between crystal and contact, the type of contact, and other small but important details. In the

Carborundum Detector Unit.

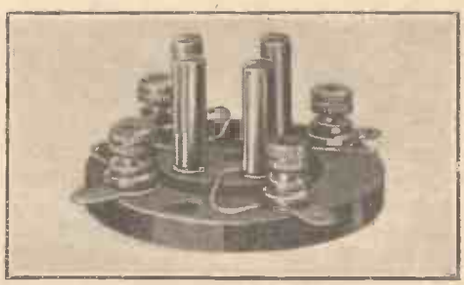
stabilising unit a small potential is applied to the crystal by means of a 1½-volt dry battery and a potentiometer.

On test we found that the stabilising unit had a wonderful sensitivity, in spite of the high-resistance crystal. This sensitivity is no doubt due to the electrical control of the detector obtained by the potentiometer, which varies the resistance of the crystal until a value is struck which suits the circuit impedance and operating conditions. Selectivity is much greater than that given by the ordinary crystal. We can recommend the unit for reflex circuits as well as for the ordinary straight circuit.

If desired, the fixed carborundum detector, which is enclosed in a cylindrical case provided with a terminal at each end, may be obtained separately.

Raymond Valve Holder

THE Raymond anti-microphonic valve holder, as illustrated in the accompanying photograph, and manufactured by K. Raymond, of 27 and 28a, Lisle Street, Leicester Square, London, possesses the simplest construction for this type of component that we have seen. Nevertheless,



Raymond Anti-microphonic Valve Holder.

the anti-microphonic properties are well developed, and are obtained by mounting the four valve-pin sockets on a small ebonite platform which is attached to an outer ebonite ring by four short pieces of stiff springy wire. The ebonite platform is thus given a "floating" suspension, the wire springs serving as connections to the valve sockets, being clamped to the outer ring by four terminals. The component is suitable for baseboard mounting, and soldering tags of ample size are fitted to each terminal.

When a valve is inserted into this holder any external vibration is absorbed by the "floating" platform, and the valve will only vibrate at a very low periodicity.

The ebonite is of good quality, the whole article being very neatly finished.

The valve-holder was used with the detector valve of a test set incorporating two low-frequency power valves and a large horn-type loud-speaker. On inserting a microphonic valve as the detector and bringing the mouth of the loud-speaker close to this, no howl was obtained, although the table on which the set was used was sharply knocked.

SOME CONSTRUCTIONAL POINTERS AS REVEALED BY THE INTERNATIONAL SET COMPETITION

THE most remarkable feature of the entries for the International Set Competition, taken as a whole, was the variety of entries. Almost every class of receiver was represented, from the straight single-valver to elaborate sets employing as many as eight valves. Not only did the sets vary greatly as to the circuits employed, but also with regard to constructional details.

A few of the sets were obviously of the purely experimental type, in which no pretence had been made at neatness. The senders of these must have misunderstood the nature of the competition, in which every feature of the sets was taken into account, including, of course, workmanship. As was only to be expected, there were numerous attempts to disguise wireless receivers as articles of furniture, and some of these resulted in really beautiful pieces of work. Then, again, other constructors had launched out on novel lines, with weird and wonderful effects in some cases.

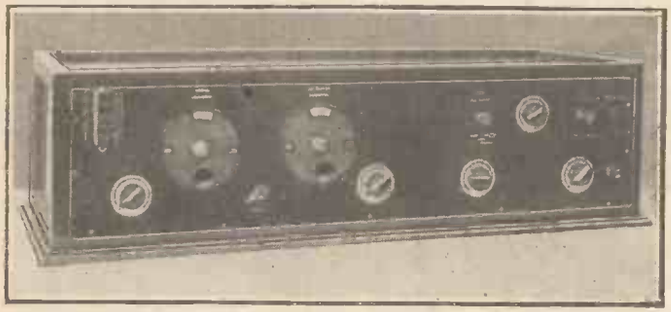


Fig. 5.—An Example of a Glass Cabinet by Mr. Fry, of London, S.W.

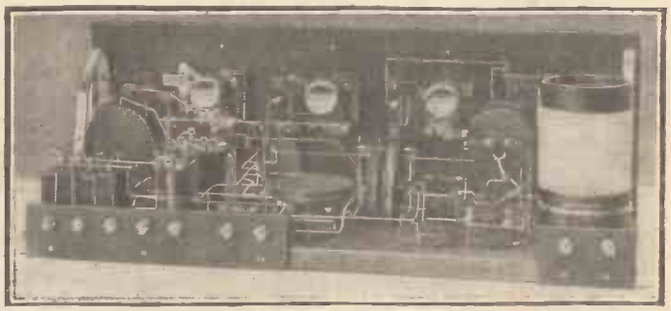


Fig. 2.—A Set with an Unusual Circuit. Mr. Loweth, of Clapham, is the builder.

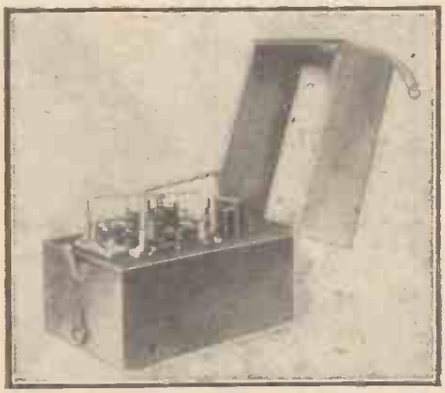


Fig. 3.—An Unusual Method of Wiring carried out by Mr. J. E. Bates, of Coventry.

Screening

The photograph Fig. 1 shows a set in the construction of which a determined attempt has been made to screen the apparatus not only from interference from external sources, but also from interaction between the various H.F. stages. The circuit used is a perfectly straight one, consisting of two H.F. stages, a crystal detector, and two L.F. stages.

The H.F. couplings consist of tuned transformers wound on low-loss formers, the aperiodic aerial coupling being constructed on the same lines. The crystal used is carborundum, the detector being of the cartridge type.

The sides, top and bottom of the "cabinet" are composed of aluminium sheets, the front, back and top measuring 20 in. by 9 in., while the ends are 9 in. square. There are also two partitions, also of aluminium sheet, which divide the interior into three equal portions.

The first compartment contains the aperiodic coupling coil, the condenser tuning the grid circuit of the first valve, and the first valve itself. The second compartment houses the tuned coupling between

(*Concluded at foot of page* 212)

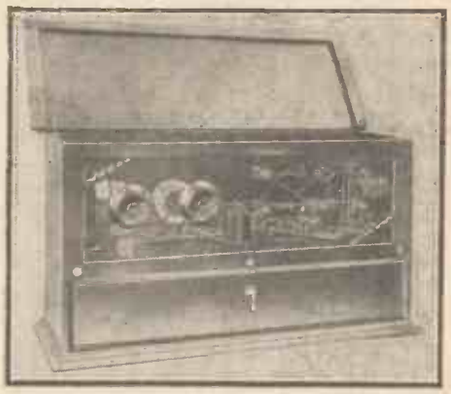


Fig. 4.—A Receiver with a Glass Panel, built by Mr. H. P. Booker, of Northampton.

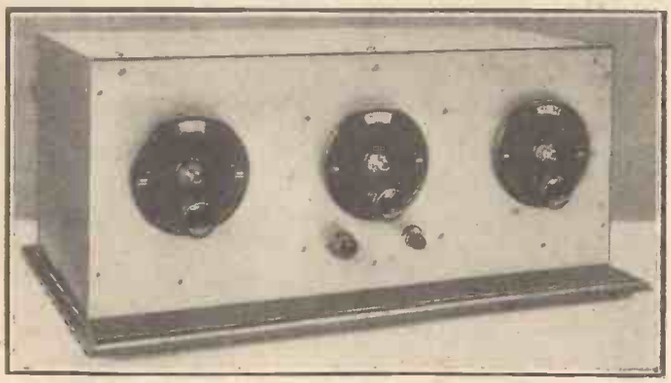


Fig. 1.—A Screened Set constructed by Mr. Emmons, of Southampton.

Fig. 6.—Mr. Llewellyn, of Letchworth, constructed this receiver entirely himself.

IN many receivers of the multi-valve order, such as the super-heterodyne types, the receiving loop is often embodied in the containing case or lid of the actual instrument, whilst in other types, and especially in the case of receivers built by amateurs, frames external to the receiver are used. Sometimes the frame is of a rigid non-collapsible form, and as such possesses the obvious disadvantage that it cannot be made small for packing or transport purposes. In other cases frames are made in a collapsible form, but in the majority of cases these are not very robust when open for use, and when folded for transport the wires are unsupported or wrapped (usually festooned) round the framework of the loop. The erection of such frames is usually a matter requiring much care lest the wires catch and become stretched, so that when the loop is finally erected they are not held taut.

The collapsible frame aerial to be described in this article has been constructed so that it is rigid and strong when open, and when closed is compact and without any straggling wires. It presents a neat and handsome appearance, can be made at a cost of a few shillings, and be opened or closed for packing purposes in a few seconds.

Construction of the Frame

The general construction of the frame can be seen in Fig. 1, which shows it open and ready for use. It consists of a wood base (1), to which are screwed two brass side pieces (2); each side piece is provided with two brass studs (3) which support the lower sides (4) of the frame; each of these sides consists of two long wooden strips held apart by three wooden cross-pieces (5). The upper sides (6), of similar construction to the lower, are hinged at (7), (8) and (9). The frame is held open by means of two brass supporting straps (10), each of which is provided with two metal projecting studs locating in holes in the metal side pieces at (11). Two holes are also provided in the supporting straps for fitting over projecting screwed studs (12). In the lower sides of the frame is a terminal band serving to hold the strap rigidly to the sides.

The loop consists of 16 turns of insulated flexible wire wound round the four sides of the frame. The wires are held taut and are equally spaced by clamping between the cross-pieces (5), each of which is formed in two halves, which are screwed together after the wires are wound. At each corner sufficient wire is left to allow the frame to be closed when required. The ends of the wire and also a centre-tap are connected to terminals mounted on insulating pillars screwed in the base. The woodwork of the frames is stained black, the wires are covered with white silk or cotton insulation, and the metal portions (2), (3) and (10) are nickelled, the whole presenting a pleasing appearance.

To Close the Frame

To close the frame for packing, the supporting straps (10) are removed from one of the lower sides and the brass side pieces (2). In practice this is best done by placing one's head under the apex of the loop

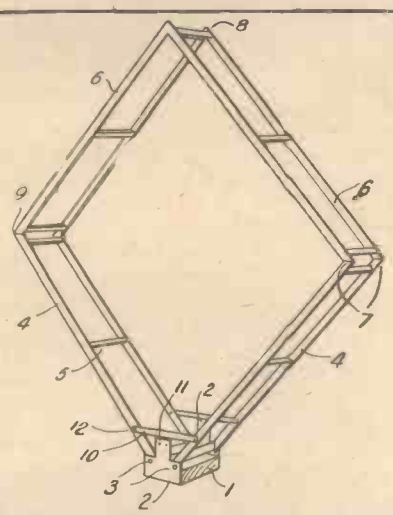


Fig. 1.—Drawing showing General Construction.

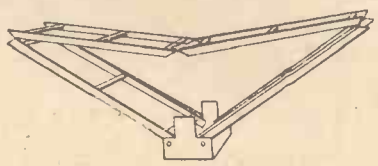


Fig. 2.—How the Frame Folds Up.

Fig. 3.—The Frame Closed.

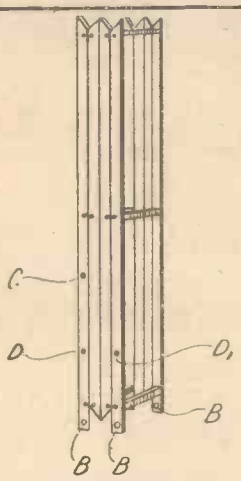


Fig. 4.—Details of Hingeing.

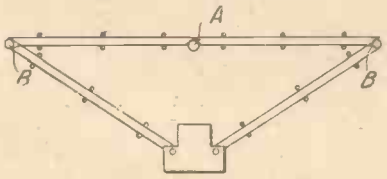


Fig. 6.—How the Frame is Wound.

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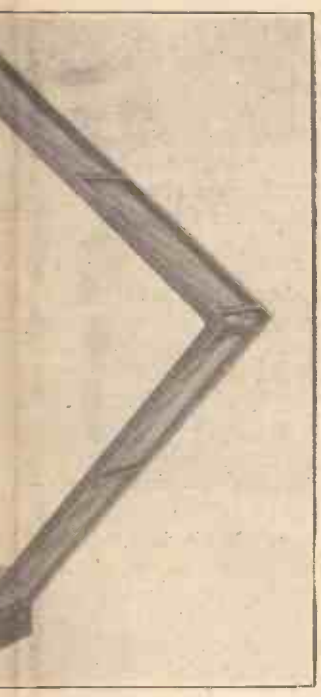
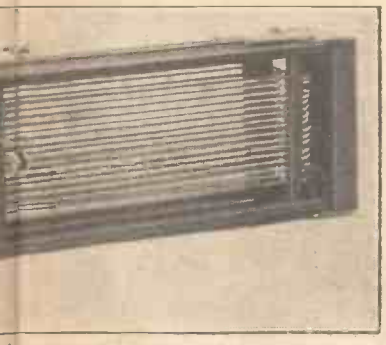


l Ready for Use.

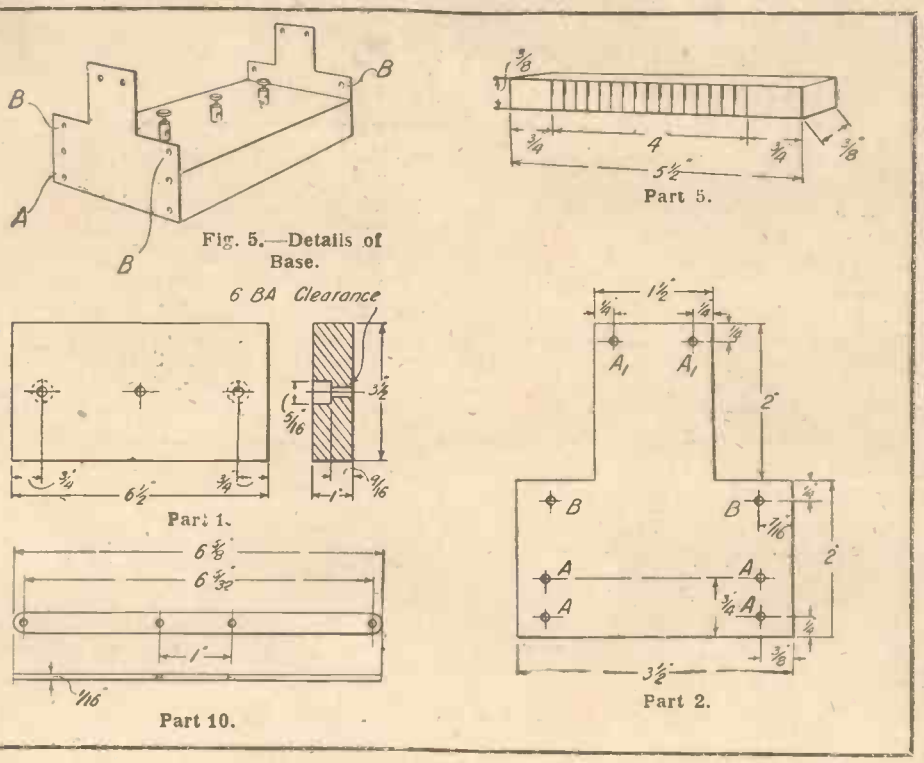


l Folded.

and supporting it so while removing the side straps. The side straps are moved by pressing the centre portion towards the loop and one end away from it. On removing the side straps (which support the frame), the lower sides of the frame move apart and the upper sides hinge downwards as shown in Fig. 2. The two upper sides are shorter than the lower ones, and consequently by pressing the outer sides together the frame can be collapsed into a convenient and portable form, as shown in Fig. 3. The supporting straps (10) are now screwed between points as shown in Fig. 3, and serve to hold the frame rigid for transport.

Materials Required

The following parts are required to make up the finished frame :—



Piece No. 1, wood to the dimensions shown; piece No. 2, brass $\frac{1}{16}$ in. thick, two pieces; piece No. 3, brass, four pieces; piece No. 4, wood, four pieces; piece No. 5, wood, twelve pieces; piece No. 5a, wood, twelve pieces; piece No. 6, wood, four pieces; piece No. 10, brass $\frac{1}{16}$ in. thick, two pieces; piece No. 11, brass terminal on ebonite pillar, three pieces. The above pieces are made as shown in the dimensioned drawings (see also next page).

Pieces No. 4 and No. 6 are dimensioned as shown. The holes marked A are drilled with a No. 39 twist-drill and those marked B (Figs. 4 and 6) are $\frac{1}{4}$ in. in diameter.

Piece No. 5 has sixteen equidistant slots as shown. The slots are about $\frac{1}{32}$ in. wide and deep, and keep the wires equally spaced when winding the loop. These can easily be made by using the corner of a triangular file. In piece No. 5a the three holes are made with a No. 39 twist-drill.

The two pieces No. 4 are connected by screwing three pieces No. 5 between them. These cross-pieces should be screwed through the holes along the shorter edges of pieces No. 4 and having the slots facing the longer edges. In the same way three similar frameworks are constructed with the remaining pieces of No. 4 and No. 6, in each case making sure that the cross-pieces No. 5 are screwed in the shorter edges of the pieces No. 4 and No. 6. No. 2 wood screws $\frac{5}{8}$ in. long are used for screwing the cross-pieces.

Next the pieces made are screwed together by strap hinges as shown in Fig. 4. The strap hinges should be 1 in. long (each strap) and $\frac{5}{16}$ in. wide. The screws to use for this are No. 2 wood brass, countersunk, $\frac{1}{2}$ in. long.

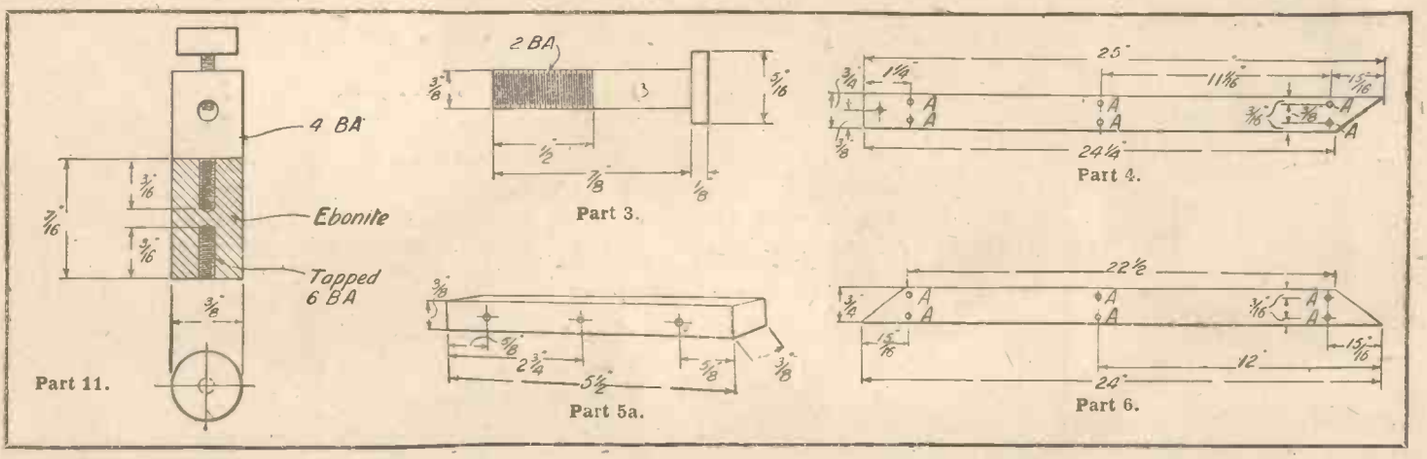
The Base

The wooden base is shown dimensioned in piece 1. The three holes shown are constructed as shown in sectional view. The 6 B.A. clearance hole is made with a No. 31 twist-drill. The metal side pieces shown in piece No. 2 are made of $\frac{1}{16}$-in. brass. The holes marked A and A1 are 6 B.A. clearance, and should be drilled with a No. 31 drill, while those marked B are drilled with a $\frac{1}{4}$-in. drill. These two brass side pieces should be marked off carefully, drilled, cleaned and sandpapered. After thus removing all scratches and burrs, they should be sent to an electroplater for nickelling.

The two pieces No. 2 are screwed on to

the short edges of piece No. 1. This is done by screwing through holes marked A in piece No. 2. Three terminals mounted on ebonite pillars as shown in piece No. 11 should be made. These are then fixed to piece No. 1 by screwing through the wood base into the bottom screwed portion of the ebonite pillar. A 6 B.A. cheese-headed ¾-in. brass screw is used for this. When hinges as shown. Similarly place two rods ¼ in. in diameter at each outside hinge. These rods are used for ensuring that sufficient wire is allowed at the hinged ends to permit opening and closing of the frame. The loop is now wound by fixing one end of the wire to an outer terminal (care should be taken that this end is fixed firmly), and winding the wire against

For winding the loop any flexible wire is suitable; a pleasing effect can be obtained with a flexible silk-covered twin cord about $\frac{3}{32}$ in. in diameter. To complete the frame, 4 B.A. screws are screwed into the long sides as shown in Fig. 4 at C and D and D1. The positions of holes D and D1 are best obtained by opening the frame as in Fig. 1, inserting the cross-



mounted the general appearance of the base piece is shown in Fig. 5.

The pieces as shown in Fig. 4 are now mounted on the base. This is done by inserting four pieces No. 3 into the holes marked B in Fig. 4 and Fig. 5. The screws (piece No. 3) are held in position by a nut and lock-nut size 2 B.A. The frame is now ready for winding.

Winding the Frame

To wind the frame, place it open on a bench as shown in Fig. 6 so that the two short sides are in a straight line. Keep the frame in position by screws or nails fixed into the bench. At the centre place vertically a wooden rod about ½ in. in diameter so that it rests against the two the slots, outside the outer rods and inside the centre rod; about 2 in. of spare wire should be left at the terminal end. The 16 turns are wound and the end made fast to the remaining outer terminal.

Pieces No. 5a are now screwed into the cross-pieces No. 5 to grip the wires in position. No. 2 countersunk wood screws ⅝ in. long are used for this. Screws are then fixed through the long side pieces into the pieces No. 5a. The screws holding the frame to the bench are now removed, also the wooden rods A and B in Fig. 6. The ends of the loop are connected permanently to the outside terminals in the base, and a wire is soldered to the centre turn and connected to the middle base terminal.

piece studs in holes 11 (Fig. 1), and then marking off the position of the outer terminals (12 in Fig. 1). The position of C in Fig. 4 is easily located by closing the frame and stretching the brass side strap from D1 to the opposite side, and marking off the position of C through the terminal hole of the side strap. The brass straps are now fixed as indicated in the figures.

Wavelength Range

A frame constructed as described has an inductance of approximately 350 microhenries, and when used in conjunction with a .0003 variable condenser forms a tuning unit for the broadcast wavelengths. The provision of a centre-tap permits the use of Hartley circuits.

S. B.

"Some Constructional Pointers as Revealed by the International Set Competition" (*continued from page 209*)

the first two valves and also the second valve of the receiver. In the third division is placed the coupling between the second H.F. valve and the detector, the crystal detector, and the whole of the L.F. amplifying apparatus.

An Unusual Circuit

Super-heterodyne receivers are becoming increasingly popular in spite of the disadvantage of the large number of valves required. The receiver shown in the photograph Fig. 2 is an attempt to overcome this disadvantage, and, although the super-het principle is incorporated, only four valves are employed. The first valve is a combined oscillator and first detector, the second valve is an intermediate-frequency amplifier, the third valve is a combined intermediate-frequency and low-frequency amplifier, and the last valve is a plain L.F. amplifier. A crystal is used as the second detector, and the most striking feature of the circuit is the reflexing of the third valve. It is owing to this and the use of a crystal as second rectifier that it is possible to use so few valves.

The set is designed for use in conjunction with an outside aerial, aperiodic coupling being employed between this and the first grid circuit. Of the four variable condensers, one tunes the first grid circuit, another the oscillator coupling, a third one of the intermediate stages, while the last provides reaction at the intermediate frequency.

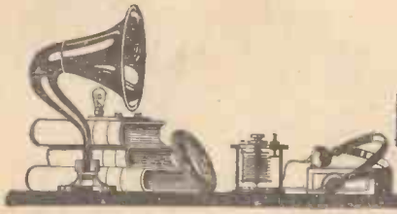
Novel Method of Wiring

The connections between the various components of the receiver shown in the photograph Fig. 3 should certainly possess the merit of low resistance. *They have all been cast in electron metal.* It is, however, a little difficult to see the object of these massive leads. As the circuit is a perfectly straight detector and one L.F. arrangement there are no H.F. losses to be considered, and even if a H.F. stage had been employed there would probably have been quite as high losses due to capacity effects.

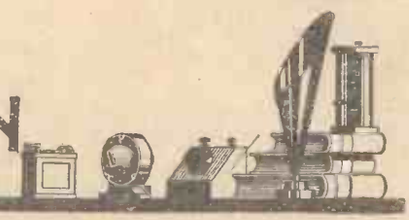
Quite a number of the sets sent in made use of either glass cabinets or glass panels. Photographs of two of such sets are given, the one with a glass panel being a three-valve Reinartz, and the other (with glass cabinet) an eight-valve super-het. Both these receivers are very slightly modified versions of sets which have been described in Amateur Wireless (see Figs. 4 and 5).

A Real Home-made Set

Although no definite stipulations were made in the rules of the competition as to exactly how much of the sets must have been made by the constructors, the builder of the receiver shown in the last photograph (Fig. 6) has made practically the whole of the set himself. The cabinet was made and polished by him (and a very nice piece of work it is, too). He also made the variable condensers, plug-in coils, coil-holder, and most of the other components. As no special allowance was made for this in the judging, it says much for his constructional skill that this is one of the sets to be sent to America.



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 224).

Potential on Carborundum.

Q.—*When a carborundum crystal is used with a biasing potential applied by a potentiometer, should the crystal or the contact point be the more negative?—P. R. T. (Essex).*

A.—Different specimens of carborundum vary in this respect. Some rectify best with the crystal negative and some with it positive. It is a matter of experimenting with each different crystal in order to find out whether it requires a positive or a negative potential.—G. N.

Advantages of Choke Coupling.

Q.—*Will choke coupling give purer results than transformer coupling?—N. S. (Belfast).*

A.—If the choke has a fairly high impedance it will give better results than would a poor transformer which has a very low impedance primary. A first-class transformer, however, is capable of giving quite as good results as choke coupling and considerably greater volume. The only advantage of choke coupling is its cheapness. It is easy to obtain a choke coil of high inductance, but transformers with high impedance primaries are expensive. The reason for this is that the choke contains but a single winding, while in a transformer two windings are required, of which the primary is the smaller.—J. F. J.

Use of Loose Coupling.

Q.—*Will it increase signal strength to substitute loose coupling for the direct coupling at present used in my three-valve set?—L. B. (E.5).*

A.—It might be possible to increase the strength of reception in this way if the alteration results in a reduction of damping, but this is not to be relied upon. The object of using loose coupling is not to improve signal strength, but to give increased selectivity. It may even be necessary, upon occasion, to loosen the coupling so much, in order to get rid of an interfering station completely, that the desired signals are very considerably reduced in strength. However, this is better than having the reception entirely spoilt by interference.—B.

"Banish Your Battery Troubles"

Q.—*With reference to the article with the above title which appeared in* Amateur Wireless *No. 207, I should like to know: (1) What length of lead pencil is required, also thickness of same? (2) What voltage is registered at the extreme end (near L.T. plus and L.T. minus)? (3) What voltages are obtained at the various tappings, when the D.C. voltage is 230 volts?—A. T. (Accrington).*

A.—It is important to note that the quality of the lead pencil is of as much importance as the dimensions. Where the electric-lighting supply is of a fairly high voltage—such as 230 volts—the lead pencils used should have a hard lead, such as is found in pencils marked H or HH. The resistance of these is approximately 150 to 300 ohms, so that with the two in series as shown in the original article, the total resistance would be about 400 ohms. On 230-volt mains a current of a little more than half an ampere would be passed on short circuit. This figure will be still further reduced when the pencil resistances are connected up to the valve filaments.

A little experimenting with various pencils will probably be required before the correct resistance is found. From what has been said it is obvious that the exact voltage obtained at any particular point on the pencil leads is incalculable.

OUR WEEKLY NOTE

USE OF DOUBLE CONDENSERS

When two stages of tuned H.F. amplification are used in a set, two variable condensers mounted on the same shaft are sometimes used to enable both the couplings to be tuned by a single movement.

When this is done, it is, of course, essential that the two condensers and the two coils or H.F. transformers should be matched exactly. But it is not sufficient to stop there. All parts of the two H.F. circuits must also be perfectly matched, and it is the failure to realise this which leads to so many constructors getting disappointing results when using a double condenser.

Not only must the lay-out of the components be symmetrical, but the various leads in both the H.F. circuits must correspond both as to position and length. It is, of course, fatal to introduce a switch to cut out one of the H.F. stages only, and, in fact, the only safe thing to do in such cases is to omit switches altogether.

THE BUREAU.

With a 60-watt lamp in series it would be impossible to pass more than .25 ampere even with none of the pencil resistance in circuit. With the full resistance in circuit the current will be still further reduced.—A. L. P.

Toroidal Coils.

Q.—*What is a toroidal coil, and for what purpose is it particularly suited?—K. S. (Blackpool).*

A.—This is a type of single-layer cylindrical coil bent round into the form of a circle so that the two ends of the coil meet, the turns thus forming a circular tube of wire. The advantage of this construction is that the lines of force set up when a current is flowing through the coil are confined within the circular "tube," and there is thus no external field. Thus two toroidal coils can be mounted close together without any causing interaction between them. This type of coil is therefore very suitable for use in H.F. stages.—B.

Interference by Crystal Set.

Q.—*Is it possible for a single crystal set to cause interference to other listeners?—T. F. D. (Kent).*

A.—Under certain conditions it is possible to do so, but not to anything like the same extent that interference can be caused by an oscillating valve receiver. When signals are received by the aerial only part of the energy is passed on to the set, some being dissipated in the resistance of the aerial circuit and some being re-radiated in the form of weak electromagnetic waves. How much energy is dissipated and how much radiated is determined by the characteristics of the aerial. For instance, if the damping of the aerial is altered so also will be the proportion of the energy radiated. The damping of the aerial is affected by the resistance of the crystal contact, so adjustments of the latter may cause scratching noises in near-by receivers.—J. W.

Browning-Drake Coils.

Q.—*I require some information with regard to the Browning-Drake 3-valve circuit diagram in the article entitled "Four Novel Circuits," by A. J. C. in* Amateur Wireless, *No. 172, and also particularly A. J. C.'s answers to A. M. (Folkestone) in the No. 181 issue regarding the sizes of formers used for coils, etc. In the dimensions of formers given will you please repeat sizes and state definitely which is diameter and which is length of same, as I wish to construct coils for the circuit and want to be sure of constructing them correctly.—S. M. (Middlesex).*

A.—Since the details referred to were published further experiments have resulted in the following information being obtained for best working:

Aerial Coil.—3 in. in diameter by 3½ in. long, wound with 50 turns of No. 20 d.c.c. wire, with centre tap.

H.F. Transformer and Reaction.—Outer coil 3 in. in diameter for secondary 5½ in. long, wound with 78 turns of No. 20 d.c.c. wire.

Inner Coil for Reaction.—2½ in. in diameter wound with 20 turns of No. 28 d.c.c. wire.

The primary coil of the transformer is wound in a slot on a wooden disc which fits tightly into the secondary former at the opposite end to that where the reaction coil is fitted. The disc should be ½ in. thick with a groove cut into it to take the winding, or else a tubular former of suitable size may be used. In either case a winding of 26 turns of No. 28 d.c.c. wire will be correct.—A. J. C.

THE Postmaster-General has informed Lt.-Commander Kenworthy that he is not prepared to authorise the immediate release of a sum of £6,000 out of the unexpended revenue retained by the Post Office so that the B.B.C. may be enabled to experiment in radio physical culture and morning programmes generally until the end of the year.

On September 10, from 8 p.m. until midnight, with the exception of the news bulletin, the entire 2 L O programme will be relayed from Margate. It will include a performance from the Westbrook Pavilion, a military band from the Queen's Lawns, and a dance programme from the ballroom of the Queen's Highcliffe Hotel.

From now onwards the "Romaine Four" will regularly appear at the Savoy, when they will broadcast dance music in turn with the Savoy Orpheans and Tango Bands.

The Sea Affair and Harry Binns is the title of a series of six readings from the pen of Major Corbett-Smith, which are to be broadcast on successive evenings from the 2 L O studio, beginning August 23.

A relay of an organ recital from the Savoy Chapel will be given on August 22.

A burlesque entitled *Rupert of Hounslow* is to be put on the ether on August 25.

It is possible in the Londonderry district, with a detector and one low-frequency stage, to pick up practically all the B.B.C. and many European broadcasts at good telephone strength. Daventry, however, is regarded as disappointing by many Ulster listeners.

Saturday, August 21, is to be an "All Scotch" day at the Glasgow station. *A Bunch of Heather* in the afternoon will be followed by an evening programme consisting of a repeat camp-fire entertainment from the shores of Loch Lomond.

The cost of a four-valve wireless set, with 18 pairs of headphones, which has been installed in Greenock Eye Infirmary, has been defrayed by Mr. John J. Lang, a local shipowner.

Beginning in September, the Glasgow Station Orchestra, assisted by renowned artistes, is to give a special series of weekly concerts. One of these each month will be given in public, the largest hall in the city having been booked for the performances. A booklet containing descriptive and historical notes of the concerts is being prepared by the Station Director, and this will be available to all listeners.

Provisional dates have been fixed for seaside broadcasts as follows: Blackpool, September 2; Margate, September 10; Eastbourne, September 24.

The Archbishop of York and the Bishop of Liverpool will broadcast from Southport early in October in connection with the Church Congress.

It is hoped that the Sandwich Pageant will be broadcast from Sandwich on September 8.

According to the Madrid papers a powerful broadcasting station founded by the Unión Radio Española will shortly come into operation at Seville.

Successful results have been obtained at Lulworth, where intercommunication between army tanks has been accomplished by means of radio telephony.

The new mystery play, *Ghostly Fingers*, by Miss Hilda Chamberlain, will be broadcast in two parts. The first two parts will be heard on August 23, and the third part on the 27th.

At the forthcoming German Radio Exhibition it is being arranged that every firm taking part will be able to demonstrate its apparatus in practical use by means of indoor aerials and sound-proof rooms.

The B.B.C. and the Ministry of Agriculture and Fisheries do not attach great weight to the suggestion that Scottish fishermen are antagonistic to the broadcasting of official news for the fishing grounds. They state that they have had many letters showing the undoubted value of such broadcasts to Scottish fishermen during the herring season.

Part of the Metropolitan Police Band Championship Festival at the Crystal Palace will be broadcast on Saturday, August 28.

A novelty for Manchester listeners-in will be the broadcasting of a wireless version of the film *The Greater Glory* towards the end of August.

The Indian Broadcasting Company, Limited, intends to establish powerful transmission stations in Bengal and Bombay, and, if these are successful, in other suitable centres. Under the agreement with the Secretary of State the company will receive for the first five years 80 per cent. of the value of the broadcasting licences issued and 10 per cent. of the value of all the wireless receiving apparatus and accessories imported.

Under the call sign P C J J the Philips Radio Works at Eindhoven (Holland) are experimenting almost nightly on 90 metres with a high-power low-wave transmitter. In most instances gramophone records are broadcast.

The production of radio sets, parts, and batteries in Canada during 1925 reached a total value of $5,548,659. Six firms were engaged solely in the manufacture of sets and parts, while nine other firms combined this activity with the manufacture of general electrical apparatus.

The tug *Alsace,* which accompanied Miss Ederle, the American Channel-swimmer, was equipped by the Marconi International Marine Communication Co., Ltd., with a Marconi ¼-kilowatt quenched-spark set, by means of which newspaper reports of her progress were dispatched at regular intervals and transmitted by the direct Marconi service to America.

Miss Mavis Bennett, the well-known B.B.C. soprano, is to be married to Mr. Stanford Robinson, director of the B.B.C. Wireless Chorus, in London, on September 4.

During the coming autumn work is to be started on the construction of the first Roumanian broadcasting station, to be installed at Bucharest, and simultaneously a small relay transmitter is to be erected at Cluj (Klausenburg). The cost of a listener's licence for a three- or four-valve apparatus will be about 250 lei, or roughly 5s. per annum.

The Berlin Magdeburgerplatz transmitter on 571 metres will be out of action for some weeks owing to the collapse of one of its aerial masts. The Berlin transmissions are now being made on 504 metres and relayed by Königswusterhausen on 1,300 metres.

During the coming winter, transmissions of symphony concerts from some provincial stations will be increased in number. Liverpool has arranged several events of the kind, and London's contribution will include concerts from the Albert Hall.

The first two licences have been granted by the Post Office to the company which has taken over the Baird Televisor, the invention with which television was recently demonstrated. Regular transmissions are taking place on a wavelength of 200 metres between the company's office in St. Martin's Lane, which has been allocated the call sign 2 T V, and Green Gables, the company's experimental station, known as 2 T W.

W G Y, the Schenectady station of the General Electric Company, now observes Mondays as a silent night, except when unforeseen programmes are possible, such as a speech by an important Government official.

(*More Radiograms on page* 224)

Miss Beatrice Harrison.

NEXT WEEK AT 2LO

By "THE LISTENER"

Mr. J. H. Squire.

NEXT week two heavy and unsuitable serials will take up much valuable time, namely, the works of Brahms for the pianoforte recitals interpreted by Charles Kelly, and a semi-martial work entitled *The Sea Affair and Harry Binns,* written by Major Corbett Smith. This latter will be given each night.

A strong classical atmosphere commences the week on Sunday, when the afternoon programme will include famous artistes and probably much music that is heard only on the classical concert-hall programmes. The artistes are: Beatrice Harrison, the well-known 'cellist; Wassili Sapellnikoff, the Russian pianist; Henri Leoni; and the Australian singer, Harold Williams. Later an appearance is promised of the American actress, Jane Cowl, at present appearing in London in the play *Easy Virtue.*

Although the evening programme is described as "light," it again includes groups of Schumann's songs, which will be rendered by the well-known singer, George Parker. For the rest the Wireless Symphony Orchestra will be conducted by John Ansell.

On Monday evening, in addition to the Brahms recital of Charles Kelly, we are also to have groups of duets for two pianos by Muriel Warne and Dorothy Folkard, followed by an hour of the songs of Roger Quilter. Mr. Mark Raphael, heard last month in songs by this composer, will again render the Shakespearean songs, with orchestra, and the composer himself will conduct. Some of the items include the incidental music taken from *Where the Rainbow Ends,* the ballet music to *The Rake,* and scenes in the Cochran revues of last year, *On With the Dance* and *Still Dancing.* The 10 o'clock feature will be the performance of the first two parts of another new mystery play, entitled *Ghostly Fingers,* and written by Hilda Chamberlain.

The Yorkshire comedian, Dick Henderson, who may be remembered by his inclusion in the Alhambra command performance in aid of the Variety Artists' Benevolent Fund, makes his first appearance before the microphone on Tuesday, and there follows a short broadcast from Verrey's Restaurant. From 10 o'clock comes more old folk songs and a harpsichord recital by Bernard Ord. Gwen Ffrangçon Davies, the actress singer, will be the vocalist.

On Wednesday a variety programme will include Dorothy Brook, one of the artistes in the recent new B.B.C. revue, *Tune In,* two new-comers, Brooks and Hepworth, and a popular programme by the Wireless Orchestra. A short recital follows at 9 o'clock by Leonard Hirsch, one of the earliest of the Manchester artistes. From 10.15 will be performed a burlesque entitled *Rupert of Hounslow,* written by Messrs. John and H. A. Melluish, authors also of the earlier operetta, *Hearts Adrift.*

The Band of H.M. Royal Air Force will be heard on Thursday. At 10 o'clock the American Emory Glee Club will broadcast.

The J. H. Squire Celeste Octet returns to us on Friday, followed by poetry reading, and at 10 o'clock a programme of chamber music is to be given by the Beckwith String Quartet. This quartet is led by Arthur Beckwith, the famous violin leader of Queen's Hall, the London String and the Philharmonic String Quartets. His colleagues are Pierre E. Tas, Arthur Blakemore and Anthoni Pini. Their scheme includes Grieg's Quartet in G. Groups of modern songs will be given by John Armstrong, in addition to other features.

On Saturday an attempt will be made to provide a popular programme by the Wireless Orchestra and Chorus.

INTERESTING AMERICAN STATISTICS

THE following statistics of American receivers and apparatus were given at the Kansas and Pennsylvania Conventions by Mr. Ray H. Manson, chief engineer, Stromberg-Carlson Telegraph Co., and are interesting as indicating the trend of the wireless movement in the States.

Home-made sets	55 per cent.
Manufactured sets ...	45 per cent.

Types of Home-made Sets.

Super-het.	16.23 per cent.
Neutrodyne	13.84 per cent.
Radio-frequency ...	5.01 per cent.
Reflex	15.38 per cent.
Regenerative	47.54 per cent.

Aerials.

Outside	76 per cent.
Frame	24 per cent.

Batteries.

L.T. wet H.T. dry ...	54 per cent.
L.T. wet H.T. wet ...	40 per cent.
L.T. dry H.T. dry ...	5.5 per cent.

Number of Valves per Set.

One valve	4.0 per cent.
Two valves	7.0 per cent.
Three valves	24.0 per cent.
Four valves	14.0 per cent.
Five valves	31.0 per cent.
Six valves	8.0 per cent.
Seven valves	3.0 per cent.
Eight valves	7.0 per cent.
Nine valves	1.5 per cent.
Ten valves	.5 per cent.

Types of Aerial on Super-het.

Outside	43.74 per cent.
Frame	36.72 per cent.
Both	19.54 per cent.

Phones or Loud-speaker in Use.

Phones	53.4 per cent.
Loud-speaker	17.4 per cent.
Both	29.0 per cent.

It is interesting to note that, notwithstanding the popularity of the super-het and neutrodyne in America, the regenerative receiver is still the most used by home constructors. That wet H.T. batteries are largely employed is also worth noting; how long will it be before the English listener follows this sensible example? The large percentage of frame aerials in use is no doubt due to the number of super-hets and multi-valve neutrodynes.

R. Y.

After experimenting with a wireless system of garden culture, Mr. A. R. Cranmer, Skelton, surveyor to Skelton and Brotton Urban Council, has grown Stourbridge marrowfat peas to a height of 8 ft. 6 in.

The death has occurred, at his residence, Gordon Lodge, Ruddington, of Mr. Leonard Maurice Baker, one of the best known and most successful amateur wireless experimenters in the county. Mr. Baker was only forty-two years of age.

BROADCAST TELEPHONY

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to British Summer Time.

London (2LO), 361 m. 1-2 p.m., con.; 3.15-4 p.m., transmission to schools; 3.30-5.45, con. (Sun.); 4.15 p.m., con.; 5.15-5.55, children; 6 p.m., dance music; 7-8 p.m., time sig., news, music, talk; 8-10 p.m., music; 9.0, news (Sun.); 9.30 p.m., time sig., news, talk; 10 p.m., special feature (Mon., Wed., Fri.). Dance music on Thurs. and Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 379 m. **Newcastle** (5NO), 404 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 306 m. **Stoke-on-Trent** (6ST), 301 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun. and Tues.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily, 7.30 p.m. Sundays, 8.30 p.m. until 10.30 p.m.

CONTINENT

The Times are according to the Continental system; for example, 16.30 is 4.30 p.m., and 08.00 is 8 a.m. B.S.T.

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 531 m. (temp.) (10 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig.; con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 20.10.

BELGIUM.

Brussels, 487 m. (2½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news. Relay: Antwerp, 265 m. (100 w.).

CZECHO-SLOVAKIA.

Prague, 368 m. (5 kw.). Con., 20.00-23.00, daily.

Brunn (OKB), 521 m. (2.4 kw.). 10.00, con., news (Sun.); 19.00, con. (daily).

Kbely, 397 m. (500 w.).

Kosice, 2,020 m. (2 kw.). 19.00, con.

DENMARK.

***Copenhagen** (Radioraadet), 347.5 m. (2 kw.). Sundays: 10.00, sacred service; 16.00, con.; 20.00, dance. Weekdays: 20.00, lec., con., news, con.; dance to 24.00 (Thurs., Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00.

*Relayed by Odense (810 m.), Sorö (1,150 m.).

FINLAND.

***Helsingfors** (Skyddskar), 520 m. (500 w.).

*Relayed by Tamafors (368 m.), Jyvaskyla (561 m.), Uleaborg (233 m.).

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. **Con.**: 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 07.15, 08.00, physical exercises; 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (daily). Relays PTT, Paris: 07.15, 08.00 (daily).

Radio-Paris (CFR), 1,760 m. (about 3 kw.). Sundays: 12.45, con., news; 16.45, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 10.40, news; 12.30, con., weather, news; 16.30, markets, con.; 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 460 m. (800 w.). 07.15, 08.00, physical exercises (except Sun.); 20.30, lec. (almost daily); 21.00, con. (daily).

Le Petit Parisien, 333 m. (1 kw.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio L.L. (Paris), 350 m. (250 w.). **Con.** (Mon., Wed., Thurs.), 20.30.

Radio-Toulouse, 433 m. (2 kw.). 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily).

Strassburg, 205 m. (100 w.). 21.15, con. (Tues., Thurs.).

Radio Agen, 318 m. (250 w.). 20.30, con. (Tues., Fri.).

***Lyon-la-Doua**, 480 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse**, 260 m. (2 kw.).

***Bordeaux**, 411 m.

* Relays of PTT Paris.

Montpelier, 220 m. (1 kw.). 20.45, con.

Angers (Radio Anjou), 300 m. (500 w.). Daily: 20.30, news, lec., con.

Bordeaux, 332 m. Con., 21.00 (Mon., Fri.).

Mont de Marsan, 390 m. (300 w.). **Con.** (weekdays only), 20.30.

Algiers (N. Afr.) (PTT), 310 m. (100 w.). 22.00, con. (Mon., Thurs.).

Ste. Etienne (Radio Forez); 220 m. (100 w.).

GERMANY.

Berlin, 504 m. (4 kw.). 06.30, con., phys. exer. (Sun.); 09.00, sacred con. (Sun.); 12.55, time sig., news, weather; 17.30, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (Sat., Sun., Thurs.). Relayed on 1,300 m. by Königswusterhausen (1,300 m.) and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, con. (Sun.); 15.00, lec. (daily); 20.30, relay of Berlin (Vox Haus) con. (not daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 418 m. (3 kw.). 12.00, con. (daily), Divine service (Sun.); 17.00, con.; 20.30, con., weather, time sig., news, dance (relays Berlin). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (3 kw.). 08.00, sacred con. (Sun.); 16.00, con. (Sun.); 16.30, con.; 20.00, lec., con., weather. Dance: relays Berlin. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (3 kw.). Relayed by Bremen (279 m.), Hanover (297 m.), Kiel (234 m.). Sundays: 07.25, time sig., weather, news; 09.15, sacred con.; 13.15, con.; 18.00, con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 05.45, time sig., weather; 07.00 and 07.30, news, weather; 16.15, con.; 18.00, relays Berlin; 19.00, con.; 22.30, dance (Sun., Thurs., Sat.).

Königsberg, 463 m. (1 kw.). 09.00, sacred con. (Sun.); 16.30, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (3 kw.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 12.00, con. (daily); 16.30, con.; 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 485 m. (3 kw.) and 204 m. (1½ kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec., con. (Sun.).

Muenster, 410 m. (1 kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 15.30, news, time sig.; 16.00, con.; 19.40, lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 446 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 06.35-15.30 (exc. Mon. and Sat., when 12.30-13.30), news, Stock Ex.

Hilversum (HDO), 1,060 m. (5 kw.). 09.00, sacred service (Sun.); 19.10, con.; 21.00, news, con.

HUNGARY.

Buda-Pesth (Csepel), 560 m. (2 kw.). 17.00, dance music; 20.00, con. or opera; dance nightly.

ICELAND.

Reykjavik, 327 m. (700 w.). Con., 20.30.

ITALY.

Rome (IRO), 425 m. (3 kw.). 17.30, orch.; 17.55, news, Stock Ex., jazz band; 20.30, weather, con.

Milan, 320 m. (2 kw.). 20.00-23.00, con.

JUGO-SLAVIA.

Belgrade (Rakovitza) (HFF), 1,650 m. (2 kw.). 17.00, con. (Tues., Thurs., Sat.).

Agram (Zagreb), 350 m. (1 kw.).

LETTLAND.

Riga, 475 m. (2 kw.). Con. daily, 21.00.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.); 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo (22.30-24.00, Sun., Wed., Sat.).

Bergen, 400 m. (1½ kw.). 19.30, news, con.

Relays.—Riukan (445 m., 50 w.), Porsgrund (405 m., 100 w.).

POLAND.

Warsaw, 480 m. (6 kw.). Daily: con., 11.00-13.00; 15.00-23.00, daily.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 12.30 and 17.55, news and con.; 23.00, chimes from Kremlin.

(Popoff Station), 1,010 m. (2 kw.). 19.00, con. (Tues., Thurs., Fri.).

Radio Peredacha, 420 m. (6 kw.).

Trades Union Council Station, 450 m. (2 kw.). 18.00, con. (Mon., Wed.).

Leningrad, 940 m. (2 kw.). Weekdays: 18.00-21.00 (exc. Thurs.).

Nijni Novgorod, 780 m. (1.5 kw.). 16.00-17.30, 19.00-23.00 (Tues. and Thurs. only), con.

Astrakhan, 650 m. (1 kw.).

Kieff, 780 m. (1 kw.). 18.00, con. (daily).

SPAIN.

***Madrid** (EAJ6), 392 m. (1½ kw.).

***Madrid** (EAJ7), 373 m. (4½ kw.).

*The Madrid stations are again working to a rota, varying time of transmissions daily.

Barcelona (EAJ1), 324 m. (1 kw.). 18.00-23.00 (daily).

Barcelona (EAJ13), 462 m. (1 kw.). 19.00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con. Close down 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 420 m. (2 kw.). 22.00-24.00, con. (daily).

Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00, con., news. Tests daily (exc. Sun.), 24.00.

Cartagena (EAJ15), 335 m. (1 kw.). 20.30-22.00, con. (daily).

Seville (EAJ5), 357 m. (1½ kw.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. 19.00-22.00, con. (daily).

San Sebastian (EAJ8), 346 m. (500 w.). 17.00-19.00, 21.00-23.00 (daily).

Salamanca (EAJ22), 355 m. (1 kw.). 17.00 and 21.00, con. (daily). Closes down 23.00.

SWEDEN.

Stockholm (SASA), 430 m. (1½ kw.). 11.00, sacred service (Sun.); 19.00, lec.; 21.15, news, con., weather. Dance (Sat., Sun.), 21.45.

(*Concluded at foot of page* 218)

THE MULTIPLE TUNED AERIAL

VERY probably in the near future experiments will be tried with the "multiple tuned aerial" at one or more of the B.B.C. stations. The system has already been put into use at the new Prague station with excellent results.

The multiple tuned aerial is not a new scheme. It consists of a number of aerials in parallel, each provided with its own inductance and variable capacity—or with fixed capacity and variable inductance—and each separately tuned to the desired wavelength. Its advantages are considerable; but it has disadvantages as well.

To deal with the disadvantages first, it may be said that it occupies a considerably greater amount of space than the ordinary type. This may, or may not, be a disadvantage, depending on the location of the station desiring to use it. It may have a marked directional effect; but this can be got over by careful attention to design. It is only available for one wavelength, because once it has been tuned a great deal of time and trouble is required to change the tuning of each section to get them all into resonance on another frequency. The latter objection has not much weight in considering the application of this type of radiating system to a broadcasting station, because the station will normally stick to its allotted frequency over a long period of time.

Its advantages are all, more or less, wrapped up in the fact that the resistance of the whole system is very much lower than the resistance of any one part, following the usual and well-known law for resistances in parallel.

The lowering of the total resistance of a transmitting aerial means that either less energy needs to be put into the aerial to get the same amount of radiation, and therefore the same range, or else with the same energy the radiation will be considerably greater.

The capability of an aerial to radiate energy depends on its height and the wavelength on which it is working. The higher the aerial can be suspended in the air the better it will radiate. On the other hand, the longer the wavelength the worse it will radiate. This capability of the aerial in radiating energy is known as the "radiation resistance." If you pass a direct current through a resistance, such as a filament resistance, part of the energy is dissipated in the form of heat. Similarly radiation resistance enables the aerial to radiate away a proportion of the energy applied to it in the form of etheric energy—wireless waves.

It is, naturally, not the re-radiation resistance which aerial designers desire to cut down. They want to keep that as high as possible. The resistance that has to be reduced to build an effective aerial is the actual resistance of the aerial to the energy put into it by the transmitter, so as to make the maximum amount available for radiation purposes. For any given aerial this resistance, which is a loss, remains fairly constant over the whole wavelength range. It can be reduced by using heavy wire in the aerial and by employing a good earth or counterpoise. But the best way is by the multiple-tuned-aerial system, and that is why we shall hear more about its application to broadcasting in the near future.

VOLTA WATTS.

"BROADCAST TELEPHONY" (*continued from page 216*)

Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 370 m.; Gothenburg (SASB), 288 m.; Gefle, 208 m.; Joenkoeping (SMZD), 199 m.; Kalmar, 253 m.; Karlsborg (SAJ), 1,350 m.; Karlscrona (SMSM), 196 m.; Kristinehamm (SMTY), 292 m.; Karlstadt (SMXG), 221 m.; Linkoeping, 467 m.; Malmo (SASC), 270 m.; Norrkoeping (SMVV), 260 m.; Orebro, 237 m.; Ostersund, 720 m.; Säffle (SMTS), 245 m.; Sundsvall (SASD), 550 m.; Trollhattan (SMXQ), 322 m.; Umea, 215 m.; Varborg, 385 m.

SWITZERLAND.

Lausanne (HB2), 850 m. (1¼ kw). 20.00, lec., con. (daily).

Zurich (Hongg), 515 m. (temp.) .(500 w.). 11.00, con. (Sun.); 17.00, con. (exc. Sun.); 19.00, news, weather; 20.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 20.15, con.

Berne, 435 m. (2 kw.). 20.30, con.

Basle. 1,000 m. (1½ k.w.), con. daily. 20.30.

THE BERLIN WIRELESS EXHIBITION

THE Berlin Wireless Exhibition is to be held from September 3 to 12 this year. With between 200 and 300 exhibitors, its displays by different German radio societies and its elaborate model plant shown by the postal authorities, it will furnish a unique opportunity for a personal survey of the German position, and the exhibition authorities are this year making special efforts to attract English trade visitors. The journey from London may be accomplished in about 22 hours in comfort, the return fare being under £10 second class. Hotel prices are practically identical with those charged for accommodation of equal character in London, and the foreign department of the exhibition undertake to engage rooms on behalf of any manufacturer or trader, and generally to see that the question of language offers no bar to an exhaustive survey of the German radio trade. Details are obtainable from Thos. Cook and Sons or from any German Consulate.

CHIEF EVENTS OF THE WEEK

SUNDAY, AUGUST 22.

London	Star Ballad Concert.
Bournemouth	Symphony Concert.
Cardiff	Joseph Farrington, Bass.

MONDAY

London	Mystery Play.
Aberdeen	Lilias Mackinnon, Piano.
Birmingham	Community Singing Concert.
Bournemouth	Light Operatic programme from Winter Gardens.
Belfast	Band of 1st West Yorkshire Regt.
Cardiff	H. G. Burgess and Orchestra.
Glasgow	*Whiffs.*
Manchester	"Our Lizzie" by Helena Millais.
Newcastle	*The Missing Link.*

TUESDAY

London	*The Sea Affair and Harry Binns.*
Aberdeen	Ballad Concert.
Birmingham	Operatic Programme.
Cardiff	Legends and their Music.
Manchester	*The Pied Piper of Hamelin.*

WEDNESDAY

London	*The Sea Affair and Harry Binns.*
Aberdeen	*What He Won.*
Birmingham	Astra Desmond, Contralto.
Cardiff	Footlight Flickers.
Glasgow	Scottish National Players.
Manchester	Buxton Gardens Night.
Newcastle	"The Novos" in *Hello, Whitby Bay.*

THURSDAY

London	Lay Vicars of Westminster Abbey.
Cardiff	*Only Mother*—A Comedy.
Manchester	Will Marsh's Entertainers.

FRIDAY

London	J. H. Squire Celeste Octet.
Aberdeen	Albert Lemaire and his Cleveland Ohio Orchestra.
Birmingham	Jupiter Mars, Entertainer.
Cardiff	Helena Millais.
Glasgow	London Radio Repertory Players.

SATURDAY

London	Mystery Play.
Birmingham	City of Birmingham Police Band.
Bournemouth	Jock Walker, Scottish Entertainer.
Newcastle	Tom Heenan, Tyneside Sketches.

TRAINING STUDENTS FOR BROADCAST DRAMA

THE B.B.C. announce that, as the result of recent negotiations with the Royal Academy of Dramatic Art, a special course of training will shortly be instituted at the Academy with the object of discovering and fostering talent that can be utilised for the broadcasting medium. To ensure that students who are desirous of specialising in dramatic broadcasting shall be trained under conditions resembling the actual requirements of the studio, the B.B.C. will instal microphones at the Royal Academy of Dramatic Art, and these will be connected to loud-speakers in separate rooms.

Special examinations will be held at the Academy, and the B.B.C. will award two prizes of the value of £10 each to successful students of either sex at the conclusion of each half-yearly term.

The committee to administer the scheme will consist of Mr. Kenneth Barnes, Director of Studies of the Royal Academy of Dramatic Art; Mr. R. E. Jeffrey, Productions Director of the B.B.C.; and one other member, who is not yet appointed, independent of either concern.

"The Newest Loud-speaker"

SIR,—We are very much surprised to find in the issue of your journal dated July 24 a picture on the cover of "The Newest Loud-speaker," and a description on page 98 of the same article, headed "The McLachlan Loud-speaker. A new departure described especially for AMATEUR WIRELESS by the inventor, Dr. N. W. McLachlan, M.I.E.E."

One would assume from the article that Dr. McLachlan was the original inventor of this loud-speaker, whereas the same loud-speaker was illustrated in the *Journal of the American Institute of Electrical Engineers,* dated September, 1925. The paper in this journal is headed, "Notes on the Development of a New Type of Hornless Loud-speaker by Chester W. Rice and Edward W. Kellogg." The paper was originally presented to the American Institute of Electrical Engineers on April 13-17, 1925, and copies were available to the public in this country very shortly afterwards.

Messrs. Rice and Kellogg are two members of the research laboratory of the General Electric Company, Schenectady, and by virtue of our agreements with the General Electric Company the British Thomson-Houston Co., Ltd., is in possession of the patent rights for this loud-speaker in Great Britain. The writer actually saw the loud-speaker in operation in the research laboratory at Schenectady as far back as March, 1925. For patent and commercial reasons the B.T.H. Co. has not considered it wise to publish details, but it may interest your readers to know that the B.T.H. Co. is actively proceeding with the necessary development to place this type of loud-speaker on the market.

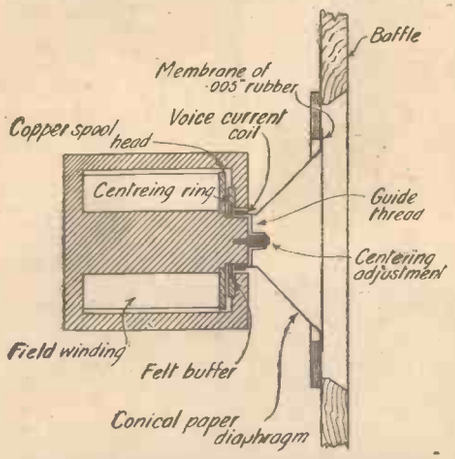


Fig. 21 of the Rice-Kellogg paper showing Free-edged Coil-driven Cone Loud-speaker.

The type of loud-speaker described by Messrs. Rice and Kellogg and by Dr. McLachlan has an electrically-energised field magnet. This type has also been developed by this company. But in addition we have a type which has a permanent field magnet, and therefore does not require an exciting coil. A commercial form of loud-speaker of this type has been in daily operation in the wireless showroom of this company for the past two months, and it has been used to demonstrate our apparatus on the broadcasting programme.

Your readers may be interested to compare Fig. 21 of the Rice-Kellogg paper presented to the American Institute of Electrical Engineers in April, 1925, with Fig. 1 of Dr. McLachlan's article in your current issue.—THE BRITISH THOMSON-HOUSTON CO., LTD. (London, W.C.).

(Continued on page 222)

CORRESPONDENCE (*continued from page 220*)

Dr. McLachlan's Reply

SIR,—In reply to the letter from the B.T.H. Co., I think the misunderstanding which has arisen is due to the alteration in title to the article and the use of my name against the title of Fig. 2 and on the front page. I was unaware of this until after publication. The original title was "Improved Loud-speaker Reproduction." There was no intention on my part of claiming either novelty or invention. The object was to describe in simple language an instrument I had designed. In a review of loud-speakers published in November, 1925, I described the G.E. Co.'s instrument, and gave diagrams taken from the Rice-Kellogg paper, full acknowledgment of their work being made. The "free" edge was used in the original Bell telephone, and later by S. G. Brown in his phones and loud-speakers, where an aluminium cone is held at its periphery by thin paper, which also serves to isolate the two sides. There is, therefore, no novelty in the general scheme of a coil-driven free-edge diaphragm, but the design requires careful consideration to get a well-balanced musical scale. In the G.E. Co. instrument there is a decided falling off below 200 cycles—that is, about halfway down the piano scale, as shown by curves published in the American Journal I.E.E., whereas in my design the low tones are more powerful. This is due to the following differences in design: In the G.E. Co. (1) the diaphragm is smaller (half the area); (2) there is a hole at the apex of the diaphragm, thereby allowing circulation between back and front; (3) the sides of the box are perforated, allowing circulation; (4) the natural frequency of the system is higher.

The theory as outlined by Rice and Kellogg, and used as a basis for design, is incomplete and inapplicable below about 1,700 cycles, where the most important part of the musical scale resides. At low frequencies both the motional impedance and the equivalent mass of air moved by the diaphragm have been neglected. These and the acoustic properties of the diaphragm conspire to reduce the low-frequency output. The motional impedance is mainly equivalent to a condenser in series with the moving coil. The smaller the diaphragm the smaller the condenser and the greater the motional impedance, for the diaphragm has to move farther to generate the air pressure. Thus, due to the equivalent condenser, the output decreases with the frequency—it is below a certain frequency. Hence to preserve the low tones the diaphragm must not be too small. In addition to the diaphragm, the moving coil and output transformer require careful consideration to preserve the low tones. With a full low-tone scale the box construction gives appreciable resonance effects, and is decidedly inferior in quality and quantity to that when both sides of the diaphragm are open. Owing to the reduced low-tone scale the G.E. Co. model would not be expected to exhibit the same box resonance tendencies, although an enclosure round any diaphragm loud-speaker is to be avoided for best quality.—N. W. MCLACHLAN (London).

[In fairness to Dr. McLachlan the Editor wishes to make it quite clear that both the description on the cover of "A.W." and the title of the article, namely, "The McLachlan Loud-speaker," were originated by him, Dr. McLachlan's original manuscript being entitled "Improved Loud-speaker Reproduction," as stated in the foregoing letter.]

What is Loud-speaker Strength?

SIR,—On reading the article, "What is Loud-speaker Strength?" by J. H. R. in No. 217, I was surprised at the obvious fallacy of his suggestion. We all agree that a system of measuring loud-speaker strength is very much to be desired, but the proposed method helps very little. The fact that speech is audible at 6, 15 or 50 ft. only indicates the clarity, but not the volume of sound. Certainly we should aim at purity of reception, but a set adjusted to receive speech clearly often makes orchestral music sound thin and reedy, and, on the contrary, when adjusted for music the speech is round and indistinct. It follows, therefore, that on two similar sets, with one adjusted for speech and one for music, the latter would require a greater volume to make speech recognisable at the same distance as the other.—R. Y. (Saltburn).

"Singers" by Wireless

SIR,—Now that wireless speakers have been drilled in the niceties of pronunciation, what of the sins of the singers?

When a speaker used one of two alternative pronunciations for a word, the listener did at least know what he meant. Can the same be said of the impression left by certain singers' songs?

It may appear incredible, but it is a fact that there are wireless singers to-day who actually do not trouble about the words of the songs they sing. They think of the voice, of how they can arrange for a particular effect, and the result of all this posturing is disastrous for the unhappy listener.

"Nerves" are another frequent cause of failure. I myself do not broadcast, but in my gramophone work I sing into a microphone, and I am never nervous there unless I have been away for a time, and then I take perhaps an hour before I get into my stride.

Many wireless singers, on the other hand, do get a fit of nerves when they remember the millions who are listening to them, and that makes them go for the song with too much voice. Now, economy in voice is the greatest asset of a wireless artiste. A whisper is heard where a shout would become a blur, and the singer from whom the listener hears every word is the one who sings quietly.

Surely a little supervision would be at

least as welcome to listeners as the selection of the more correct of two correct pronunciations of "idyll"?—PETER DAWSON (London, W.).

Reverse Reaction Effects?

SIR,—The following may be of interest to some of your readers. I have a 2-valve set, tuned-anode circuit with reaction on anode. I discovered that by putting a shorting plug in the reaction-coil holder I got louder results from Dublin, and that when I bridged the anode-coil holder with my fingers I got very much louder results. I was not disposed to keep my hand there all night, so I tried various things to take its place. Eventually I was successful in getting the desired result by means of a resistance plugged into the anode-coil holder. The resistance was made from a small piece of ebonite bored to take a plug and socket, with a saw cut across the two holes in which was rubbed a pencil lead till desired resistance was obtained.

I should like to know if any of your readers have tried this experiment. I may say that I am about six miles from the local station.—A. H. D. (Dublin).

[We suggest that this correspondent was getting a reverse reaction effect, and that by reversing the connections to the reaction coil (with the H.F. valve in circuit) correct results would be obtained.—ED.]

Wireless Inventions

SIR,—In the interesting article "Wireless Inventions That Are Wanted," in No. 217, no mention is made of what to very many is the worst bugbear of all, and that is interference caused by electric tramways. The oscillation nuisance is bad enough, but to anyone living on a tram route it is but secondary compared with the above. The "howler" must on occasion be silent, but the tramway trouble is always in evidence.

Many in this district alone never knew what reception could be like until the few days of the general strike (would that the strike of tramways had gone on for ever!).

By the way, it is curious that though American practice and design are frequently mentioned in your journal, yet there is no reference to what has been done in the U.S.A. to eliminate this trouble. If conditions there are as in England, reception would be rendered impossible in that country of vast electric traction.—V. F. J. (Bath).

"Burglar Alarms and How to Fit Them" is the title of a well-illustrated article appearing in the current issue of "The Amateur Mechanic and Work" (3d.), and should be of interest to many readers. Other articles appearing in the same number are: "The Art of Lacquering Metals," "Mending a 'Nest' Table," "Hints and Kinks Illustrated," "Overhauling Motor-cycle Cylinders," "Building a Portable One-valve Set," "Easing Furniture Doors," "Making a Standing Book-rack," "Seaside Snapshots," etc. etc.

MORE RADIOGRAMS

AGAINST a yearly payment of 10 marks (10s.), German wireless experimenters may obtain permission from the local post office authorities to attach their aerials to the telephone masts installed on the roofs of high buildings. The work must, however, be carried out by the post office technical staff. As in most cities the telephone lines are now being placed underground, opportunities will be given to licence holders to purchase the masts.

The German Postmaster-General has now liberated for the use of amateur transmitters the following wavelength bands: 8-10 metres, 37-42 metres, 60-65 metres, and 95-100 metres.

According to the annual report just filed with the Royal Board of Telephones and Telegraphs, wireless messages between Sweden and the United States are steadily increasing, and the first year's income of the Grimeton Station on Sweden's west coast, which communicates direct with New York, was twice the anticipated amount.

According to reports received from Berlin, work on the new short-wave transmitter for the broadcasting of studio programmes is nearing completion at Königswusterhausen, and experimental tests will be effected towards the end of this month.

The Wireless Institute of the Sorbonne, in Paris, has now made all arrangements for the daily broadcast of its university course of lectures, and it is hoped to bring it into operation at the beginning of October.

It is reported that W E A F (New York), the Broadcasting Company of America, will amalgamate with W J Z of the Radio Corporation, the result of which would be that, in addition to the fifteen stations already included in W E A F's system, the new company will control transmitters owned by the General Electric and Western Electric Companies. By this means simultaneous programmes of a New York performance should effectively cover a big proportion of the United States.

Experiments are being made with a view to equipping with wireless receivers some of the fast expresses on the Austrian railway system.

STRETFORD and DISTRICT RADIO SOCIETY

WE are informed by J. Hartley, jun., of 21, Plymouth Grove, Manchester, that he has been allotted the call sign 6 J H, and that the Stretford and District Radio Society, of The Cottage, Derby Farm, Derbyshire Lane, Stretford, Manchester, has been allotted 5 S S as a call sign, both for use on a fixed wavelength of 8 metres. They ask for co-operation in their experiments from both home and foreign transmitting amateurs.

TRADE BREVITIES

DESCRIBED in a profusely illustrated booklet issued by The Foolprufe Patent Accumulator Co., Ltd., of Kettering Road, Market Harborough, is the Lion series of high- and low-tension accumulators.

An interesting experiment in aerial-insulator leakage is included in a 4-page book of instructions for installing Sarbolt aerial insulators, of which the concessionaires are The Hatton Supply Co., of Hatton, Middlesex.

A large, well illustrated folder is issued by Messrs. Wright and Weaire, Ltd., of 740, High Road, Tottenham, London, N.17, which gives particulars of over twenty "Wearite" components of special interest to the home constructor. A small leaflet issued by the same firm describes an A.C. rectifier for obtaining the H.T. supply direct from the mains, with, it is claimed, a background of absolute silence.

A comprehensive selection of electrical and radio components are contained in a 68-page catalogue issued by Electradix Radios, of 218, Upper Thames Street, E.C.4. Divided up into twenty-one distinct groups of components, this catalogue forms a handy reference for almost every conceivable requirement of the radio amateur.

The well-known Polar series of receiving sets and components is illustrated and described in the new Polar Catalogue just issued by The Radio Communication Co., Ltd., of Barnes, London, S.W.13. Of special interest to those in search of purity of reproduction are the new Polar wire-wound resistance-coupling units.

Although primarily intended for purchasers or constructors of the MH seven-valve supersonic heterodyne receiver, the 24-page book issued by L. McMichael, Ltd., of Hastings House, Norfolk Street, Strand, W.C.2, will be found interesting and useful to all amateurs interested in "superhets." An introductory section gives a concise explanation of the theory of supersonic-heterodyne reception, while, in addition to useful information on the construction and operation of the McMichael receiver, there is also a useful page devoted to the art of soldering.

A new 56-page booklet, Publication No. 6,232, has been sent to us by The Igranic Electric Co., Ltd., of 149, Queen Victoria Street, London. In it are contained full particulars of the radio accessories manufactured by this firm, including concise tabulated details of their latest coil developments.

Particulars of a new positive grip socket and plug are contained in a leaflet issued by the Lisenin Wireless Co., of Connaught House, 1A, Edgware Road, Marble Arch, London, W.2.

Mr. L. Hermes, late general sales manager of the Marconiphone Co., Ltd., and Stirling Telephone and Electric Co., Ltd., has been appointed director of sales to Cleartron Radio, Ltd. This firm also announce that they have secured the world rights for the manufacture and distribution of sets embodying Sir Oliver Lodge's latest invention the "N" circuit. These sets will be exhibited at the National Wireless Exhibition at Olympia on September 4.

The London Electric Wire Co. and Smith's, Ltd., of Playhouse Yard, Golden Lane, London, E.C.1, are putting on the market a series of battery leads, the prices of which are the subject of a pamphlet obtainable on request.

We are notified by the Radi-Arc Electrical Co., Ltd., of Bennet Street, Chiswick, W.4, that Letters Patent 25524 have now been granted them in respect to the "Liberty" Permanent Crystal Detector.

Burndept Wireless, Ltd., announce that as from August 3 the price of the well-known Burndept Anti-phonic Valve Holder is reduced from 5s. to 2s. 9d. each.

A young South-coast wireless engineer has perfected a wireless receiver by means of which any broadcasting station out of a given number may be listened to by the simple pull-and-push, press-the-button method of the ordinary electric-light switch.

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that is tough enough to support four valves without breaking

Every feature of the wonderful P.M. Filament has a superiority all its own.

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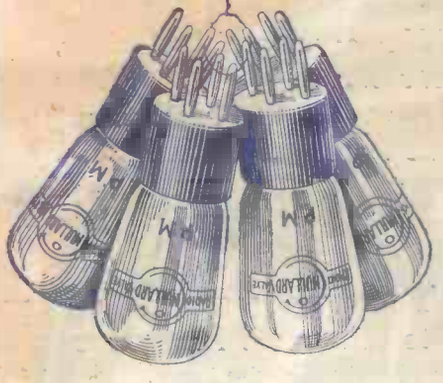

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Amateur Wireless And Electrics

Vol. IX. No. 220 SATURDAY, AUGUST 28, 1926 Price 3d

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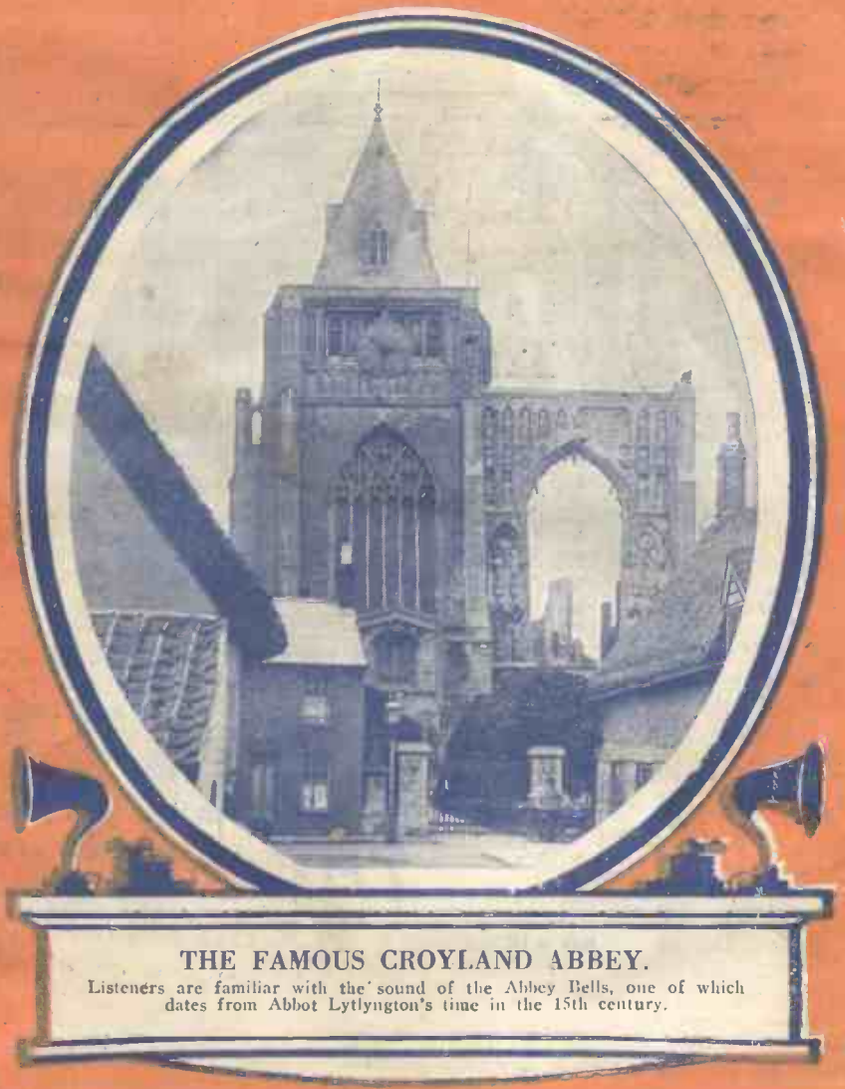

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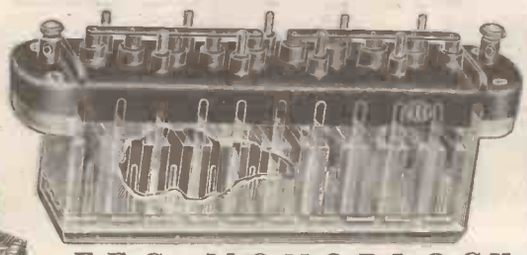

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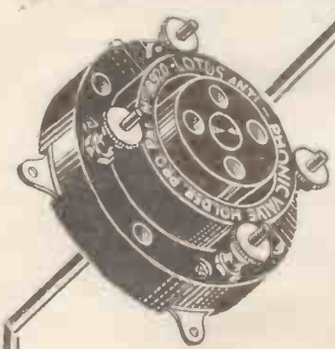

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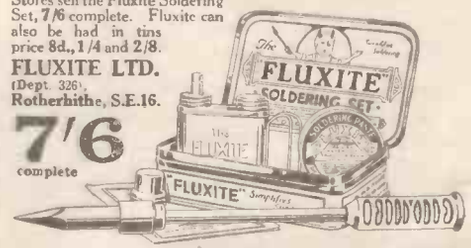

FLUXITE

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Technical Adviser: SYDNEY BRYDON, D.Sc., M.I.E.E.

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Chief Contents

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General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

HOME-MADE PHOTO-ELECTRIC CELLS

SO much attention is being centred just now around the subject of photo-electric cells that a method by which a "cell" sensitive to light can be made at home at a cost well under sixpence will be of interest. Many types of photo-electric cell are by no means inexpensive, and require a certain amount of experience for their successful handling. The type of cell to be described in this article is constructed on entirely different lines, but a number of investigations which have been recently carried out show that it can be surprisingly reliable. The method of construction is as follows.

Fig. 1.—Copper Element.

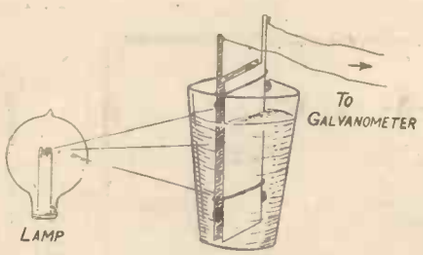


Fig. 2.—The Photo-electric Cell in Use.

Two strips of copper sheet about 2½ in. by 1 in. are cut from a nice flat piece, and are cut with lugs as shown in Fig. 1. The copper is thoroughly cleaned with emery cloth, and is then well rubbed over with a pad of cottonwool dipped in water containing a little caustic soda. The clean plates are then thoroughly rinsed in water.

Two small pieces of wood, or preferably glass rod, are cut about 1½ in. in length; the two plates are fastened together with an elastic band round them top and bottom, and are then forced slightly apart and kept separated by sliding the glass rods between them.

A weak solution of copper sulphate (blue vitriol) is then made up of about 1-per-cent. strength (10 grains in 2 oz. of water, for example). Distilled water need not be used; in fact there are reasons which make tap water slightly better. A small tumbler, such as can be bought for three-halfpence at Woolworth's, is filled with the copper sulphate solution, and the copper plates are stood in it. This completes the cell, which should be kept in darkness for a few days, during which time a very thin film of black copper oxide forms on the surface.

This copper oxide is photo-sensitive. In other words, if a beam of light be directed upon it, negative electrons will leave the surface, thus giving it a positive charge. Hence if one plate is exposed to the light of an electric lamp, say a 60-watt lamp 4 in. away, the other plate—that is to say the other side of the cell—being kept in complete darkness in the manner indicated in Fig. 2, a current will flow from one plate to the other if connected.

A wonderfully good output can be obtained from a cell of this kind. For example, with a 100-candle-power lamp 6 in. away I have been able to obtain as much as 150 micro-amperes and 25-30 milli-volts; the internal resistance of the cell is usually 200 or 300 ohms, according to size. The micro-amperes produced are very large in comparison with those given by a vacuum type of photo-electric cell for the same amount of illumination.

The response of the cell to fluctuations in the intensity of the light is very remarkable and if a telephone is connected in series with the cell it is possible to listen to the spluttering of an arc lamp quite easily. The amount of current is, within a little, exactly proportional to the intensity of the light falling upon the one side of the cell.

Nickel plates in solutions of a nickel salt, silver plates in a solution of a silver salt, and so on, give excellent results; in fact the possibilities of this type of wet photo-electric cell appear to rival those of the vacuum type at present in general use. Some further notes on the results of present investigations will be published at a later date.

T. THORNE BAKER.

THE COMPLICATIONS OF S.B.

Interesting Details of Procedure in Simultaneous Broadcasting

A PHRASE which so often occurs in wireless programmes is, "S.B. from London." The majority of listeners are aware of its meaning, but perhaps not of the many stages of preparation entailed in this announcement.

Briefly they are as follows: All provincial stations receive a skeleton schedule of the London programme six weeks in advance. This long period is to allow of time for booking artistes, liaison between stations, and publication.

The Preliminary Arrangements

From this schedule the provincial station selects the programmes or groups of items which it is intended to relay from London. One or two are ear-marked as compulsory—that is, all stations will be taking these transmissions; but as a general rule the provincial station is a free unit. Of course, there are many considerations, such as finance, which curtail freedom of choice, as independent local programmes must be paid for out of a station's budget.

When the selection of items has been made, the local transmissions are then determined. The difficulty of deciding on a definite programme can be realised when all the circumstances which have to be borne in mind are reviewed.

When at length the provincial stations' programmes for the week are complete they are forwarded to head office. Here they are tested, among many other things, for their soundness from the S.B. point of view. All transmissions must dovetail perfectly, not only those emanating from London, but also those from other stations. Another difficulty frequently arises at this stage. In the majority of cases a transmission needs two telephone lines, one for the broadcast and the other for engineers' control. This arrangement enables the receiving station to keep in touch with London and inform them of the quality of the reception. This duplication in lines limits to a certain extent the choice of programmes.

As an example of this, Station B, whose lines pass through Station A, must take the same relay as Station A. Two separate programmes would leave no control line.

At Savoy Hill all stations' arrangements are cleared up, or where this is impossible the station in question is consulted as to an alternative plan.

At this stage one may take it that all S.B. transmissions are sound. The programmes then go forward for preparation for the Press. But during six weeks many things can happen; artistes and speakers fall ill, or are prevented from appearing, local functions are cancelled; but the greatest complication is caused by the continual evolution of the London programme. In so large a city as London the material available for broadcasting is always fluctuating. Great artistes must be used when available, national crises occur suddenly, public functions originally unsuited to broadcasting are changed and included in the week's programmes. Some of this additional material, owing to its character, must be radiated by all stations. The result is that the original drafts undergo constant change during the six weeks preceding broadcast.

To enable the smooth working of this simultaneous system, a time-sheet based on the official publication is drawn up. All "exits" and "entries" from one programme to another are now made with due regard to propriety and artistic effect. It would hardly please a listener were his station to be cut off in the middle of a concerto. Yet this is not the final check, for an hour before simultaneous broadcasting begins the programme staffs of all stations hand over to the local engineers the final time-sheet. This is checked over between stations, and finally agreed upon.

The London Control Room

The next stage in the proceedings takes place in the London control room. Here there are controls, which look rather like large-sized secretaires. The big centre one is the chief factor. To it are connected all the lines in the S.B. system, so that one operator can control the output or intake of all twenty stations. He has his music lines, on which the programmes go, plugged in, and stations are able to signal him on the parallel control line. A plug is inserted in answer to a control "call," and the adjustment made verbally. On this board there is a system of coloured lights, which indicates to the operator the lines in use and, incidentally, the exact time at which a station begins and terminates a relay. All such data is carefully logged. This centre board is solely concerned in the "output" and "intake."

There are four smaller controls connected to the four principal studios. These can be described as the connecting links between the studios and the distributing switchboard. The individual operating these studio controls must possess engineering ability and musical and artistic talent, for it is here that the voices of the artistes are controlled. By a single "knob" and a pair of headphones the broadcast is amplified up to its correct power. Not only must distortion be avoided, but the person in charge of the studio must be kept informed as to the effect on the indicating dial of the artiste's voice. Too much excitement will set the needle of a little clock swinging violently, which is a potent warning for protection of valves.

When all is ready the studio signals to its own control board, and back comes the answering flicker of the red lights. This is the announcer's "cue." All the controls are connected, the stations have already been plugged in, and simultaneously all listeners hear the opening remarks of the announcer.

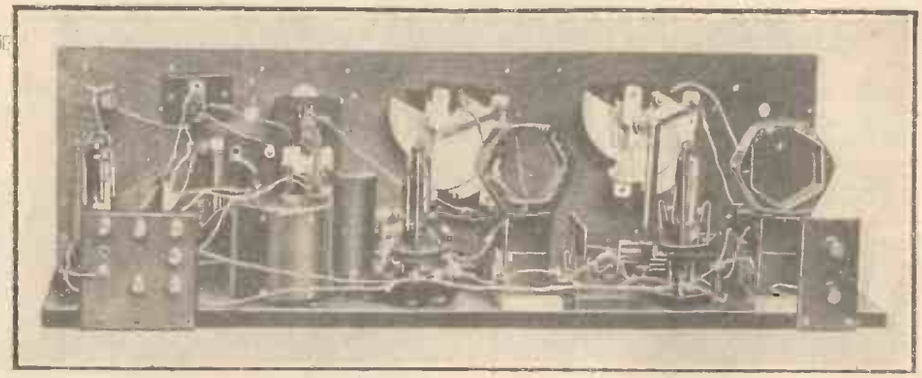
S. B.

2 L O's NEW CONDUCTOR

Mr. John Ansell has succeeded Mr. Dan Godfrey as Conductor of the 2 L O Orchestra.

THE ART OF "HOOKING-UP"

By J. HARTLEY REYNOLDS



Photograph of Receiver in Hook-up Form.

EVERY experimenter who goes in for trying out new circuits, whether they are his own or other people's, must make use of "hook-ups"—that is, receiving sets put together in a rough-and-ready way. The advantages of the hook-up method are many. Given a stock of suitable components you can wire up almost any circuit quite quickly, and when this has been done you can change the positions of components until the best places for them have been found, and you can substitute one component for another in order to find the combination that produces the best working.

Now there is a great deal more than there might seem to be at first sight in hooking-up. If, for example, one is experimenting with high-frequency amplifiers, the wiring, though quickly done, must be kept fairly neat, for if long, straggling leads are used in the rough-and-ready receiver quite different results may be obtained when it is put together later on in finished form.

Wiring

In hooking-up it is not desirable to go to the expense of using elaborately insulated wire that adds so much to the appearance of a finished receiving set; it does not in the least matter what a hook-up *looks* like so long as connections are efficiently made. The best material that I know for the purpose is No. 20 double-cotton-covered wire, which should be purchased on pound reels. No. 20 is stiff enough to "stay put" when leads are bent into various shapes, but not so stiff as to make it necessary to use pliers for forming loops at the ends for connections. Further, the ends are very easily bared. The only tool that is required when working with such wire is a pair of cutting pliers.

Soldered joints are quite out of place in the hook-up. Apart from the fact that they take some little time to make in the first instance, they make it impossible to change connections over quickly, a thing which must often be done when one is making comparative tests. And it must not be forgotten that if soldered connections to any component are frequently made and unmade there is bound to be a certain amount of messiness due to flux splutterings. It is not always realised what an adverse effect a deposit of this kind may have upon the qualities of a component, but actual tests show that if it is allowed to collect between the pins of a valve holder or the contacts of a high-frequency transformer, quite unexpected results may occur owing to the leakages which it sets up.

Photograph of Panel attached to Baseboard.

Every component should be provided with terminals. One of the photographs shows how this difficulty can be got over in the case of clip-in condensers, grid-leaks, anode resistances and the like. The clips are mounted upon small ebonite bases, being fixed in position by countersunk screws, which act as the stems of terminals. You can obtain from any good tool shop milled-headed and "butterfly" nuts in all sizes from 4 B.A. upwards, which are of the greatest use when you wish to convert screws into terminals.

The "Hook-up" Board

I do not much believe in bench hook-ups which are made by using a number of components each provided with its own cabinet or stand, which are placed upon the bench and connected up by odd lengths of flex. I have always found it far better to use various kinds of special board for the purpose. A particularly useful type is that illustrated in Fig. 1. It consists of a horizontal baseboard of soft wood measuring 24 in. by 12 in. To this is screwed a vertical panel of ¼-in. mahogany 8 in. in height. Two slots each ⅜ in. wide are cut in the panel; these enable one-hole fixing components, such as tuning and neutralising condensers, potentiometers and rheostats, to be mounted with the greatest ease, and to be moved about until the most convenient positions for them have been found.

The aerial and earth terminals are mounted upon a small ebonite panel fixed to the back edge of the baseboard near the left-hand end. Those for the battery connections have a small panel all to themselves. The arrangement of this is shown in Fig. 2. It will be seen that the terminals are spaced 1½ in. apart, so as to give plenty of room. All terminals on

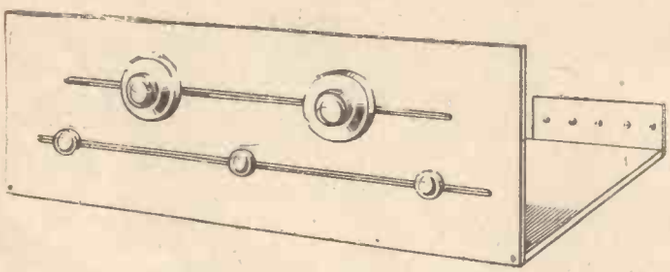


Fig. 1.—Suggested Type of Hook-up Panel and Board.

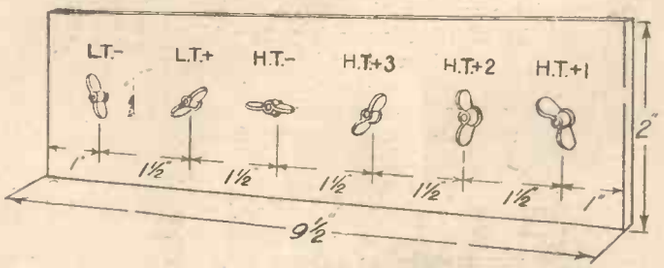


Fig. 2.—Details of Battery Panel (winged nuts are used).

both panels are made double, so that connections either to the batteries or to components in the receiver under construction can be made with the greatest ease. A separate H.T.– terminal is provided for two reasons; when it is there the batteries may be connected either negative to positive or negative to negative, as desired; and even more useful, a milliammeter can be inserted into the connection between the high- and low-tension batteries, so that readings of the plate current of any or all of the valves may be obtained.

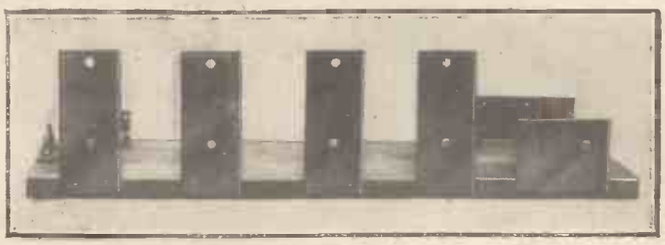
which holes are drilled as and when they are required. Actually such a panel will serve for the construction of dozens of receiving sets; one can, in fact, continue with it until it begins almost to resemble a piece of lace. The one seen in the photograph of a typical hook-up, which has been in use for some little time, contains over a hundred holes, though it is still good for a great deal more work.

Insulation

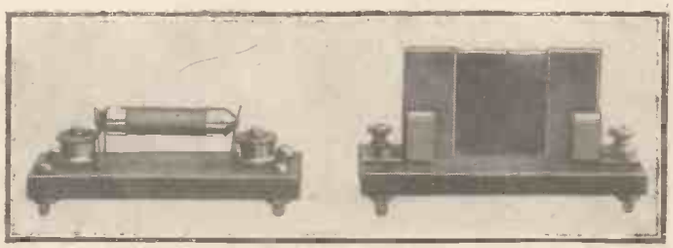
It will be noticed that, except in the

against the flow of direct current from H.T.+ to L.T.–. Well-seasoned mahogany is quite good enough for this purpose, especially as there is always a considerable distance between the contacts of components that are at different potentials.

With the exception of variable condensers and a few other small parts, such as those which have been mentioned, the components used for hook-up purposes should all be of the baseboard-mounting type provided with terminals. The baseboard itself should be of soft white wood,



Another Suggested Type of Hook-up Board.



Method of Mounting Individual Components.

In other photographs are seen two other very useful kinds of hook-up board. One of these has no fixed vertical panel, variable condensers and so on being mounted upon ebonite strips 8 in. in height by 2½ in. in width, each of which is attached to the baseboard by means of a couple of wood screws. With these the positions of components can be changed quite easily, since it is a short business to withdraw the wood screws that hold them and to re-insert them in another place. Each strip has two ⅜-in. holes, one intended for mounting a variable condenser, whilst the other serves for a rheostat, a neutralising condenser or some other small component which is usually placed low down on the panel of a finished receiving set.

Another board seen in one of the photographs has a vertical mahogany panel, in case of the board which uses separate ebonite strips to hold condensers and so on, mahogany panels are employed. This is done for several very good reasons. Mahogany is very much cheaper than ebonite, so that one feels no compunction in disfiguring it by making all the holes that one may need; nor need one worry at all if it becomes scratched, as is bound to happen during experimental work. There need be no qualms so far as insulation is concerned. If the moving plates of one-hole fixing variable condensers are attached, as they should be, to the filament in grid circuits or to H.T. in plate circuits, then those portions of the condensers which come into contact with the panel are at high-frequency earth potential. All that the panel has to do then is to provide the necessary insulation

so that screws may be driven in or extracted without difficulty. I have found it a very good tip to mark my baseboards out in inches along both the long and the short sides. This enables the spacing between components, once the best positions have been found, to be gauged at once, and saves a great deal of time that would otherwise be lost in making even rough measurements.

Another great time-saver is a wire box made on the lines of the carpenter's nail box. It contains from four to six compartments, into which leads of various lengths are put when any hook-up is being dismantled. They are thus kept sorted out, and you can place your hand in a moment upon just the wire that you want when a new circuit is being put together.

J. H. R.

MOISTURE IN COILS

ONE of the difficulties in the construction of a really efficient single-layer solenoid coil is the prevention of moisture from affecting the windings of the coil. If the windings are left exposed to the air for any length of time they will absorb an appreciable amount of moisture, which will have the effect of increasing the self-capacity of the coil considerably, and so lowering its efficiency. No matter what varnish or wax is used to prevent such absorption, the distributed capacity of the coil will certainly be increased by such a measure.

It is therefore a choice of two evils. Any table of specific inductive capacities will show that whereas shellac has an S.I.C. value of approximately 3.5, distilled water has an S.I.C. value of 81. It therefore appears that a very thin coating of shellac over the previously well-dried windings will be much more efficient than allowing the windings to absorb moisture from the air. There is little to choose in ultimate efficiency between cotton-covered or silk-covered wire. The silk covering is certainly less hygroscopic than cotton, but if the coil has an unspaced winding the turns will lie closest together when silk-covered wire is used. Hence the inter-turn capacity will be greater than in the case of an unspaced winding of the same gauge of cotton-covered wire. The most efficient way out of the difficulty would be a spaced winding of enamelled wire, each turn spaced from adjacent turns by a space equal to the gauge of wire used.

A. S. H.

"Who Invented the Neutralised Circuit?"—We apologise for a slight misprint that occurs in our article on page 181 of our August 14 issue. We are made to say that "The Hazeltine Corporation (of U.S.A.) are now the registered sole proprietors of the Scott-Taggart neutralised circuit patent, subject to a free non-exclusive licence enjoyed by Radio *Corporation*, Ltd." Of course Radio *Communication* Co., Ltd., was meant.

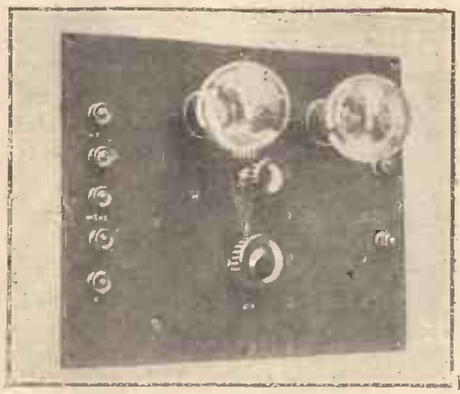
H.T. LEAKAGE

MANY of the crackling sounds heard in the loud-speaker or phones (usually attributed to atmospherics) are caused by leakage either from the H.T. battery to some other component in the receiver or between various units in the battery itself.

In the case of a battery cast *en bloc* in wax, about the only practical precaution against leakage is to stand it on a sheet of glass or on insulating rubber feet. Batteries composed of flashlamp refills, however, may be further insulated by inserting strips of thin rubber sheet or waxed cardboard between each 4½-volt cell.

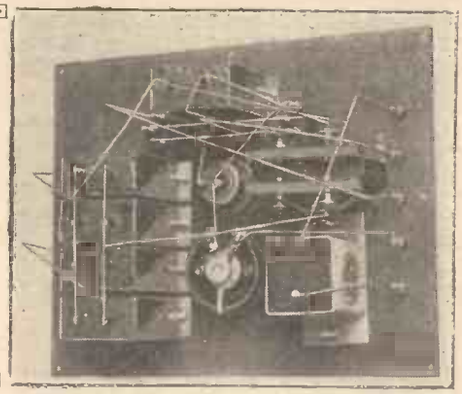
H.T. accumulators and "wet" cells are particularly prone to give trouble in the matter of inter-cell leakage, and for this reason the containers of cells of this type should be stood on insulated pads. K.

For several weeks M. R. Goldschmidt has been in direct communication by wireless telephony with the Congo. He uses a short-wave system.



The Complete Rectifier and Smoother.

TAKE YOUR H.T. FROM THE MAINS



View of Underside of Panel.

THE small thermionic rectifier about to be described was designed for the purpose of converting house-lighting alternating current at 240 volts 50 cycles to direct current for supplying the high-tension current for an eight-valve super-sonic-heterodyne receiver. This it does with a remarkable degree of success, and it is quite automatic in action, no attention ever being given or required.

A valve rectifier, of course, is rather an expensive item (although not as expensive as an H.T. accumulator), but it is well worth making up, as it really does provide a solution to the H.T. problem.

A transformer for reducing the voltage is necessary, but this component should be purchased, as its design will vary with the different voltages and frequencies of the supply current. It may be mentioned, however, that the writer uses a transformer having two secondaries, one of which supplies the current for lighting the filaments of the rectifiers.

For the purpose of obtaining a large current output it is usual to use two valves in parallel, and two valve holders are thus provided. For use with an ordinary two- or three-valve receiver one rectifier will be sufficient, and there is no need to go to the trouble of providing holders and connections for two rectifiers. When all the valves in the writer's super-heterodyne are in action, two Philips's hard R-type bright-emitter valves are used, but for ordinary broadcast reception of the local station a single Philips-Mullard P.M.4 power valve answers.

The Circuit

Consider for a minute the circuit diagram of the rectifier shown by Fig. 1. It will be seen that the two valves are in parallel, and for all practical purposes may be regarded as one valve. The filaments, however, are connected in series, as the current for heating the valves is supplied by a second winding on the transformer. When it is desired to use batteries the usual parallel connection should be made. A further point in regard to the filament supply is that a rheostat is placed across the legs of one holder to correct for inequalities of current when two different types of valve are used in parallel. This is a very handy device and enables the valves to be used to the greatest advantage, but it is scarcely possible if an accumulator is used, as it then merely wastes current.

As already stated, the valves are placed in parallel, the grid of one being connected to the grid of the other, and plate to plate. One lead from the mains passes straight through from the input of the rectifier to the positive output terminal, the only component in this lead being a small iron-cored smoothing choke. The secondary of a disused low-frequency transformer does very well for this, and there is really no need to wind a special choke for the purpose.

The other mains lead is taken to the common connection between the filaments. If A.C. from a second winding on the transformer is used for filament lighting, it is essential (in order to minimise "hum") that this mains lead *should be* connected to the common filament connection. If an accumulator is used there is, of course, no common connection, as the filaments will then be in parallel and it is immaterial to which L.T. terminal the mains lead is taken.

Grids and plates of the two valves are connected together and leads are taken, one to the H.T. negative output terminal, and the other to one end of the smoothing choke through a 2-microfarad condenser.

Four other smoothing condensers, each of 2 microfarads capacity, are placed across the H.T. output terminals to reduce the ripple. The back-of-panel photograph of the unit clearly shows the wiring of these condensers.

It will also be seen that another 2-microfarad condenser is connected between "earth" on the receiver and one main lead. The lead to which it is connected is the one earthed at the power station, as was found by a simple trial with a lamp placed across earth and each lead in turn.

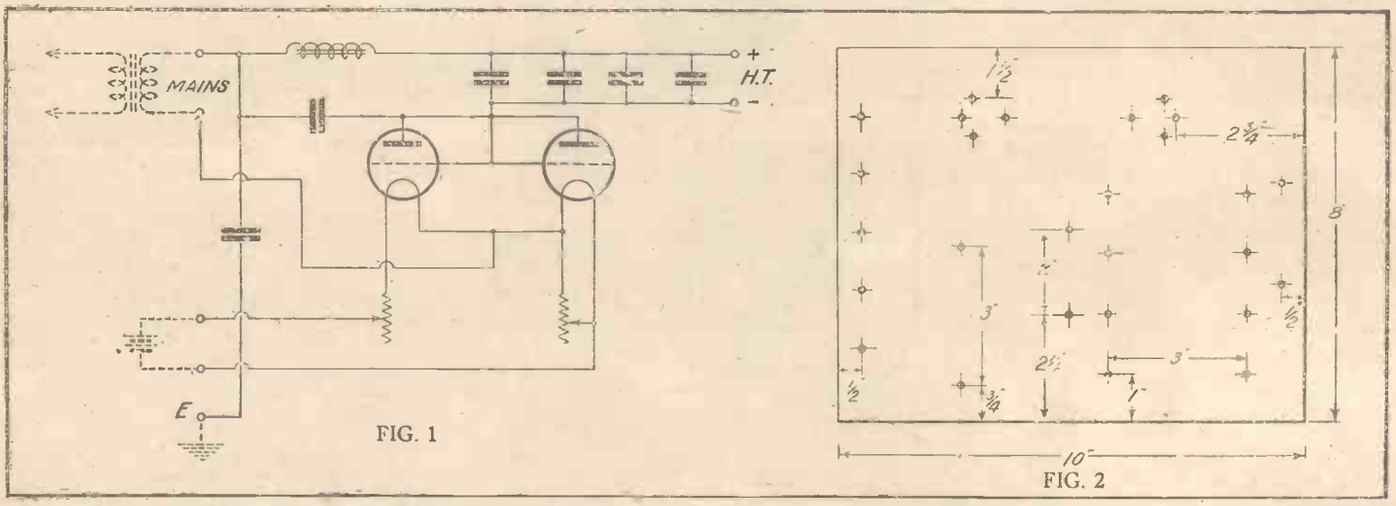


FIG. 1

FIG. 2

Fig. 1.—Circuit Diagram of Rectifier and Smoother.

Fig. 2.—Details of Panel.

In nearly every public-supply system one lead is connected to earth, and, as in the writer's case, a great deal of noise is noticed in the receiver unless a large-capacity condenser is connected as shown.

Connections

Seven terminals will be seen on the front of the panel, and these are connected as follows: The two marked "H.T." on the left are taken to the mains supply, care being taken to see that the "earthed" main is connected to the proper terminal. As the supply is A.C. there is no necessity to trouble about polarity. The two terminals beneath the mains input are marked "Valve," and are the input terminals for the filament current, either from an accumulator or from a secondary winding on the transformer. On no account must the accumulator on the receiver be used or the mains will be shorted. Beneath these is a single terminal marked "E," and this is the output from the single 2-microfarad condenser connected between the earthed main and earth. It has, therefore, to be joined to the earth of the receiver.

On the opposite side of the panel are two terminals marked + and −. These of course are the output terminals of the rectifier, and are taken to the H.T. + and − terminals on the receiver. The main rheostat and the smaller one in parallel with one valve are placed in the middle of the panel.

Components

Although slight constructional alterations may be necessary if, for instance, it is only desired to use one valve, a few details of construction may be of use. The following components are required: Ebonite panel 10 in. by 8 in. by $\frac{3}{16}$ in.; cabinet to fit, 4¾ in. deep; two filament rheostats; six 2-microfarad condensers; one L.F. transformer or L.F. choke; eight valve legs; screws, wire, etc. For those who may care to make up the H.T. unit exactly as described, a panel-drilling diagram is given in Fig. 2. No difficulty should be found in wiring up if the theoretical circuit diagram be closely followed.

If care is taken in the selection of the earthed mains lead, the rectifier can be tested without a transformer, although very good results cannot be expected.

First connect up the unit to the mains and the filament supply and turn on the valves. If everything is satisfactory, the smoothing condensers will become charged up with rectified current and a crackling spark should be obtainable on shorting the H.T. output terminals. It may here be mentioned that no harm is done by shorting this part of the unit and, unlike an H.T. battery, no damage is caused if the H.T. section of the receiver "shorts" internally. When all appears to be working satisfactorily, the set may be connected and an attempt may be made to tune in the local station. The setting of the rheostat controlling the rectifier valves is also a control of the amount of H.T. current rectified, and a very delicate variation is possible.

If the rectifier be made exactly as shown, *no A.C. ripple will be audible* in the phones even if three stages of L.F. be used. In a two-valve receiver the "background" is as silent as when a good H.T. battery is employed.

Ripple

Should any A.C. ripple be experienced it will probably be found that the smoothing choke is at fault (probably it has too few turns or insufficient iron in the core), or else the "earthing" condenser is wrongly connected.

Although it may appear unnecessary to place a condenser between two conductors at earth potential, there is a real necessity for its inclusion in the rectifier. The reason is that the earth on the receiver is usually good, whereas the earthed main often has a potential of as much as 10 or 12 volts to earth. This extra unrectified current is quite capable of spoiling results and causing a most annoying ripple.

It is essential to use the right type of valve in the unit; ordinary general-purpose receiving valves are usually too "soft" to stand up to the work, and a very "hard" valve (that is one in which exhaustion is complete) must be used. Dull-emitters are advisable if a separate accumulator be used, but bright-emitter power valves are usually more constant and may safely be employed if the filament is lit from the mains. P.

WHEN A WIRE BREAKS

IT sometimes happens that a connection to a component breaks loose or a soldered joint breaks in a part of the set which cannot easily be reached by a pair of pliers or by a soldering iron. This difficulty is more likely to occur in connection with sets built on the American plan, with a vertical panel affixed to a baseboard.

There are two or three things which it is well to remember in such an emergency and which may sometimes save the troublesome and vexatious job of dismantling half the set: (1) A 4 B.A. spanner will often reach where a pair of pliers cannot go; (2) a component such as a rheostat can often be removed from the set in a few moments, and a fresh wire affixed to it before it is remounted on the panel; (3) if the wire that has broken loose cannot be put back in position, it is sometimes possible to attach another length of wire and solder that to the broken wire. H. P.

On Your Wavelength!

In Full Swing

THOUGH possibly you did not know it, the broadcasting of pictures by wireless is in full swing at the present time. Mr. J. L. Baird, who has been hard at work for a long time in developing his apparatus, recently obtained two transmitting licences from the authorities, and is now busily sending pictures from his laboratory in St. Martin's Lane in London to his house at Harrow. He is conducting the work rather under difficulties at the moment, for, owing to the lack of expert assistance, he is forced to set his transmitter going in London and then to dash off to Harrow to work the receiver. If any fault develops at the sending end, back he must go once more, and so the strenuous process continues. Mr. Baird is very optimistic about his invention, for he has recently expressed his belief that he will be able to put receiving sets on the market at round about £30 apiece.

I think myself that it will be some time before we get anything like a regular picture-broadcasting service, but it is a development that is bound to come, and when it does so it will make an enormous difference to the popularity of radio. Meantime, if you should happen to hear queer noises that sound rather like atmospherics gone mad in the neighbourhood of 200 metres, do not jump to the conclusion that you are receiving a weather report in Czecho-Slovakian; what is coming through is one of Mr. Baird's pictures, and it is distinctly difficult to appreciate any picture by ear!

Near Perfection

If you want to obtain an idea of how good reception can be, drop in, as I did last week, to the Science Museum (where incidentally you will find some most interesting exhibits in the wireless section) and hear the receiving set which the B.B.C. has installed there. Its performances will probably be a revelation to you, for music is produced with absolute perfection, no part of the scale being unduly favoured, and the rich tones of the bass coming through with their full beauty. It is not perhaps such a set as the average amateur can construct for himself, since it employs eight special valves, which alone represent an outlay that would make a good hole in a couple of ten-pound notes, but it will make him realise the goal towards which he ought to strive. Most of us pay far too much attention to the high-frequency side of our sets, and our loud-speaker reproduction suffers somewhat as a consequence. It is not perhaps generally known that very big improvements have been made in the last few weeks in the technique of broadcast transmission; the lowest notes are, in fact, there now if only your receiver is good enough to get them.

Physical Jerks?

Are we to have physical jerks by wireless? Heaps of people seem to desire that courses of morning exercises should be broadcast, whilst still other heaps (in which your Thermion is included) do not care either way. My own feeling is that since nothing could persuade me to leave my bed at the uncomfortable hour at which those who like to lie on their backs and kick heels over their heads are wont to practise their diversions, I have no objection to exercises being broadcast so long as the Editor does not insist on my taking part in them in order to write an article upon "Growing Healthy by Wireless" or something of the kind.

Wireless physical jerks are immensely popular in the States, where they take life more seriously than we do. No self-respecting American, for example, ever thinks of ordering a chop until he has worked out the number of calories and vitamines and things that it will contain, and satisfied himself that this corresponds to the requirements of his inner man. I expect, though, that if we do have physical jerks in this country there will be some horrible catastrophes to receiving sets, when, under the instructor's exhortations to put some life into it, people spring smartly to their feet or fall smartly on their tummies, forgetting that they are wearing headphones!

Nature's Record

I think that Dame Nature can claim a record in the way of simultaneous and continuous broadcasting on all wavelengths for her work during the last ten days. Never since I first tapped a home-made coherer can I remember such an atmospherically period. Let us hope that the good lady, having had her fling, will take a rest from now onwards. One often comes across specifications of patents whereby inventors seek to find a means of filtering out atmospherics. Myself, however, I doubt whether any really effective method of doing this will be discovered, unless we adopt some entirely different system.

You can easily see what the effect of an atmospheric upon an aerial is if there is in your house a banjo, a ukulele, or some other instrument of similar type, as there is in most houses where there are young people in these jazzy days. Having tuned the thing, give its drum or sounding-board a smart rap with your knuckles. You will find that every string is set a-jangle at the pitch to which it is tuned, and that you hear more of the lower ones than of the higher. The strings represent aerials tuned to different wavelengths. Each oscillates violently at the wavelength to which it is tuned under the impact of an atmospheric just as the strings vibrate when the instrument is jarred by your knuckles. Just as you hear the notes of the lower-pitched or longer wavelength strings most strongly, so the aerial tuned to a high wavelength is more affected than that tuned to a low one. It is for this reason that atmospherics become more and more noticeable as you ascend in the wavelength scale.

Experimental Tests

Within a very short time now the B.B.C. will begin its tests upon the new wavelengths, which will not be brought into general use until the middle of next month. The tests are expected to take place after the ordinary evening programmes have come to an end, and it is expected that announcements will be made in due course, so that listeners may see for themselves what their effects are likely to be. So far as I can see, the Londoner who possesses a valve set is going to find a considerable improvement. Cardiff will still be difficult to get, whilst Manchester goes up almost to Bournemouth's old wave. Bournemouth, however, is going down to 306 metres, so that there should be little difficulty in tuning in this station, which comes in quite strongly in the London area. Belfast and Newcastle, too, should be receivable on efficient receivers, for both should be outside the wipe-out effects of 2 L O. The only station that will be lost is Birmingham, for it seems probable that London listeners will experience interference from Aberdeen, since these two stations are almost in a straight line with the metropolis.

For the Shorter Waves

I mentioned recently that those whose sets would not tune down below 300 metres as they now are would probably be able to accomplish the necessary reduction in their minimum wavelength by placing a small condenser—from .0001 to .0003 microfarad would be a suitable value—in series with the aerial lead-in. This is perhaps the simplest way of doing it, though it may lead in some cases to a small reduction in signal strength. If the inside of the set is easily accessible, and if its owner is capable of undertaking a simple wiring job, a better plan is to place the A.T.C. in series with the A.T.I. Besides reducing the upper and lower wavelength limits of the aerial circuit, this has also, as a rule, the effect of materially increasing the selectivity of the receiver.

On Your Wavelength! (continued)

An Interesting Point

I was talking the other day to an expert who maintained that the average wireless man relied upon his local station almost entirely, and hardly ever bothered to tune in other transmissions. I held that almost every valve user finds occasional DX work enormously interesting, and that the majority of such people, though the local station is naturally their main stand-by, quite frequently indulge in the thrilling pastime of making a search round for far-away stations. The expert protested that most of these transmissions were not worth listening to; to which I replied that they *were* worth listening to, not perhaps from an æsthetic point of view, but because there is a real thrill, and therefore a vast amount of pleasure, in the very fact of being able to hear speech and music, even if distance has deprived them of some of their real quality, from places hundreds or possibly thousands of miles away. Though I am a pretty old hand at the game, I must confess that when I log for the first time a Swedish relay station or some little fellow in Central Europe, I have a pleasant feeling that I have done something that is really worth while. I wonder whether readers think as I do?

Beware the Spark-gap!

I had an interesting half-hour recently when a neighbouring broadcast listener invited me to come in and "see what was wrong with his set." I went in, for I simply dote on tracing out troubles in naughty sets at times, but I had not bargained for the gay and giddy dance which this set was to lead me. In my usual careful manner (all my readers will take note of that I am sure) I examined that set from aerial to earth, from grid bias battery to the interior of the transformers. At the end of the half-hour my neighbour's face had increased in length so that it represented an elongated egg.

Sometimes one is tempted to make unpleasant remarks when on these excursions, something about bad soldering or messy flux all over the panel, and I was just on the point of giving voice to my thoughts and feelings when the B.C.L. (broadcast listener), thinking that he would calm my ruffled feelings, drew my attention to a neat little lightning switch which he had recently installed. Now, I am always a suspicious person when I see these neat little recently-installed switches on a faulty receiver, but my rising hopes were dashed to the ground, for a further careful examination of the wires showed that they had all been properly connected up. I was loth to part with my ideas, however, and got a screwdriver on the job, with the result that the underside revealed a neat little spark gap of pressed brass plates in which a nest of earwigs had carefully deposited themselves! No wonder my friend was having a merry time with clicks, no signals and other difficulties. I fear that I was rather brutal with that happy family of earwigs, and I was none too pleasant with the owner of the neat little switch who, as usual, did not bring the addition to notice until my patience had all but run out!

Thermion at Work

Speaking of examining sets reminds me that your Thermion is often in demand for this purpose, probably owing to the fact that he runs a transmitting station when he has time, and he is sometimes faced with appalling collections of gear for overhaul. These neighbours often lay skilful traps, principally in the early morning, when one's main objective is a certain train to the City. "Ah, good morning, Mr. Thermion," says the cunning B.C.L. "What a lovely morning!" You unsuspectingly fall into step and trail by his side while he regales you with his latest exploits in ether-combing. "And would you believe me," he finishes, "something has gone wrong with that set after all this time?" All too late you realise that you have been bitten once again, and with one eye on the station clock and the other on the signal, you make hurried promises to call round in the evening and see this wonderful set which has received every station on earth, but which, alas! now refuses to pass a single electron!

A Thankless Task

In the evening you call according to plan, and the crafty one conducts you to a room where you are faced with the awful monstrosity. "I think that a man like you will be able to put it right in two twos," he says. The ebonite panel looks as though it has been bored with a red-hot poker and well smeared with vaseline, after which your torturer has retired to the bottom of the garden and flung component parts such as condensers, transformers, screws, terminals and the like with incredible force. Some of them have stuck, although perhaps somewhat precariously, and the whole has been tied up with wires of many coloured jackets. "Two twos! I think that I had better take it away, as I have all my instruments handier at home." Wearily you shoulder the burden, which, after it has been well dusted (they always dust them nicely before you take them away), is carefully tied up with a weird assortment of various-sized strings, and away you go with a heavy heart.

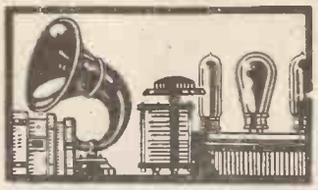
Little Difficulties We Meet

It is surprising how easy it is to make a slight error in wiring-up a set even when the greatest care is taken when the job is in progress. The sure and certain wiring-up of a set only comes with long practice, and it is only the experienced hand who should risk a few pounds' worth of valves by switching on all batteries without first of all testing out with a flash-lamp bulb. Even then, assuming that the high-tension and low-tension battery circuits are in order, it is quite an easy matter to forget a short length of wire, especially in a multi-valve set, and unless the wiring is checked over very carefully this may be overlooked and render our early tests negative. Another source of early trouble is the connecting of the secondaries of the low-frequency transformers. If these are made positive instead of negative, and a positive potential is applied to the grid of the valve in so doing, it is quite possible to lose signals entirely and cause a long search for an imaginary disconnected wire. Very often our anxiety to have the wiring neat results in a temporary carelessness as regards the connections, and it is then that we are prone to make these mistakes.

Foolproof!

Before I possessed one, I used to regard the H.T. accumulator as a rather delicate affair which could be easily ruined by any kind of ill-treatment. The little fellow that I am now using appears, however, to be foolproof; at any rate, it has shown itself to be Thermion-proof! I cannot remember ever having accidentally short-circuited a dry H.T.B., for I am always rather careful about my wiring when I am making hook-ups. However, I did very successfully short my accumulator H.T.B. not long ago, producing a very pretty display of the proverbial blue flames. The thing went on for quite a few seconds, for I was so flabbergasted for the moment that my fingers appeared to be all thumbs, and I could not get the H.T. leads disconnected. Fearing the worst, I then examined the battery. There was not a sign of buckling or of any damage whatever, and though this happened a couple of months ago the battery still smilingly does its job.

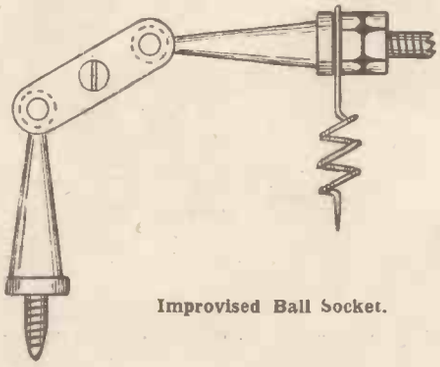
The next thing was that whilst I was away for a week-end my family switched on the set on Friday evening and "switched off" (!) by merely pulling out the loud-speaker plug. When I came back on the Monday the H.T.B. had run right out, there being no sign of even a fraction of a volt across any of its terminals. That is ill-treatment if you like, but I can assure you that as soon as it was recharged the battery was just as good as ever. The one that I am using is by no means an expensive fitment, the price being twelve shillings for each 20-volt unit, and it is quite a tiny thing, five of these units taking up no more space than a 100-volt dry battery. You need hardly ask whether I approve of accumulator H.T.B.'s. THERMION.



PRACTICAL ODDS & ENDS

Improvised Ball Socket

QUITE a good substitute for the orthodox ball-socket movement of a crystal detector can be made from two brass feet taken from an old alarm clock. One member is inverted and mounted



Improvised Ball Socket.

vertically on the receiver panel, the other being swivelled to the panel by means of two fairly stout sheet-brass links and a small bolt as shown in the sketch. The holes in the ends of the links should be about half the diameter of the balls on the feet (the latter shown dotted), and they should be countersunk on the inside in order to obtain a perfectly smooth movement. It will be found that the screwed shanks on the feet are rather short; extension pieces may be easily fitted by using screwed sleeves or locknuts. R. T.

Increasing Condenser Range

THE tuning of any selective set is made much easier if a small-capacity variable condenser is used, for the movement of the dial over a given number of de-

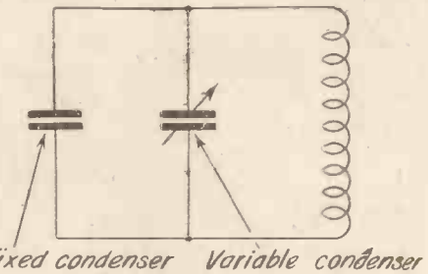


Diagram of Condenser Connections.

grees makes less difference to the wavelength than is the case when a large condenser is employed. The only drawback to using variable condensers with a maximum capacity of, say, .00025 mfd., or .0003 mfd. for broadcast reception, is that one cannot, as a rule, cover the whole broadcast waveband with a single set of coils. This difficulty can, however, be surmounted by means of the tip illustrated in the diagram. Obtain a clip-in fixed condenser with a capacity slightly smaller than that of the variable one. If the variable condenser is .00025 microfarad, the fixed condenser should have a capacity of .0002; a .00025 fixed condenser will be right for a variable condenser with a maximum capacity of .0003 microfarad. Connect one of the clips to the fixed plates and the other to the moving plates of your variable condenser. Without the fixed condenser in the clips, a movement of the dial through 180 degrees covers the normal range of the variable condenser. By placing the fixed condenser in its clips and turning the variable back to about 20 degrees, a further range of 160 degrees of the condenser scale is obtained. R. H.

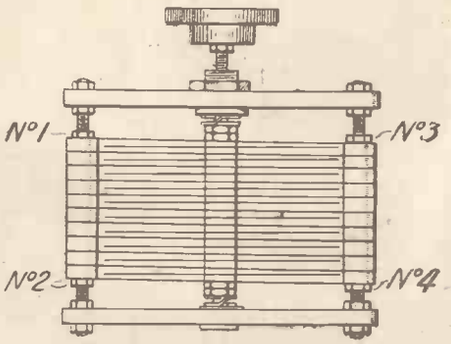
Fine Reaction Control

FINE control of reaction is most important when receiving long-distance telephony. The method of grid-circuit damping often employed has an adverse effect on signal strength, and is, to a certain extent, interfered with by hand-capacity effects.

Here is a simple method of exerting a delicate and easily-operated control over oscillation. Connect one end of a variable anode resistance (having a maximum value of about 100,000 ohms) to earth and the other end to a tapping a few turns along the tuner. The resistance is thus in parallel with a portion of the coil, and a fine control of damping is possible. In order to minimise hand-capacity effects, the end of the anode resistance which supports the control knob and spindle should be connected to earth. P.

Adjusting Variable Condenser

WHEN the plates of a variable condenser scrape, do not try to bend them, otherwise the condenser will be ruined altogether. Instead, begin by removing it temporarily from the receiving set. You will find probably that its condition is very much as seen in the drawing, though possibly not quite in so exaggerated a form. In the drawing the fixed plates are too high on the pillar on the left and too low on the right-hand one. To set them correctly proceed as follows: Slacken off nut No. 2, and turn No. 1 a little way down; then slacken No. 3 and turn No. 4 upwards. Working in this way it will be possible to get the fixed plates level, and the moving plates will turn without touching them at any point. Only two pillars are shown in the drawing, though most condensers have three. The principle,

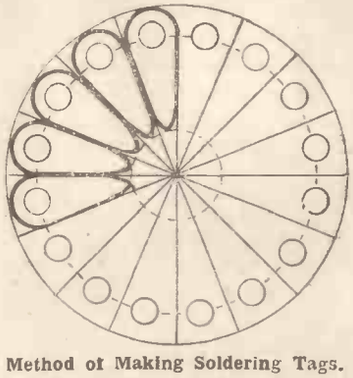


Condenser with Faulty Plates.

however, is unaffected; the plates are levelled by means of the nuts above and below them at each pillar. J. H. R.

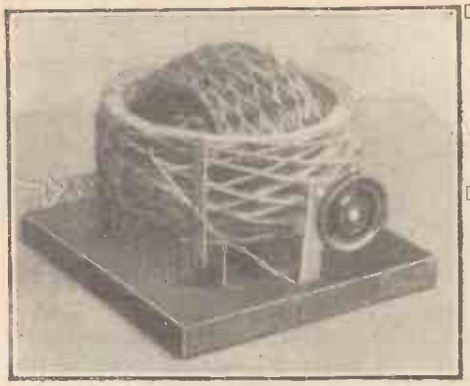
Making Soldering Tags

THE sketch shows how a number of soldering tags may be acquired at a cost not exceeding the wear and tear of a pair of scissors and a small drill. The thin inner lid of an air-tight tin of tobacco or cigarettes is divided off into a number of equal parts, as shown, the number of the divisions depending upon the size of tags required, and holes for terminal shanks, etc., are drilled in the centre of each division on a line previously scribed near the outer edge of the disc. It is



Method of Making Soldering Tags.

then only necessary to cut out the divisions by means of a pair of scissors, and finally shape them as indicated by the thick lines. The result will be found very pleasing; the tags, being extremely thin, heat up very quickly and thus facilitate soldering operations. O. J. R.



The Finished Basket-coil Variometer.

A NOVELTY IN VARIOMETERS

Building a Basket-coil Variometer for 5 X X or the Local Station

THE variometer about to be described has a natural wavelength range with a 100-ft. aerial of 350 to 1,650 metres. This range can be efficiently increased from, say, 250 to 2,200 metres by means of a small fixed condenser as described later. Efficient reception is obtained through the whole range, and this tuner has been used very successfully as the A.T.I. in a valve set in place of basket coils of different sizes. Using this variometer in a crystal set, the writer has obtained better results than with honeycomb basket coils and variable condenser.

The design is such that a considerable air space separates the layers of wire, thus reducing capacity losses. The model was constructed in twelve hours and is easily made. Nine ounces of No. 22 d.c.c. wire were used, the remaining materials being furnished by the scrap heap.

Construction

As will be seen by the photograph, the tuner consists of one basket coil rotatable about an axis inside another basket coil which is fixed. It will also be noticed that both coils are ball shaped, thus rendering closer coupling possible and increase of the wavelength range.

Winding the Coils

In the first place, prepare carefully a cylinder of wood 2⅜ in. in diameter and 3 in. long and the distance pieces H and K (Fig. 1). Eleven of each of these distance pieces are required. The cambered pieces K are used for both the rotor and stator. This is not strictly good practice, as the camber required for the stator is of greater radius than that of the rotor. However, in order to save time, the same packings for the dual purpose can be used satisfactorily.

Now carefully draw the former template (Fig. 2) the correct size, cut it out and gum it round the cylinder. If the cylinder is accurate the template will fit exactly. Having fixed the template and allowed it to dry, the distance pieces K are successively placed in position and fixed with the headless nails as shown in Fig. 3.

The former is now ready for the rotor winding. This is a very simple matter, as the lines on the former are traced with the wire and no mistake is possible. Eight layers, or 112 turns, are wound, after which the winding is secured with cotton in the usual way. A coat of very thin shellac varnish is now given, which considerably increases the rigidity of the coil while adding but slightly to its self-capacity. The winding is now left for twenty-four hours to dry, after which the former can be taken apart and the rotor winding removed.

The former is now prepared, as indicated in Fig. 4, for the stator windings. Six layers, or 84 turns, are given. This coil is finished off like the rotor coil. It is very important to use good shellac varnish, and the coils should be heated in a warm oven to drive off traces of moisture.

Mounting the Coils

Having completed both coils their mounting is a simple matter. Study the sketches of the requisite parts and their construction will prove very easy. The parts (Fig. 5) are assembled as indicated by the photograph, and no difficulty should

(*Concluded at foot of page 249*)

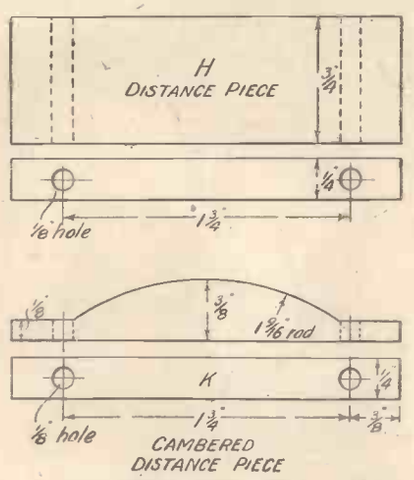


Fig. 1.—Details of Distance Pieces.

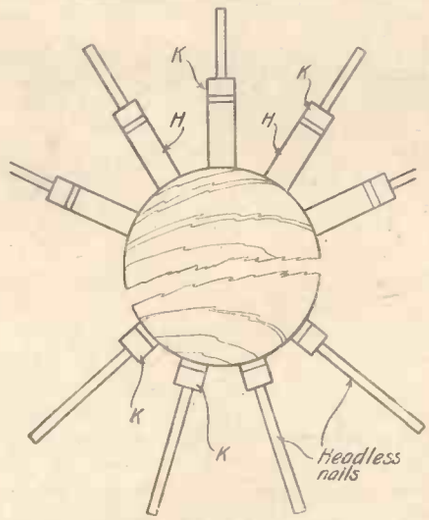


Fig. 3.—Method of Building Rotor Former.

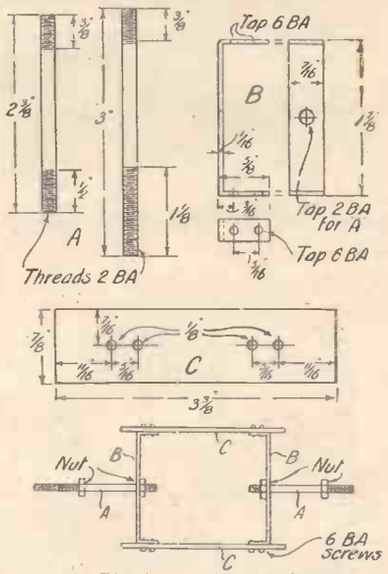


Fig. 5.—Details of Spindles and Bearings.

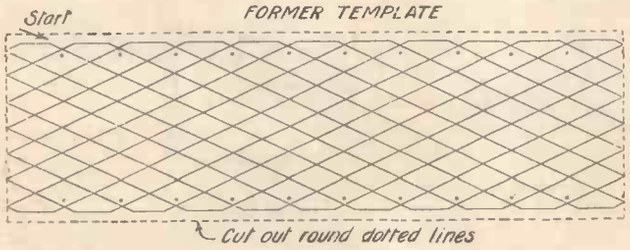


Fig. 2.—The Former Template.

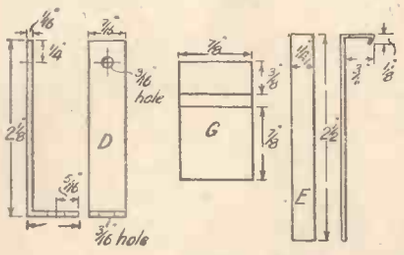
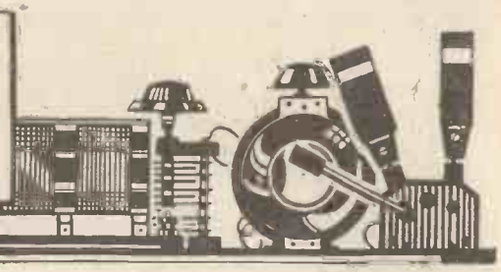


Fig. 4.—Details of Stator Former.

THE DIFFERENT METHODS OF APPLYING REACTION



THERE can be little doubt but that the discovery of the reaction principle has done more to make long-distance wireless reception possible than anything else since the invention of the three-electrode valve.

The principle, of course, makes use of the fact that the valve is an amplifier, and that the current variations in the plate circuit are of greater amplitude than those in the grid circuit. A certain portion of the plate-circuit energy is handed back to the grid circuit in such a manner as to nullify the effect of some of the resistance of the grid circuit.

When receiving telephony it is not possible to make the energy in the grid circuit greater than it would be were the damping of this circuit zero, as if this were done the valve would commence to generate oscillations. Still, if the damping of the grid circuit, which is often the aerial circuit, is made almost zero, very little of the received energy will be lost.

The transference of energy from the plate circuit of a valve to the grid circuit of the same, or of a preceding, valve may take place through a magnetic coupling, through a condenser, or through both a magnetic and a capacity coupling.

In Fig. 1 is shown the popular circuit

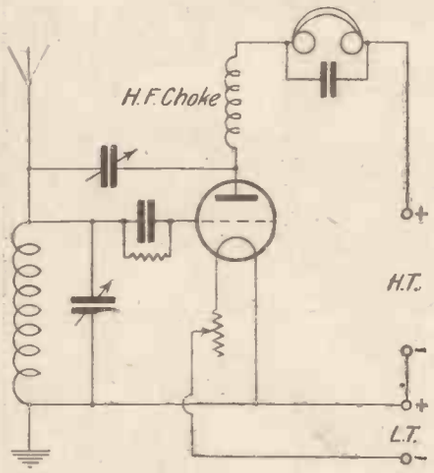


Fig. 2.—In this Circuit a Condenser provides Reaction Coupling.

which is used in perhaps 90 per cent. of single-valve sets. Reaction is obtained by coupling a coil in the plate circuit of the valve to the grid-circuit tuning coil. The coupling in this case is purely magnetic, and care must be taken that it is in the right sense.

Variations of this arrangement occur when H.F. valves precede the detector, in which case the reaction may be from the detector-plate circuit to the grid circuit of the first H.F. valve, or from the detector-plate circuit to one of the tuned intervalve H.F. couplings. In the first case more or less reaction is applied to all the circuits between the first grid circuit and the de-

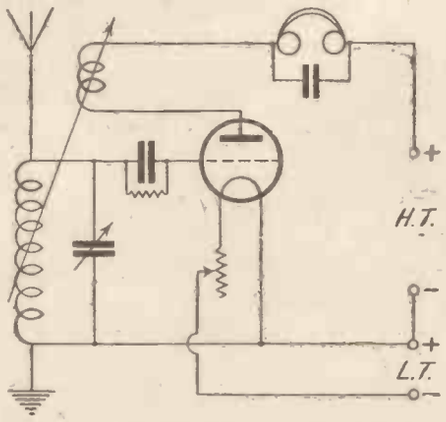


Fig. 1.—The Most Common Method of Applying Reaction.

tector-plate circuit, while in the second case reaction is only applied to the circuits between the intervalve coupling *to* which reaction is applied, and the plate circuit *from* which it is applied—the detector-plate circuit.

Reaction on to the first grid circuit (often the aerial circuit) gives the greater signal strength when it can be used without causing the set to oscillate uncontrollably. A more efficient method than either of the above, but one which calls for greater operating skill, is to apply reaction from the detector-plate circuit to the first-grid circuit, *and* to the tuned intervalve coupling.

A disadvantage of using magnetic reaction is that two coils are required, one of which must be movable. Thus difficulty may arise when building a portable or other compact set owing to the necessity of allowing space for the moving coil to operate. Another disadvantage is that it is necessary to change the reaction coil when receiving on a different band of wavelengths.

Capacity Coupling

Capacity coupling is greatly favoured for use in portable sets, as instead of a moving coil a small variable condenser is used to provide the reaction coupling. An arrangement of this type is depicted in Fig. 2, where it will be seen that the reaction condenser is connected between the plate of the valve and the grid side of the A.T.C.

A H.F. choke coil is placed in the plate circuit of the valve in order to prevent the H.F. currents from passing through the telephones. This choke coil is not always necessary, as often the high inductance of the phone windings serves the purpose.

The ultraudion circuit employs capacity reaction, but in this circuit the inter-electrode capacity of the valve is used instead of a separate reaction condenser. As the reaction coupling is fixed it is not so easy to adjust the circuit to its most sensitive condition as is the case with the circuits shown in Figs. 1 and 2.

Magnetic Coupling

The Reinartz circuit, shown in Fig. 3, employs both capacity and magnetic reaction. The magnetic coupling is fixed, but the proportion of the H.F. energy, supplied from the plate circuit of the valve, which flows through the reaction turns, is governed by the capacity of the reaction condenser. The greater this is, the lower is the impedance of the condenser, and the greater the reaction effect.

As in Fig. 2, it is necessary to prevent the H.F. energy flowing too easily through the phones, and a H.F. choke coil is often employed, as shown in Fig. 3. If this is not used, and it is desired to make use of the inductance of the phone windings, or of the primary of an intervalve transformer

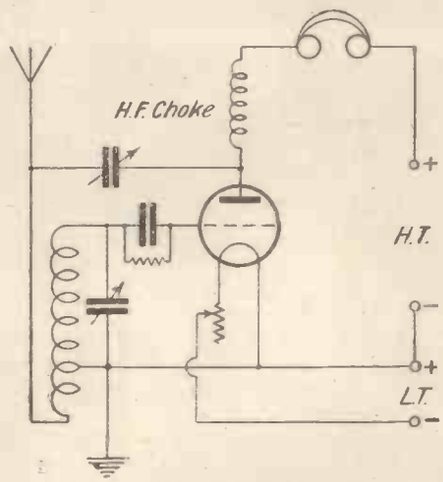
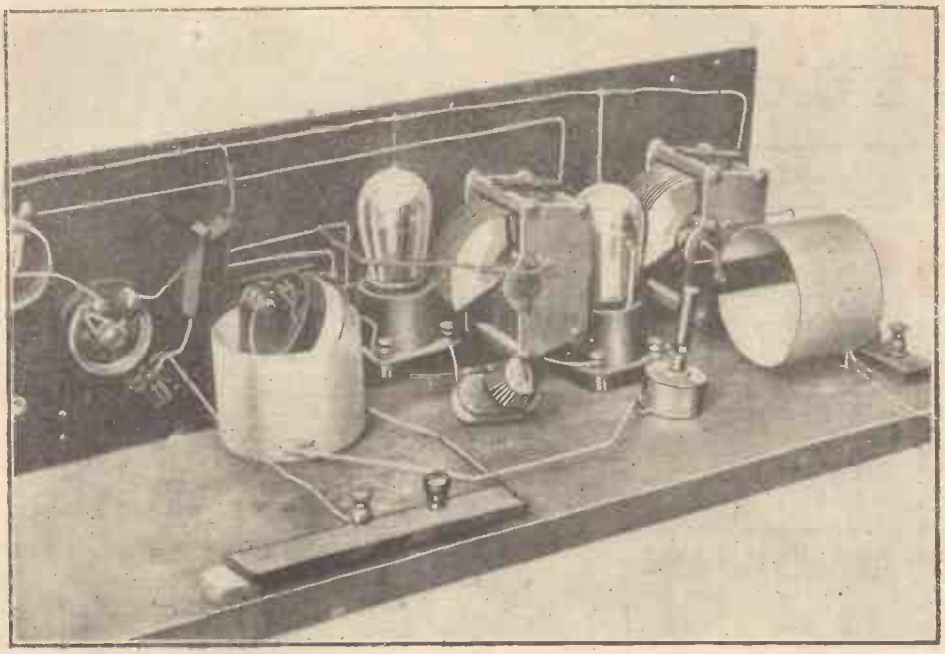


Fig. 3.—The Reinartz Circuit with Capacity and Magnetic Coupling.

when an L.F. stage follows the detector, no condenser should be placed across the phones or transformer primary, as this would bypass the H.F. energy.

When either of the two arrangements first described is used it will be found that an alteration of the reaction coupling affects the tuning of the grid circuit, which makes operation rather difficult. In the Reinartz circuit this effect is not so noticeable as in other circuits.

J. F. J.



Three-quarter Back-of-panel View of Two-control Two-valver.

A SELECTIVE T
TWO-V
Embodying the Silv

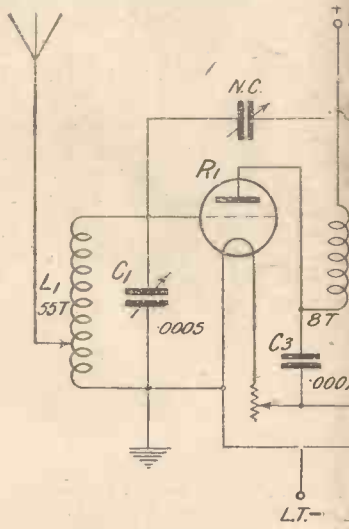


Fig. 1. Circuit Diagram of

WITH the rapid increase in the number of broadcasting stations all over Europe a demand has arisen for sufficient selectivity to separate one from another with ease. While the readjustment of wavelengths by Geneva will undoubtedly clear the ether of much of the present heterodyning, it will not, in the writer's opinion, make listening any more pleasant for the owner of a broad-tuning set, as a 10-kilocycle separation, while ample for a really selective set, will leave hardly a point on the 200-600 metre band where at least two stations will not be heard.

The Silver-Marshall Circuit

Some months before this demand became insistent the writer was experimenting in this direction and reading of the wonderful performances of various neutrodyne circuits, but finding tuning somewhat difficult without a third hand, decided to try something simpler. The object then became a question of finding a set which gave very sharp tuning with only two dials and without the bother of a wave trap. The result was the circuit, the American Silver-Marshall, about to be described, in which the tuning is done with two vernier dials, with a third control for reaction, which, however, needs very little attention after the set is properly adjusted.

Selectivity, while not that of a good supersonic heterodyne, is certainly good, as the results to be described later will show, and the sensitivity is said to be as great on a favourably-situated outside aerial as the super-het working on a frame. It is, of course, much more economical of both L.T. and H.T. batteries than the latter. Further, by the use of a neutralised H.F. stage before the regenerative detector, re-radiation of oscillation in the set is eliminated, or at least reduced to a very small amount. The reaction control, too, is so easy that there is no need to force the set to yield the very last ounce of power when searching for distant stations.

A word of caution: this circuit will probably not be the solution of the interference problem of the would-be distant listener so unfortunate as to be situated within three or four miles from the local station, but those ten miles or more away will certainly be able to pick up many foreign stations without resort to a wave trap or other multiple-dial circuits.

The H.F. and detector circuit only will be described, so that the experimenter may use either headphones or add any number of L.F. stages according to individual taste. The set is essentially a four-valve loud-speaker set, and when used as such no resort to phones for tuning is necessary, as the dials are in step. That is, when one dial reads 60 the other will be 60 also, or at worst 59 or 61. One stage of transformer-coupled L.F. amplification will be quite sufficient for the nearer B.B.C. and good Continental stations. The circuit is shown by Fig. 1.

List of Components

Aerial coil and detector coil; two .0005 variable condensers (Igranic, G.E.C., Rothermel) (C1 and C2); one each .006 and .001 fixed condensers (Dubilier) (C3); one .002 fixed condenser (Dubilier) (C4); one neutralising condenser (Gambrell) (C5); two 6-volt .25-ampere valves (Cleartron, Mullard, B.T.H., Osram); two valve holders (any good anti-capacity type); two 30-ohm rheostats; one .0003 condenser and two megohm grid-leak unit (Dubilier); one single-circuit jack (Ashley); two 4-in. vernier dials; one dial (any sort); one panel, 7 in. by 18 in., or nearest standard; seven terminals; ½ lb. No. 22 d.c.c. wire; ¼ lb. No. 30 d.c.c. wire; two terminal strips; one 3-in. cardboard former 10 in. long; ebonite: two pieces 5/8 in. by 3 in. by 1/8 in., one piece 5/8 in. by 3½ in. by 1/8 in., one piece 2 in. by 3½ in. by 1/8 in., one ring 2 in. diameter, 1 in. long, 1/16 in. thick; soldering tags, nuts, screws and wire, etc.

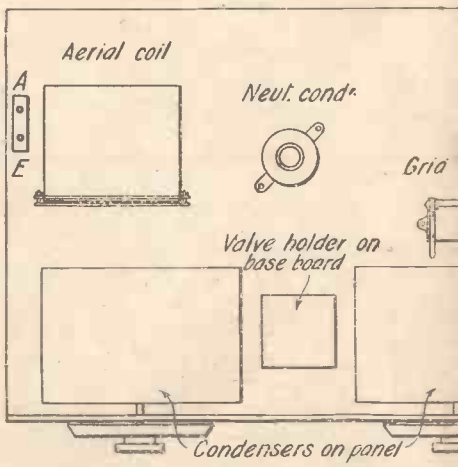
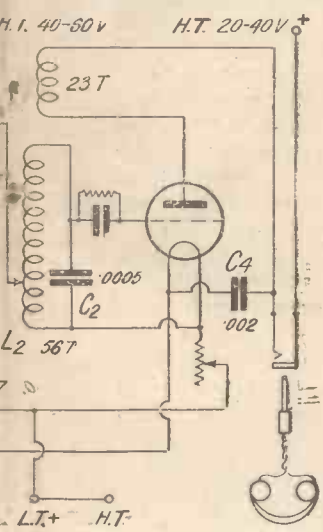


Fig. 3.—Plan of Receiver sh

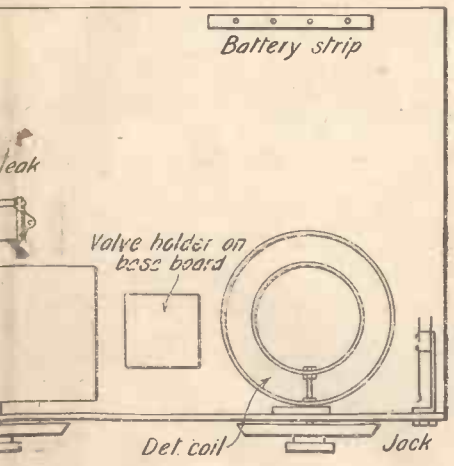
WO-CONTROL ALVER

er-Marshall Circuit

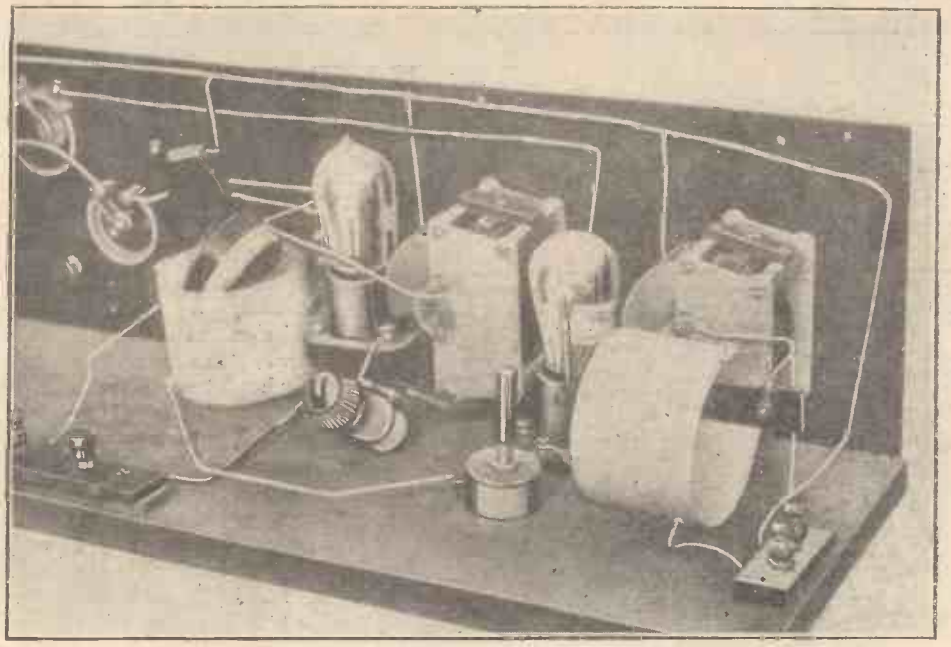


Two-control wo-valver.

In purchasing the components mentioned care should be taken to employ only those of undoubted quality. The variable condensers should be the straight-line-frequency type, if obtainable, or at least square law. The use of American-type valve sockets will greatly simplify the wiring, as the low-tension leads may be isolated from grid and anode leads, thus lessening the chance of stray couplings, although any good anti-capacity holder will do. Both valves should be of the small power type (6 volt .25 amperes),



owing Layout of Components.



Another View of the Back of the Receiver.

such as the CT25, B4, DFA1, etc. The Cleartron and Mullard may be obtained with either English or American bases. It cannot be too strongly emphasised that departure from the general type will mean very poor working of the set, as it was designed to work with the small power valve, and the various windings are suited to the anode impedances of these valves.

The condenser dials should be of the geared or cam-vernier type, and as large as possible. The particular dials shown in the photograph are the ultravernier 20-to-1 American dials (Rothermel), which have proved excellent in use, as a great number of stations may be pencilled on them without destroying their attractive appearance. The writer's practice has been to reserve the top and largest circle for B.B.C. stations, the second for German and French, and the third for more distant stations such as Rome, Zurich, Vienna, etc., while the little tail at the bottom is for amateurs. Any large vernier dial, however, or the dial supplied with the condenser, if of good size, will answer just as well.

The Panel

A 7-in. by 18-in. by ¼-in. panel (see Fig. 2) will be sufficient to contain the two-valve unit without crowding, and one 6 in. longer a four-valve unit. In the writer's set considerable space was saved by placing the condensers in the somewhat unusual position shown. The aerial coil should be directly behind its own condenser and supported by its own connection wires alone. The H.F. valve is placed between the two condensers (Fig. 3), the detector valve between the second condenser and detector coil and mounted on the panel about 1½ in. above the baseboard, thus ensuring very short grid and anode connections. It would be better to place the rheostats directly behind their respective valves instead of at the extreme right as illustrated (Fig. 3), as this arrangement simplifies the wiring and makes for a more attractive appearance.

Details of Assembly

The detector coil and reaction unit are placed at the extreme right, the spindle being on a line with the condenser spindles and equally spaced (see Fig. 4). The hole indicated at the extreme lower left-hand corner of the first photograph is for a single-circuit jack. The neutralising condenser can be clearly seen at the back of the panel, well spaced from any other parts. The other object at the back is a variable grid leak, which, however, has not been found of any advantage in this circuit, the ordinary clip-in type being quite suitable. Condenser C4 can best be hung on the wiring, and it is important that the specified value be used, but C3 is not critical and may be of rather large value. Aerial and earth terminals should be on a separate strip, and are best placed as shown to afford additional support to the aerial coil. The L.T. and H.T. terminals may be placed on a strip at the back or on the panel according to individual needs.

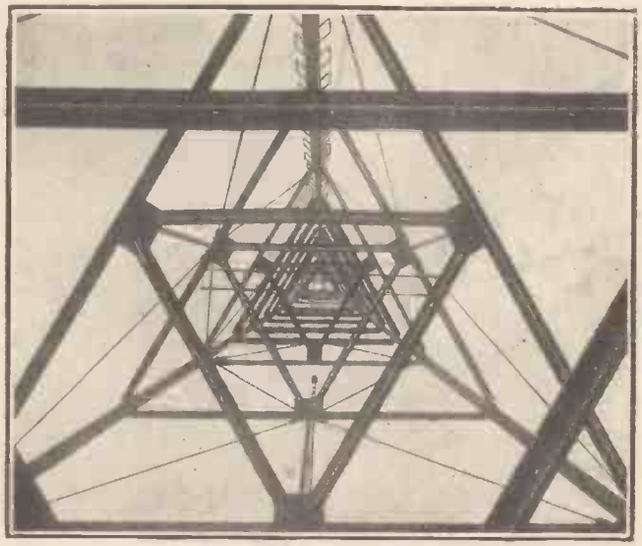
The coils, which are very efficient, and upon which the success of the set depends, may be obtained complete from Messrs. Rothermel, but as the winding presents no great difficulty or expense the method of procedure will be shown in detail. The aerial coil, wound on a 3-in. diameter cardboard tube about 5 in. long, contains 55

(*Continued at foot of next page*)

THE AERIAL TOWERS OF W J Z

By LLOYD JACQUET

THE new W J Z station is situated at Bound Brook, New Jersey, about twenty-four miles south of New York City. It is every listener's hope that he may be permitted to go and see the most modern station in existence. It is of the "super-power" type, and boasts of all the latest improvements, even to the crystal control of the wavelength. Normally it transmits on 25 kilowatts.



A View Looking Up One of the Aerial Towers of W J Z.

The other day, as representative of AMATEUR WIRELESS, I received permission to see the station. The matter which interested me most, apart from the "pie-plate" aerial vernier condensers and the vacuum tube cooling towers, were the aerial towers. One can see them from afar; they are 300 ft. high and the tallest things for miles around in that flat section of New Jersey.

The United States Airmail Flying Field is only a few miles distant, and only an airman can appreciate the inconvenience of two 300-ft. objects sticking up in his path.

But as soon as the officials of the Hadly Airmail Field discovered these two structural steel obstructions rising, they decided that besides supporting an aerial they could be used for other purposes also. Consequently, a possible air menace was quickly converted into a guide pylon by day and an aerial lighthouse by night.

It was easy enough to paint the steel structure white for daytime warning, but it was quite another matter to install a light at the top of the tower for evening warning. Indeed it was impossible to do so, because the towers, to prevent absorption, are insulated from the ground. They accumulate quite a large charge when the station is in operation, and no lights or wiring could be located on them. However, the situation was solved when red reflectors were fastened at the top of each tower and so placed as to reflect the beams of searchlights on the ground.

That will explain to the visitor to W J Z the reason for those queer "caps" 300 ft. above the ground level, fastened next to the two ends of the six-wire cage used for broadcasting.

Distant listeners to the Glasgow station still experience unceasing heterodyning by an unidentified foreigner. There are confident anticipations that the new wavelength scheme will bring the trouble to an end.

"A SELECTIVE TWO-CONTROL TWO-VALVER"
(*continued from preceding page*)

turns of No. 22 d.c.c. copper wire, a twisted tap being taken at the tenth turn. The end nearest the tap is connected to earth, the tap to aerial, and the other end to the grid of the H.F. valve. The second coil is of the same dimensions, except that it has 56 turns forming the secondary; it is tapped at the tenth turn as before. The primary is wound in the same direction inside the secondary at the tapped end of the coil, and consists of eight turns of No. 30 d.c.c. wire. The reaction coil is wound in the same direction as the other coils on a cylindrical piece of ebonite 2 in. in diameter, 1 in. long, and $\frac{1}{16}$ in. thick, and consists of 23 turns of No. 30 d.c.c. wire. The tap on the secondary goes to the neutralising condenser, the end nearest the tap to L.T. +, and the further end to the grid leak. The top of the primary winding goes to H.F. valve anode and the bottom to H.T. + 40-60 volts. If this arrangement does not seem to work well try reversing the leads. Assuming the reaction wiring to be parallel to the other wiring, the top connection goes to phones or jack and from thence to H.T. + and the bottom to the anode of the detector valve. If tightening the coupling does not cause oscillation, reverse these leads also.

Detailed instructions for winding the coils and operating the receiver will be given in a concluding instalment.

(To be concluded.)

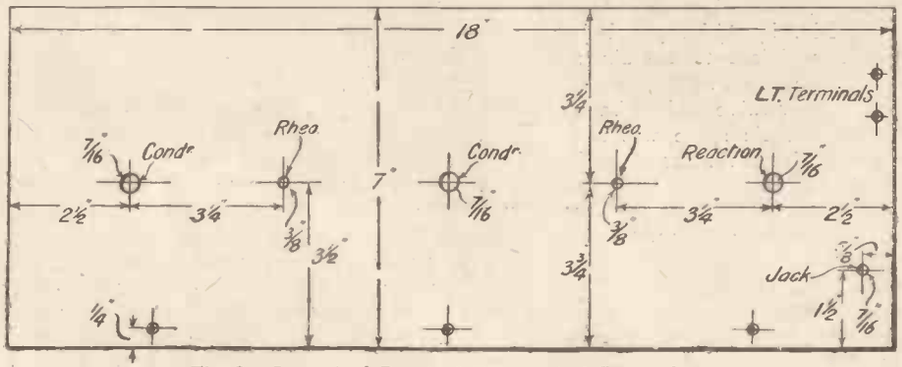


Fig. 2.—Layout of Panel of Two-control Two-valver.

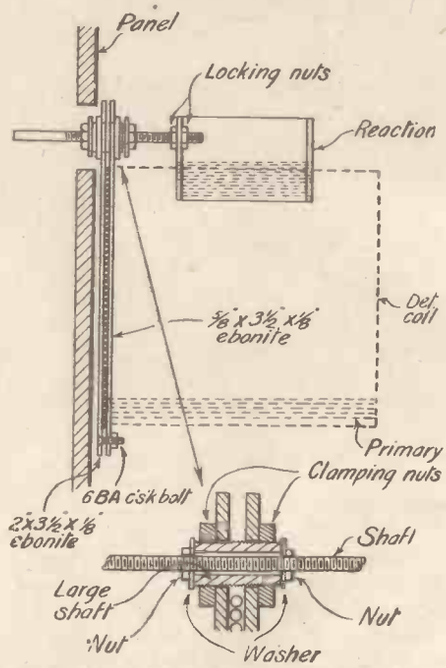


Fig. 4.—Method of Mounting Detector Coil and Reaction Unit.

"A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

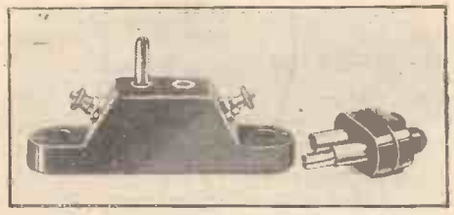
An Aerial Earthing Plug

THE Athol Engineering Co., Ltd., of Tiger Works, Seymour Road, Crumpsall, Manchester, have submitted to us for test an advance sample of their aerial earthing-plug.

The component consists of a large porcelain base fitted with two terminals and provided with holes so that it may be screwed to any convenient piece of woodwork near the aerial and earth leads. A plug and switch is provided, so that when the former is pulled out the aerial and earth leads are shorted and the risk of lightning damaging the set is eliminated. Leads to the set itself are attached to the plug. By pushing the plug down into the base the short circuit between aerial and earth is broken.

As far as insulation and ruggedness of construction are concerned, the device has everything to recommend it, and for the majority of receivers, where slight losses are unimportant, the switch will be found extremely useful.

We can recommend this switch as one of the few which completely isolates the set when the plug is removed.



Athol Earthing Plug.

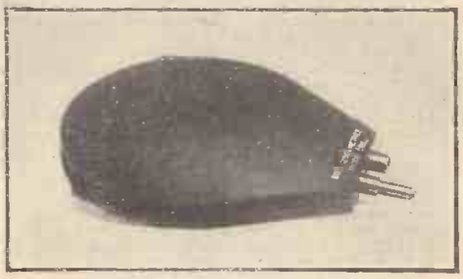
Zincs and Connectors for H.T. Batteries

WE have constructed a very efficient H.T. battery by using the carbon rods and sacks from an old dry-cell battery and the special zincs and connectors manufactured by Cole and Vincent, of 147, Barclay Road, Walthamstow, E.15. These zincs and connectors dispense with the need for soldering, and consist of a piece of curved zinc plate measuring 1½ in. by 2 in., to which a short piece of wire is attached; the free end being coiled in a small spiral which can fit tightly round the carbon rod.

The carbon rod, with its enclosing depolarising sacks, are then placed in small glass jars, the rims of which should be coated with wax to prevent creeping. Each jar is then nearly filled with a weak solution of sal-ammoniac. In this manner an H.T. battery is obtained which has a much longer life than the totally-enclosed dry type. Each cell is accessible for inspection, and if faulty is easily replaced.

H.T.C. Plug-in Basket Coils

WELL-MADE and efficient plug-in coils are made by the H.T.C. Electrical Co., Ltd., of 2, Boundaries Road, Balham, S.W.12, one of which is illustrated here. The cores are wound basket-weave fashion, and are completely enclosed in a polished black case, the ends of the coil being brought out to plug and socket connections. By the use of several of these



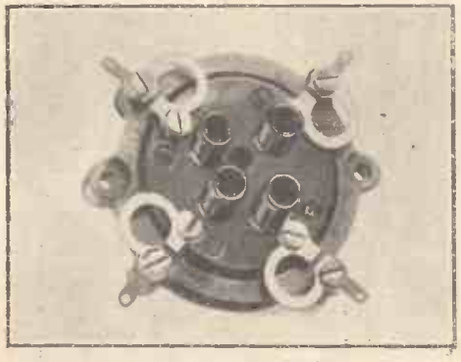
H.T.C. Plug-in Basket Coils

coils the complete broadcast wavelength range is covered, the wavelength for which each coil is suitable being indicated on the case.

On test these coils gave very good results. The H.F. resistance and self-capacity are low and the pure inductance high.

Anti-microphonic Valve Holder

A VERY well-made valve holder of the anti-microphonic type which we have recently tested is produced by Harlie Bros., of 36, Wilton Road, Dalston, London, E.8. The component is made in two moulded parts, an inner floating platform on which the four valve sockets are mounted, and an outer fixed moulding which screws down to the baseboard and



Harlie Valve Holder.

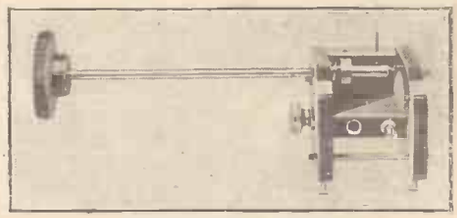
supports the floating platform by four C-springs, which also serve the purpose of connections to the valve sockets. Each valve socket is itself insulated, the anode socket being immediately recognised from the others by a red coloration round the rim. Superfluous dielectric between the sockets has been removed, thereby reducing the inter-electrode capacity and other losses.

By the well-designed formation of the floating platform it is impossible to fracture the springs supporting the latter by the insertion or withdrawal of a stubborn valve. Soldering tags, the connections of which are clearly indicated by letters moulded on both portions of the component, are provided.

Tested in an actual receiver under working conditions, the valve holder effectually absorbed any external vibration, imparting to the valve a slow swinging motion which had no effect on reception.

The Penton Coil Holder

A FEW weeks ago we gave a report in these columns of the Penton coil holder, manufactured by the Penton Engineering Co., of 15, Cromer Street, London, W.C.1. A new edition of this model has been produced which, while retaining the excellent features previously described, shows a great improvement by the use of adjustable helical-cut gears, which, together



Penton Coil Holder.

with the adjustable metal bearing, completely banishes back-lash and takes up any wear. It is seldom that we have seen such an ingenious method for the elimination of back-lash, especially with metal gears.

The gear ratio is approximately 8 to 1, and an extra long operating handle is provided to avoid hand-capacity effects. To the moving-coil block is attached an adjustable tension device which ensures that the moving block will not fall under the weight of a heavy coil. In the same manner the degree of coupling between two coils may be permanently fixed by locking the tension device. The component, besides being well made and finished, is constructed of good insulating ebonite.

For mounting purposes four screws are inserted in tapped holes drilled in the bottom edges of the ebonite end-plates. The coil holder may thus be fixed to a panel or to a wooden baseboard, the control handle passing through the panel.

RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 252).

Mixing Accumulator Acid.

Q.—*What is the correct way of mixing and adjusting the electrolyte of an accumulator?—A. C.* (*Hendon*).

A.—Acid of 1.22 specific gravity contains about 1 part of concentrated pure acid to about 3 or 3½ parts of water by volume.

In mixing this, add the acid slowly to the water (and *not* the water to the acid) and wait till the solution is cold. Evaporation from the cells should be corrected by the addition of distilled water.—R. U.

New Short-wave Circuit.

Q.—*In reference to the article "A New Short-wave Receiving Circuit," published in* AMATEUR WIRELESS *No. 212, I should be glad to have the information required to construct a set incorporating the circuit. In the photograph there appear three variable condensers, whereas only two are used in the circuit.—G. C. P. B.* (*S.W.14*).

A.—For the broadcast band the aerial wire is connected to *a'* and the aperiodic coil short-circuited as stated by means of a clip and lead seen in photograph. This is done to prevent action on coil A, which, together with its loading coil, is now the only aerial inductance. The second clip and lead are only used for short-circuiting turns of A, and are removed for broadcast reception.

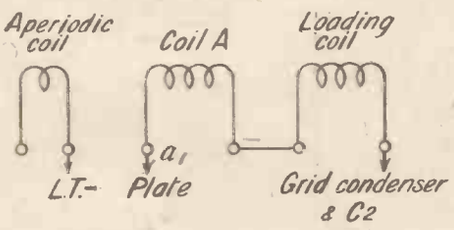


Diagram of Coil Connections.

The variable condenser on terminal strip is connected in series with the aerial where necessary, and can be omitted altogether. The set differs in no way from the circuit diagram except in experimental additions such as that of the condenser.—G. B.

H.T. Negative Connection.

Q.—*In some circuits H.T. negative is shown joined to L.T. positive, while in others it is connected to L.T. negative. Which is the correct method?—R. S.* (*Surrey*).

A.—When H.T. negative is connected to L.T. positive the effective voltages applied to the plate is that of the H.T. battery plus that of the filament battery, and these few extra volts may be useful in some cases. However, with such connection, should a part of the anode circuit be accidentally earthed there is a risk of the filament being burnt out by the current from the H.T. battery. With the negatives of the H.T. battery and the accumulator connected together this risk is eliminated, so that this method is to be preferred.—J. F. J.

Aeroplane Telephony.

Q.—*What is the wavelength used by the cross-Channel aeroplanes, and should I be able to receive speech from the aeroplanes on two valves, one detector and one low-frequency?—F. T.* (*London*).

A.—The wavelength used is 900 metres, and you can tune your receiver by listening for Croydon, who works almost continuously during the day. You should receive Croydon loudly on two valves in London. You ought to receive speech from aeroplanes while they are on this side of the Channel, but if you wish to follow them all the way you should add one stage of high-frequency amplification.—J. F. J.

OUR WEEKLY NOTE

H.F. AMPLIFICATION

The use of H.F. amplification when it is not necessary, and its omission when really required, is the cause of much distortion in broadcast receivers. The use of switches in H.F. circuits cannot be encouraged on principle, but at the same time some means of cutting out the H.F. valves is really essential for good results when a set is to be used for both very long-range and short-range work.

At distances less than twenty miles or so from the main station a H.F. valve cannot do any useful work if the aerial circuit is fairly efficient. The detector valve has a limiting effect, being able to deal only with a certain maximum amount of energy, and when it is being worked at its full capacity signals cannot be made stronger by inserting H.F. stages in front of it, but these useless valves introduce a certain amount of distortion.

On the other hand, if no H.F. amplification is used for long-distance reception, the detector valve cannot work efficiently, as it also requires a certain minimum amount of energy to enable it to rectify properly, and reaction must therefore be pushed to the uttermost limit, which practice inevitably results in distortion.

THE BUREAU.

Friend: "Say, old chap, what's the value of your condenser?"
Broker: "Oh, point five."
Friend: "What! microfarad?"
Broker: "No—Bradbury."

Saturation Point.

Q.—*What is meant by "saturation point" as applied to a valve?—P. R. D.* (*Essex*).

A.—A valve is being worked at its saturation point when it is being operated at the top bend of its characteristic curve. This means that with the particular filament current and H.T. voltage being used all the electrons which are emitted by the filament are reaching the plate. Under these circumstances no increase in the plate current can take place however much the grid is made more positive.—J. F. J.

Fixed Condenser Across First L.F. Transformer.

Q.—*Why is a fixed condenser placed across the primary of the first low-frequency transformer?—A. K.* (*Mitcham*).

A.—Because the primary of the first low-frequency transformer is connected in the plate circuit of the detector valve, and in this circuit there is a flow of high-frequency current as well as the low-frequency current. The condenser by-passes the high-frequency current, but not the low-frequency current, which latter passes through the primary winding.—A. H.

Storing Accumulators Safely.

Q.—*As I understand that it is inadvisable to leave accumulators idle for any lengthy period, I should be glad of some information as to the necessary precautions which should be taken to avoid damage to my accumulator while I am on holiday.—F. G.* (*Rye*).

A.—First charge the battery fully and empty out all the acid into a glass or earthenware jar. Thoroughly wash out the accumulator with pure distilled water and then fill each cell with distilled water. The accumulator can then safely be left for quite a long period. Upon your return empty out the water and fill the cells with the original acid. Give a short charge at a low rate until the cells gas freely and the battery will be ready for use.—B.

Variometer and Variocoupler.

Q.—*Is there any real difference between a variometer and variocoupler?—B. M.* (*Shropshire*).

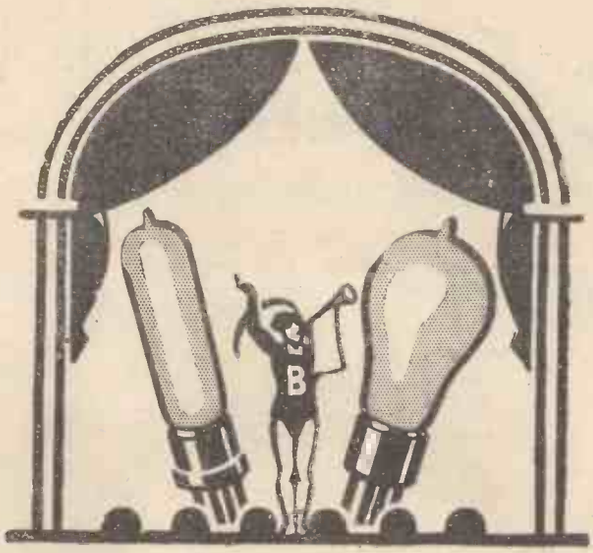
A.—Both these instruments look very much alike, as they both consist of two coils, one inside the other, these coils being either spherical or cylindrical. One coil is fixed, while the other is capable of being rotated; the fixed coil is called the stator and the movable coil the rotor. It is in the matter of connections that there is any big difference between them. In the variometer the two coils are connected in series and the instrument is used for tuning. By altering the relative arrangement of the coils the two fields can be made to reinforce or oppose each other, and the total inductance is therefore varied. The variocoupler is not used for tuning but for variably coupling two circuits together. Here the two coils are quite separate, and one is included in each circuit. In such a case tuning is accomplished by means of variable condensers. By altering the relation to each other of the two coils in a variocoupler the strength of coupling is varied. When the two coils are parallel to each other the coupling is strongest, and when they are at right-angles it is weakest.—J. F. J.

S.P.18 RED SPOT
An excellent all-round-purpose Valve. Very effective as an L.F. amplifier, especially in last stage. Exceptionally good as a rectifier and very efficient as an H.F. amplifier.
Fil. Volts: 1·6-1·8.
Amps.: 0·3.

S.P. 18 GREEN SPOT
Specially designed for resistance-capacity and choke coupling. Also suitable for use in early stages of L.F. amplification. A very efficient H.F. Amplifier and even a better detector than Red Spot.
Fil. Volts: 1·6-1·8.
Amps: 0·3.

S.P.18 BLUE SPOT
Extra high amplification Valve. With L.F. resistance-capacity coupling gives as much amplification as most valves with transformer. With a transformer, tremendous amplification. As an H.F. amplifier in stabilised circuits gives far greater amplification than otherwise obtainable. Takes only a fraction of the H.T. current taken by other valves.
Fil. Volts: 1·6-1·8.
Amps.: 0·09.

STAND No. 105 at the NATIONAL RADIO EXHIBITION.



Making their bow

EVERYONE knows the name BENJAMIN—makers of the world-famous Valve Holder. This season BENJAMIN will be doubly in the public eye—for a complete range of BENJAMIN RADIO VALVES is now on the market. In these valves are combined every recent discovery and advance in valve manufacture.

Greater amplification, greater output, less distortion, exceptionally good rectification, and extremely low filament consumption are among their more important features. Better results can be obtained from *any* receiving set if BENJAMIN VALVES are fitted.

Ask your dealer about them—or send to us for leaflet giving full particulars.

BENJAMIN

SHORTPATH

RADIO VALVES

THE BENJAMIN ELECTRIC LTD.,
Brantwood Works, Tottenham, N. 17.

STAND No. 105 AT THE NATIONAL RADIO EXHIBITION.

S.P. 55 RED SPOT
A perfect last-stage power Amplifier. Will handle an exceptional amount of power. Greater volume obtainable without distortion begins. Excellent in all stages with transformer or choke coupling. Also gives good results as H.F. amplifier or detector.
Fil. Volts: 5·5.
Amps.: 0·25.

S.P. 55 BLUE SPOT
An extra high amplification Valve with a moderate impedance. Designed specially for resistance and choke-coupled L.F. and for tuned anode H.F. Ideal for anode rectification.
Fil. Volts: 5·5.
Amps.: 0·09.

D.E. 55.
A very good general-purpose Valve for H.F., L.F., or detector work. Gives splendid results where the super-efficient SHORT-PATH Valves are not suitable because of their "liveliness." One of the most economical Valves with L.T. and H.T current.
Fil. Volts: 5·5
Amps.: 0·09.

STAND No. 105 at the NATIONAL RADIO EXHIBITION

ONE of the musical features of the broadcast from Olympia on September 4 will be the playing by the London Radio Dance Band of selections of old-fashioned dances.

It is reported that a new broadcasting station being erected outside Cologne is to have a power of 60 kilowatts.

Between now and September 15 the B.B.C. will conduct a number of tests on the new wavelengths between station and station, and every effort will be made to acquaint listeners with the best methods of adapting themselves to the new conditions.

A wireless message from London to America, costing nearly £500, contained the first screen story that has ever been sent by wireless across the Atlantic.

Remnant Acre is the title of a one-act play specially written for broadcasting by Dion Titheradge, to be broadcast from the London studio on August 30.

From 1 to 2 p.m. on October 29 the 2 L O station will relay from St. Lawrence Jewry, Guildhall, a quintet recital composed by Baron d'Erlanger.

On September 3 the 2 L O studio will broadcast another of the popular entertainments given by Willie Rouse, well known to listeners as Wireless Willie.

In Fifeshire and adjoining counties on the east coast, the new wavelength scheme is regarded with consternation. This area is mainly supplied by the Edinburgh and Dundee relay stations, and with these transmitting different programmes on the same wave it is held that good reception will be impossible.

Complaints are being made about the quality of the S.B. transmissions sent out by Belfast. The submarine cable difficulties are great, and some listeners in the North of Ireland find it preferable to take such broadcasts from Glasgow or one of the English stations.

The Pitlochry branch of the Women's Rural Institutes has provided a wireless installation in the Atholl Nursing Home at a cost of £117.

A recently issued list of American broadcasting stations reveals the large number of interests which make use of the microphone. Schools and colleges head the list with 94 stations; wireless and electric stores come next with 73; then come the miscellaneous stores with 65. Churches and religious organisations operate 44 stations, papers and publishers 37, and electric-equipment manufacturers 30.

A playlet entitled *Nerves,* by Miss Ann Stephenson, is to be broadcast from the London studio on September 2.

The Sandwich Pageant will, it is hoped, be broadcast from Sandwich on September 8.

The opera, *The Bohemian Girl,* will be transmitted on September 15.

The presidential address by the Lord Chief Justice, Lord Hewart, at the meeting of the Classical Association at Manchester University, will be heard on October 8.

The Dutch broadcasting station at The Hague, one of the earliest broadcasting stations, will be reopening shortly on a wavelength of 1,150 metres.

The B.B.C. is arranging a unique competition for the autumn, when the photographs of a number of artistes will be published, and these artistes will subsequently broadcast. Listeners will then be invited to identify the performers by means of the voice.

Dick Henderson, Yorkshire comedian, who was one of the artistes in the command performance at the Alhambra some months ago, will entertain London listeners on August 24.

In reply to many criticisms regarding the new wavelength scheme, the B.B.C. point out that these wavelengths are provisional, and that alterations will be made, if necessary, after the proposed scheme has been given a fair trial.

Owing to the strong representations being made, it is anticipated that marine traffic, using Morse on a 300-metre wavelength, will in future have to be conducted on a wavelength of 800 metres.

Music by the band of the 1st Lancashire Fusiliers will be relayed from Granville Gardens, Dover, and broadcast through Daventry on August 30.

Six wireless vans are in daily use by the Flying Squad of Scotland Yard in the prevention and detection of crime. The authorities at headquarters can communicate by wireless with the vans at any moment and get a reply.

Great alarm was created in the North of Scotland by the publication of a rumour that the Aberdeen station was to be scrapped in view of the new high-power regional transmitter scheme. It is now understood, however, that the B.B.C. are about to improve the Aberdeen station at considerable expense—a sufficient answer to the closing-down rumour

A wireless fog-signal has been established experimentally at Casquets Lighthouse, and will be operated continuously, or at such time as the experiments may require.

Vienna Fairs, Ltd., has arranged an International Exhibition of Broadcasting within this year's Autumn Fair (Sept. 3 to 12). A great many applications have already been received for this exhibition from Austria and from abroad, so that four halls in the Palace of the Fair had to be reserved.

The proposed reduction in the price of Free State broadcasting licences will, it is believed by the broadcasting authorities, result in a big increase in the number of licences paid for.

Another broadcast by Layton and Johnstone, the entertainers and singers, will take place at 2 L O on September 17.

In the new high-power low-wave station at Daventry the carrier wave will be produced at lower power and modulated at low power, the carrier being subsequently amplified up to 15 kilowatts.

"A Day in the Life of a Large Hospital" will be the subject of a talk by Mr. Philip Inman on August 28.

The National Institute for the Blind is endeavouring to provide the blind with wireless sets. Up to the present 158 sets and 282 pairs of headphones have been presented, 117 licences have been provided, and 26 aerials erected. An appeal is being made for old sets or discarded headphones.

The British Broadcasting Co. announces that Mr. G. C. Beadle, of the broadcasting station at Durban, South Africa, has been appointed director of the B.B.C. station at Belfast in succession to Major W. M. Douglas Scott, who has resigned on account of ill-health.

It is stated that certain American landowners, tired of poor programmes and continual jamming from certain stations, are now raising a claim that the ether above their land is their own property and that these stations in question are, therefore, trespassing.

Glasgow Radio Circle is chartering a large motor boat for a trip to Craigmarloch on September 4, when 20 cripple children from a city home will be the guests of the excursionists. An attractive programme ashore is being arranged, and it is expected that about 200 young folks in all will make the journey.

The tug, *La Morinie,* which accompanied Miss Lilian Cannon, one of the Channel-swimming aspirants, was equipped with a Marconi ¼-kilowatt quenched-spark set. By this means newspaper reports of Miss Cannon's progress were dispatched at regular intervals and transmitted by the direct Marconi service to America, where newspaper readers were enabled to follow the progress of the swim from hour to hour.

Sir Hamilton Harty.

NEXT WEEK AT 2LO

By "THE LISTENER"

Miss Winifred Small.

CONSIDERABLE variety is promised for next week. On Sunday afternoon the winning band of the Metropolitan Police Festival will broadcast. The soloists include old broadcasters in Miss Marjorie Hayward (leader of the Virtuoso String Quartet), Mr. Michael Head (baritone and composer), Miss Vivien Lambelet (who will sing two negro spirituals among others). Another singer, Dorothy Lebish, will join her in duets. The evening programme is devoted to the Norwegian composer, Edward Grieg. A well-known North Country soprano, Lillian Cooper, is the singer, Ethel Bartlett, solo pianist, and the orchestral examples will be played by Casano's Octet, in which Frederic Casano is the 'cellist.

Monday evening's programme commences with a Musical Divertissement by Mons. Camille Couturier, who, in addition to playing at Frascati's daily, is a solo virtuoso player on several instruments. On this occasion he will devote himself to the saxophone and flute. Then follow songs by Alexander McCredie and a group of pianoforte solos by the famous pianist Benno Schonberger. *Remnant Acre,* a one-act play by Dion Titheradge, will also be given. The ten o'clock feature programme is entitled "When We Were Children," and the general texture of the programme comprises themes of childhood. Fraser Simson's settings of A. A. Milne's poems, collected under the title of "When We Were Very Young," will be sung by Vivienne Chatterton, while the Wireless Orchestra will be conducted by John Ansell, who succeeds Dan Godfrey as the conductor of the orchestra.

Led by Samuel Kutcher, his quartet will be heard on Tuesday, the chief item being the rather more familiar Quartet in F by Dvorak, and in which, as in the "New World Symphony," he again uses negro tunes. The vocalist is Leonard Gowings, whose gramophone records also make such fine hearing.

A welcome relief is provided on Wednesday, when the evening commences with selections from comic operas and musical comedies, and the performance of a short operetta entitled *The Marchioness,* by B. W. Findon, with music by Edward Jones.

The first part of Thursday evening's programme consists of a violoncello recital by John Barbirolli, the conductor in the recent Chenil Galleries concerts as well as 'cellist of many of the broadcasting string quartets. The feature concert at ten o'clock will be carried out by Isabelle I'Anson (soprano) and Sinclair Logan (the blind baritone). Folk songs of Britain, collected by Frank Kidson, form the programme. There will be also performed a little play, *Nerves,* written by Ann Stephenson.

The classical atmosphere again prevails on Friday, when from 8.30 to 9.30, and from 10 to 11, a symphony concert will be given, conducted by Sir Hamilton Harty, the conductor of the Hallé Orchestra. Light symphonic music is promised, and a novelty in the form of a new suite of Bach works, arranged by the English composer Gerrard Williams. The modern element will be provided by the performance of a work, "Procession du Rocio," by Turina, one of the well-known Spanish composers of the day. Its first performance was given in England at a Promenade Concert at Queen's Hall in 1918, under Sir Henry J. Wood. Later, Willie Rouse will give a short recital.

On Saturday the Wireless Exhibition opens at Olympia, and a special morning concert will be given from a studio specially built as an exact replica of the large studio at Savoy Hill, by the Wireless Orchestra. Amongst the artistes will be Franklyn Kelsey (baritone) and Winifred Small (solo violin). A programme will also be given in the afternoon from 4 to 6 p.m., when the soloists are Alice Moxon (soprano) and Stuart Robertson (bass), with the Royal Air Force Band. The evening programme begins with a revue, also to be given in the Olympia studio. It has been specially written by Peter Haddon, of the Winter Garden Theatre, and bears the modest title, *The Awful Revue.*

Pianoforte Recitals

The 7.25 pianoforte recitals of the next fortnight are to be taken from the famous Fitzwilliam Virginal Books. These are a collection of Elizabethan pavanes, gigues, and other early English attempts, collected by Viscount Fitzwilliam, who died in 1816. The original edition of the Fitzwilliam book was in forty volumes. Excerpts will be made from these by Rae Robertson.

"TINNINESS"

ONE of the most objectionable faults that a set intended to work a loud-speaker can have is that of giving thin, "tinny" reproduction. There may be plenty of strength, but very little is heard of the lower notes, and there is no richness of tone. The piano sounds rather like a harpsichord, and there is a kind of "edginess" about other instruments. Tinniness is unfortunately rather a common failing in wireless sets, though it is not usually difficult to effect an improvement in the quality of the reproduction, provided that the set is not worked too near the oscillation point.

The cause of it is usually to be found in the low-frequency transformers, or in the loud-speaker itself. In such cases the first step should be to try the effect of shunting the transformer primaries or the loud-speaker windings with condensers of capacities varying from .002 to .01 microfarad. It will be found, as a rule, that the larger is the shunt capacity the lower will be the pitch. Another palliative is to place variable resistances of about 60,000 ohms across the secondaries of the low-frequency transformers.

The only real cure, however, is to scrap the transformers—small instruments with light cores and a little wire are the worst offenders—and to fit in their stead resistance-capacity or choke-capacity amplification for the first stage, followed by a really good modern transformer for the second. The difference in the results obtained is a revelation in ninety-nine cases out of a hundred.

J. H. R.

ELECTRIC-LIGHT AERIALS

AN aerial connection which is quite workable when reception from only the local station is desired can be made by means of the public electric-lighting mains. No actual electrical connection with the supply is necessary, and no fears need be entertained on the score of the possibility of getting "shocks."

Simply twist a short length of the aerial lead round the flex connection to one of the lamps, leaving one end free and taking the other as usual to the aerial terminal on the receiver. Signals are picked up by the great length of wire in the whole mains system, and are by-passed through the capacity of the twisted wires to the tuner and detector.

K. U.

Quality of Transmissions

SIR,—I, too, have somewhat the same sort of grumble as your correspondent H. B. (Southbourne) in No. 218. There is something radically wrong with the studios, whereas it is a pleasure to listen when a transmission is being made from the Grand Hotel, Eastbourne. Cannot the B.B.C. make a study of this wonderful room, and build and arrange their studios the same way. If not, I suggest they make arrangements for a nightly concert from there, as in comparison 2 L O is hardly worth listening to, except, perhaps, for London listeners. What is the use of blaming receiving sets when we have proof that transmission is at fault?—H. P. (Hove).

Safeguarding Valves

SIR,—I have seen it stated that valves of the dull-emitter variety may have their life or efficiency reduced by as much as 50 per cent. by being overrun for a short time on 2 volts (I am now referring to the 1.6 or 1.8 volt variety). Now, the new types of dull-emitters cannot be seen to glow at their normal temperature, and the usual method of test over the counter is to see if they will light. I think the public should be safeguarded against buying a valve with a filament damaged in this manner, and some form of seal should be on all valves, so that the filament could not be "lighted" up. The seal could be broken in the presence of the customer, and should be tested for continuity by a voltmeter. The test should show continuity of the filament, and at the same time prevent an excessive current from passing through the filament, because of the high resistance of the voltmeter.

I think that you will agree that some guarantee that the purchaser gets an undamaged valve as sent out by the makers is necessary.—W. A. M. (Tiverton).

L.F. Valve Coupling

SIR,—The letter from your correspondent F. P. in No. 217 contains certain statements with regard to my previous letters, to which, if I am not trespassing too much on your space, I should like to reply.

In the first case there is, of course, transformer *and* transformer coupling, and whilst it is perhaps not permissible to mention names of firms' products, the transformers I have in mind are referred to as being "nearly perfect," with which description they comply, and if your correspondent uses two stages employing these transformers the resulting purity will be a revelation; and I am prepared definitely to maintain that he will be unable to distinguish the purity of this method of coupling from that obtained by resistance-capacity coupling, which for equal volume when using ordinary commercial units will require four L.F. stages, although I am, of course, aware that by the use of anode resistances of the order of 1 megohm much greater amplification by the resistance-coupling method is to be obtained.

I regret if I misread F. P.'s proposal for connecting a resistance in parallel with a condenser and transformer primary connected in series, but even so my remarks hold good. Since a resistance of 100,000 ohms is connected across the condenser and transformer primary as indicated, the total impedance in the plate circuit of the valve can never exceed 100,000 ohms, so that the amount of amplification is limited by this consideration, and the impedance can never equal 100,000 ohms unless the impedance of the transformer primary and condenser is infinite, which can only happen at one frequency. At most frequencies the plate-circuit impedance will be less than 100,000 ohms, and the amplification curve will of necessity be of the humped variety, except that it may be a rather flatter hump than would be the case if the additional condenser and resistance were not employed. It should also be observed that the proportion of the valve-amplification factor which is passed on is that proportion which is impressed across the primary winding, which, owing to the condenser in series, will be less for low frequencies than for high ones. As already indicated, an inferior transformer may have its tone slightly improved by the additions referred to, but only at the expense of amplification, and even then without giving really pure results.

The remarks in the last paragraph of the letter referring to R. G. T.'s statements in No. 212 have arisen owing to the latter portion of my letter in No. 215 having been omitted for reasons of space. The reason why R. G. T. is not correct is that whilst it is the voltage impulse which is passed on to the subsequent valve, that voltage is impressed across the grid condenser and grid leak in series, only the proportion across the grid leak being actually passed on to the following valve. The voltage expended across the grid condenser and grid leak respectively is equal to the product of their respective impedances and the current which actually flows through them, the value of the current depending on the impedances of the items mentioned.

The grid-leak impedance remains practically constant at all frequencies, whilst the condenser impedance varies between practically nothing at high frequencies, say 10,000 cycles, and infinity at zero frequency. It therefore follows that at high frequencies a larger proportion of the voltage impulses from the previous valve is passed than at lower frequencies, which results in resistance coupling having a rapidly-falling amplification curve round about 75 cycles, and usually having a characteristic which rises from that frequency upwards very gradually.—J. B. (Moston).

[This correspondence is now closed.—ED.]

CHIEF EVENTS OF THE WEEK

SUNDAY, AUGUST 29.

London	Prize Band of Metropolitan Police Festival.
Birmingham	Symphony Concert.
Glasgow	Band of H.M. Grenadier Guards.
Manchester	Chester Cathedral Quartet.

MONDAY

London	Camille Couturier in a Musical Divertissement
Aberdeen	*Dido and Aeneas.*
Bournemouth	Popular Overtures, relayed from Winter Gardens.
Glasgow	Speeches at Annual Dinner of Inst. of Journalists.
Manchester	Broadcast version of "The Greater Glory."
Newcastle	Besses O' Th' Barn Band.

TUESDAY

London	The Kutcher Quartet.
Belfast	Arnold Trowell, 'cello.
Cardiff	*Gwen*, a Play by M. Tydfil Richards.
Manchester	Symphony Concert.
Newcastle	Parry Jones, tenor.

WEDNESDAY

London	Musical Comedy Programme.
Aberdeen	*Radiance*, a Gleam by J. Vaughan Emmett.
Belfast	*Grey Ash*, a Play by Leonora Thornber.
Cardiff	"The Enchanted Land," a Children's Programme.
Edinburgh	Glimpses of Foreign Lands.
Manchester	Buxton Gardens Night.

THURSDAY

London	*Nerves*, a Comedy in one act.
Birmingham	The Spirit of Carnival.
Manchester	Blackpool Calling.
Newcastle	*The Idol of Jade*—Dramatic Sketch.

FRIDAY

London	Symphony Concert conducted by Sir Hamilton Harty.
Birmingham	*What He Won.*

SATURDAY

London	Wireless Orchestra relayed from Olympia.
Bournemouth	Louis Hertel, Entertainer.
Belfast	Ulster calling Scotland.
Cardiff	Besses O' Th' Barn Band.
Glasgow	Irish Programme.
Newcastle	Song Recital by Nellie Walker.

"A NOVELTY IN VARIOMETERS" (*continued from page* 236)

be experienced. At the point where the rotor shafts pass through the stator winding, take great care that there is good clearance. The stator winding can easily be levered away from the shaft to effect this. The ends of the rotor winding are brought out via the shaft and bearing in the usual manner. C is of ebonite, the

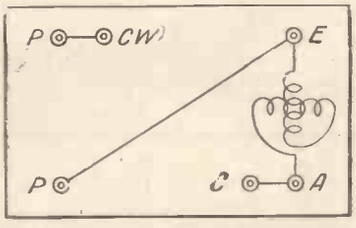


Fig. 6.—Diagram of Connections for Variometer.

other parts, with the exception of the wooden base F and the support G, are of brass.

A .0003 low-loss variable condenser connected, as shown in Fig. 6, with a D.P.D.T. switch should be used, though a .0003 fixed condenser will also answer. The detector and phones can be connected across the points A and B. W. H. C.

BROADCAST TELEPHONY

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to British Summer Time.

London (2LO), 361 m. 1-2 p.m., con.; 3.15-4 p.m., transmission to schools; 3.30-5.45, con. (Sun.); 4.15 p.m., con.; 5.15-5.55, children; 6 p.m., dance music; 7-8 p.m., time sig., news, music, talk; 8-10 p.m., music; 9.0, news (Sun.); 9.30 p.m., time sig., news, talk; 10 p.m., special feature (Mon., Wed., Fri.). Dance music on Thurs. and Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 379 m. **Newcastle** (5NO), 404 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 306 m. **Stoke-on-Trent** (6ST), 301 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun. and Tues.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily, 7.30 p.m. Sundays, 8.30 p.m. until 10.30 p.m.

CONTINENT

The Times are according to the Continental system; for example, 16.30 is 4.30 p.m., and 08.00 is 8 a.m. B.S.T.

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 531 m. (10 kw.). 15.30, con.; 19.25, news, weather, time sig., con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 20.10.

BELGIUM.

Brussels, 487 m. (2½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news. Relay: Antwerp, 265 m. (100 w.).

CZECHO-SLOVAKIA.

Prague, 372 m. (5 kw.). Con., 20.00-23.00, daily.

Brunn (OKB), 521 m. (2.4 kw.). 10.00, con., news (Sun.); 19.00, con. (daily).

Kbely, 397 m. (500 w.).

Kosice, 2,020 m. (2 kw.). 19.00, con.

DENMARK.

***Copenhagen** (Radioraadet), 347.5 m. (2 kw.). Sundays: 10.00, sacred service; 16.00, con.; 20.00, dance. Weekdays: 20.00, lec., con., news, con.; dance to 24.00 (Thurs., Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00.

*Relayed by Odense (810 m.), Sorö (1,150 m.).

FINLAND.

***Helsingfors** (Skyddskar), 520 m. (500 w.).

*Relayed by Tamafors (368 m.), Jyvaskyla (561 m.), Uleaborg (233 m.).

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. Con.: 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 07.15, 08.00, physical exercises; 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (daily). Relays PTT, Paris: 07.15, 08.00 (daily).

Radio-Paris (CFR), 1,760 m. (about 3 kw.). Sundays: 12.45, con., news; 16.45, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 10.40, news; 12.30, con., weather, news; 16.30, markets, con.; 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 463 m. (800 w.). 07.15, 08.00, physical exercises (except Sun.); 20.30, lec. (almost daily); 21.00, con. (daily).

Le Petit Parisien, 333 m. (1 kw.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio L.L. (Paris), 350 m. (250 w.). Con (Mon., Wed., Thurs.), 20.30.

Radio-Toulouse, 433 m. (2 kw.). 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily).

Strassburg, 205 m. (100 w.). 21.15, con. (Tues., Thurs.).

Radio Agen, 318 m. (250 w.). 20.30, con. (Tues., Fri.).

***Lyon-la-Doua**, 480 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse**, 260 m. (2 kw.).

***Bordeaux**, 411 m.

* Relays of PTT Paris.

Montpelier, 220 m. (1 kw.). 20.45, con.

Angers (Radio Anjou), 300 m. (500 w.) Daily: 20.30, news, lec., con.

Bordeaux, 332 m. Con., 21.00 (Mon., Fri.)

Mont de Marsan, 390 m. (300 w.). Con (weekdays only), 20.30.

Algiers (N. Afr.) (PTT), 310 m. (100 w.) 22.00, con. (Mon., Thurs.).

Ste. Etienne (Radio Forez); 220 m. (100 w.)

GERMANY.

Berlin, 504 m. (4 kw.). 06.30, con., phys. exer. (Sun.); 09.00, sacred con. (Sun.); 12.55, time sig., news, weather; 17.30, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (Sat., Sun., Thurs.). Relayed on 1,300 m. by Königswusterhausen (1,300 m.) and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, con. (Sun.); 15.00, lec. (daily); 20.30, relay of Berlin (Vox Haus) con. (not daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 418 m. (3 kw.). 12.00, con. (daily), Divine service (Sun.); 17.00, con.; 20.30, con., weather, time sig., news, dance (relays Berlin). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (3 kw.). 08.00 sacred con. (Sun.); 16.00, con. (Sun.); 16.30 con.; 20.00, lec., con., weather. Dance: relays Berlin. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (3 kw.). Relayed by Bremen (279 m.), Hanover (297 m.), Kiel (234 m.). Sundays: 07.25, time sig., weather, news; 09.15, sacred con.; 13.15, con.; 18.00, con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 05.45, time sig., weather; 07.00 and 07.30, news, weather; 16.15, con.; 18.00, relays Berlin; 19.00, con.; 22.30, dance (Sun., Thurs., Sat.).

Königsberg, 464 m. (1 kw.). 09.00, sacred con. (Sun.); 16.30, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (3 kw.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 12.00, con. (daily); 16.30, con.; 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 485 m. (3 kw.) and 204 m. (1½ kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec., con. (Sun.).

(Concluded on page 252)

"BROADCAST TELEPHONY" (*cont. from page* 250)

Muenster, 412 m. (1 kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 15.30, news, time sig.; 16.00, con.; 19.40, lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 446 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 06.35-15.30 (exc. Mon. and Sat., when 12.30-13.30), news, Stock Ex.

Hilversum (HDO), 1,060 m. (5 kw.). 09.00, sacred service (Sun.); 19.10, con.; 21.00, news, con.

HUNGARY.

Buda-Pesth (Csepel), 560 m. (2 kw.). 17.00, lance music; 20.00, con. or opera; dance nightly.

ICELAND.

Reykjavik, 327 m. (500 w.). Con., 20.30.

ITALY.

Rome (IRO), 425 m. (3 kw.). 17.30, orch.; 17.55, news, Stock Ex., jazz band; 20.30, weather, con.

Milan, 320 m. (2 kw.). 20.00-23.00, con.

JUGO-SLAVIA.

Belgrade (Rakovitza) (HFF), 1,650 m. (2 kw.). 17.00, con. (Tues., Thurs., Sat.).

Agram (Zagreb), 350 m. (1 kw.).

LETTLAND.

Riga, 475 m. (2 kw.). Con. daily, 21.00.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.); 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo (22.30-24.00, Sun., Wed., Sat.).

Bergen, 400 m. (1½ kw.). 19.30, news, con.

Relays.—Riukan (445 m., 50 w.), Porsgrund (405 m., 100 w.).

POLAND.

Warsaw, 480 m. (6 kw.). Daily: con., 11.00-13.00; 15.00-23.00, daily.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 12.30 and 17.55, news and con.; 23.00, chimes from Kremlin.

(Popoff Station), 1,010 m. (2 kw.). 19.00, con. (Tues., Thurs., Fri.).

SPAIN.

*Madrid (EAJ6), 392 m. (1½ kw.).
*Madrid (EAJ7), 373 m. (4½ kw.).
*The Madrid stations are again working to a rota, varying time of transmissions daily.

Barcelona (EAJ1), 324 m. (1 kw.). 18.00-23.00 (daily).

Barcelona (EAJ13), 462 m. (1 kw.). 19.00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con. Close down 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 420 m. (2 kw.). 22.00-24.00, con. (daily).

Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00, con., news. Tests daily (exc. Sun.), 24.00.

Cartagena (EAJ15), 335 m. (1 kw.). 20.30-22.00, con. (daily).

Seville (EAJ5), 357 m. (1½ kw.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. 19.00-22.00, con. (daily).

San Sebastian (EAJ8), 346 m. (500 w.). 17.00-19.00, 21.00-23.00 (daily).

Salamanca (EAJ22), 355 m. (1 kw.). 17.00 and 21.00, con. (daily). Closes down 23.00.

SWEDEN.

Stockholm (SASA), 430 m. (1½ kw.). 11.00, sacred service (Sun.); 19.00, lec.; 21.15, news, con., weather. Dance (Sat., Sun.), 21.45.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw). 20.00, lec., con. (daily).

Zurich (Hongg), 513 m. (temp.) (500 w.). 11.00, con. (Sun.); 17.00, con. (exc. Sun.); 19.00, news, weather; 20.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 20.15, con.

Berne, 435 m. (2 kw.). 20.30, con.

Basle, 1,000 m. (1½ k.w.), con. daily, 20.30.

TRADE BREVITIES

MESSRS. LISSEN, LTD., inform us that they have adopted a new policy in respect of their sales organisation. Lissen apparatus is now sent direct from the factory to the retailer instead of through the usual trade channels. This procedure, they state, is the result of a desire to give the retail trader bigger profits than before, and also to enable them to reduce the prices of their goods to the public.

A. C. Cossor, Ltd., of Aberdeen Works, Aberdeen Lane, Highbury Grove, N.5, advise us that the only Cossor valves to be affected by the price reductions which took effect on the 16th inst. are the Point One (H.F. and L.F.) and the P.3 (4-volt power valve). All the other Cossor valves will remain at the present prices.

"A Well-built Tool-chest: Its Making and Fitting" is the subject of a well-illustrated article appearing in the current issue of "The Amateur Mechanic and Work" (3d.). Other articles in the same number are: "Evolution in Household Goods and Utensils"; "Babbitting Bearings"; "Relaying a Wood-block Floor"; "Mending a Plant Stand"; "Hints and Kinks Illustrated"; "A Crystal Set for Daventry or Local Station"; "Cutting a Hole Through a Brick Wall"; "Drawing Pens; and an Opisometer or Map Measurer"; "An Oil Drip-can for the Lathe"; "The Art of Lacquering Metal"; "Overhauling Motor-cycle Valves."

ADVERTISEMENT INSTRUCTIONS for "Amateur Wireless" are accepted up to first post on Thursday morning for following week's issue, providing space is available.

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Advertisements under this head are charged FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.

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