The Wireless Constructor

6D MONTHLY

EDITED BY
PERCY. W. HARRIS

Vol. 1. No. 9 JULY 1925

CONTENTS

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The WIRELESS CONSTRUCTOR

— Edited by Percy W. Harris —

VOL. 1. No. 9. JULY

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The WIRELESS CONSTRUCTOR

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Vol. 1. JULY, 1925. No. 9.

A Double-Purpose Two-Valve Receiver

By D. J. S. HARTT, B.Sc.

Loud-speaker reception of the local station up to ten miles, and distant reception on telephones, by the turn of a switch, are the chief features of this fascinating receiver.

ONE of the most useful circuits it is possible to obtain using two valves is undoubtedly a simple detector circuit, with reaction on to the aerial, followed by one stage of transformer-coupled low-frequency amplification. By the use of good components and with the help of a good outdoor aerial, a well-designed receiver embodying this circuit will give good loud-speaker strength from a main broadcasting station up to distances of about 10 miles, this being a conservative estimate of the range for this purpose, since the conditions prevailing locally have considerable bearing on the useful loud-speaker range. Under good conditions, and with careful tuning and judicious use of reaction, a receiver of this type will also prove very useful for long-distance reception.

For reception on the telephones of more distant stations, however, a stage of high-frequency amplification, followed by a detector valve, is often to be preferred, in that it is possible to receive these stations without undue forcing of the set, to obtain greater selectivity than with the conventional detector circuit, using reaction on to a direct coupled aerial circuit, and followed by one stage of L.F. amplification.

When the H.F. and Detector Circuit is in use, note that the two coils should be kept at right angles.

It occurred to the author that the functions of the two types of receiver discussed above could well be combined in one set, without any appreciable sacrifice of efficiency, so that it would be possible to change instantly from an H.F. detector circuit to a detector and one stage of transformer-coupled L.F. amplification.

The idea has been incorporated in the receiver shown in the accompanying photographs, and the results obtained with the actual set are fully up to expectations. The local station is received at good loud-speaker strength, while other British and many Continental stations have been heard at good strength on the 'phones

even while the local station was transmitting, and interesting comparisons of reception on the two circuits have been made.

Two Possible Circuits

The two possible circuits which are shown in separate diagrams may be traced out from the theoretical circuit diagram of the receiver. It will be seen that when the double-pole double-throw switch S is in position 2, and the lead from the grid of the first valve plugged into the socket marked S_1, then the resulting circuit consists of one stage of H.F., employing tuned-anode, followed by a detector valve in the ordinary way. No reaction is introduced from the anode circuit of the detector valve, for the set will be found to oscillate quite freely without it, and the oscillation can be controlled, and the set worked in its most sensitive condition just off the oscillating point by means of the potentiometer R_5.

Switch Positions

When the switch is in position 1, and the lead from the grid of the first valve plugged into S_2 the detector and note-magnifier circuit is obtained, and the potentiometer in this case can be used to control the potential on the grid of the detector valve, but in general the best results will be obtained with the slider over towards the positive side of the potentiometer winding.

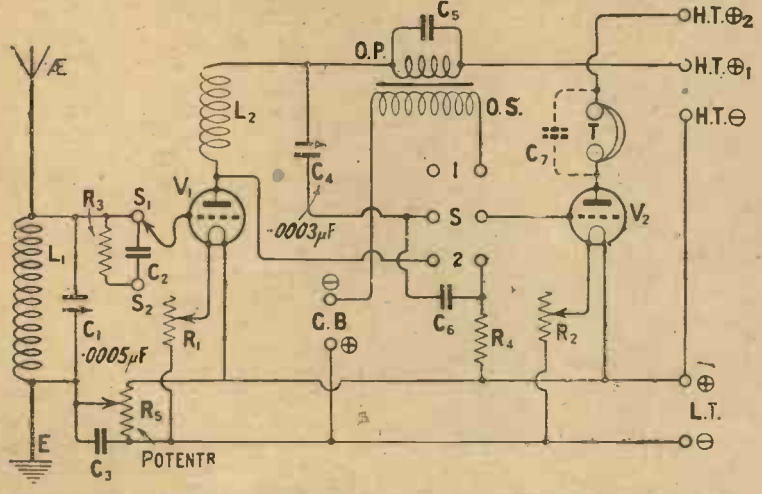
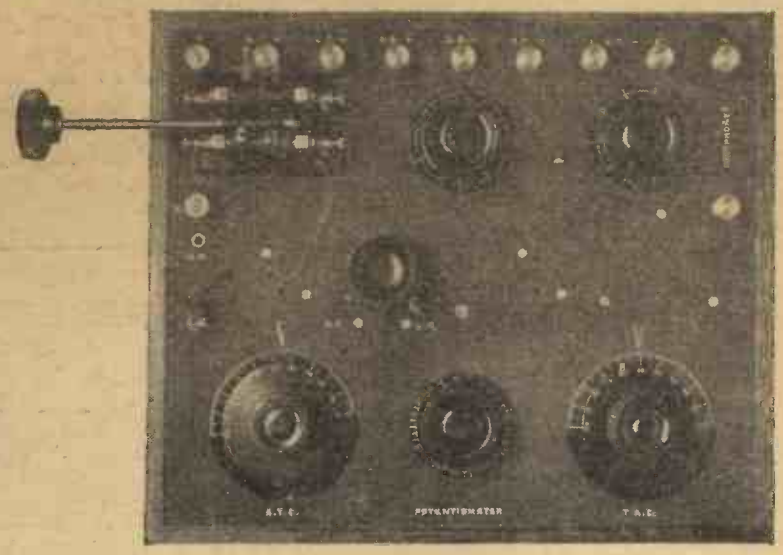


Fig. 1.—A complete diagram of the circuit employed, with the switching arrangements clearly indicated.

The coil L_2 is coupled to the aerial coil L_1 to obtain reaction in the ordinary way, whereas in the case of the H.F. detector circuit the coil L_2, in conjunction with the variable condenser C_4, forms the tuned-anode circuit, and is then kept at right-angles to the aerial coil L_1, and reaction controlled by adjusting the potentiometer. It will be noticed that separate high-tension tappings are provided for each valve in both circuits and that provision is made for grid-bias when using the second valve as a low-frequency amplifier, thus allowing the valves to be operated at the best working conditions in each case.

Points of Design

The photographs should give a good idea of the design and layout of the set, all the components of which are mounted on a standard-sized panel arranged to fit horizontally into a suitable box. The tuning condensers are located conveniently at the front of the panel, that on the left being for aerial tuning, and on the right for the anode tuning in the H.F. circuit. The potentiometer control knob is seen between the two condenser dials, while the two rheostats are located at the rear of the panel,



A near view of the panel. The terminals are arranged at the back for convenience.

where the coil-holder is also conveniently placed on the left. The switch occupies the space between the two valves, while the terminals for battery connections are arranged at the back of the panel, the aerial and the earth terminals being on the left-hand side at the back, and those for telephones in a corresponding position on the right. Thus the controls are in convenient and accessible positions for easy adjustment.

Components Necessary

A complete list and specification of the components actually used in the receiver are given here, but the discriminating constructor has a wide field of choice if any departure from this list is desired.

One ebonite panel, 12 in. by 10 in. by ¼ in., of guaranteed quality (Paragon).

One variable square-law condenser, ·0005 μF (Collinson's Precision Screw Co., Ltd.).

One variable square-law condenser, ·0003 μF (Collinson's Precision Screw Co., Ltd.).

One L.F. transformer, "Success" (Beard & Fitch, Ltd.).

One D.P.D.T. "anti-capacity" switch (Gambrell Bros.).

Two filament resistances, Dual type, centre fixing (L. McMichael, Ltd.).

One potentiometer (L. McMichael, Ltd.).

One two-way coil holder, one-hole fixing type (Hall & Brenard).

One ·0003μF fixed condenser (Paragon, Peter Curtis, Ltd.).

One ·006μF fixed condenser (Paragon, Peter Curtis, Ltd.).

One fixed condenser with clips (L. McMichael, Ltd.), the value of this will be referred to later in the text).

Two valve holders, Type C (H.T.C. Electrical Co.).

One ·0003μF fixed condenser with clips and two 2m Ω grid leaks (both Dubilier).

One combined grid condenser (·0003μF) and gridleak holder (Dorwood).

Two sockets and one plug fitting (Lisenin Wireless Co.).

Eleven terminals.

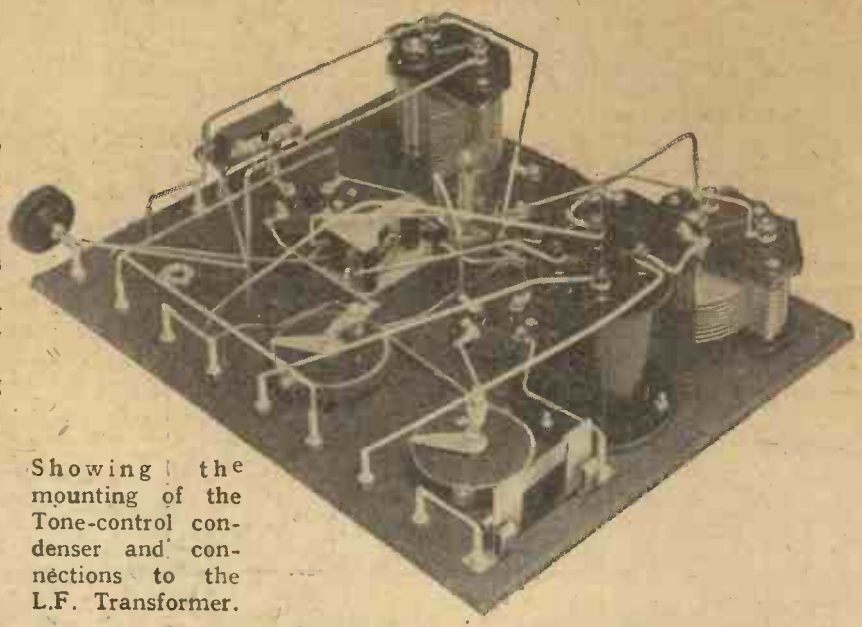
Two condenser indicators (Decko).

Square-section tinned copper wire for wiring.

Radio Press Panel Transfers.

One suitable containing box (Carrington Mfg. Co.).

The first operation in the construction of the set is to prepare the panel for mounting the components, and provided that one of the guaranteed makes of ebonite has been purchased the work of marking out and drilling may be attempted as soon as all the components have been obtained.



Showing the mounting of the Tone-control condenser and connections to the L.F. Transformer.

Drilling and Tapping the Holes

The drilling centres should be marked out carefully on the back of the panel with the help of the dimensioned diagram accompanying the article; where templates are supplied with the components, as is the case with the valve holders and the switch specified, these should be used to mark out the correct drilling centres. The centres are then all indented with a centre punch and the necessary holes carefully drilled.

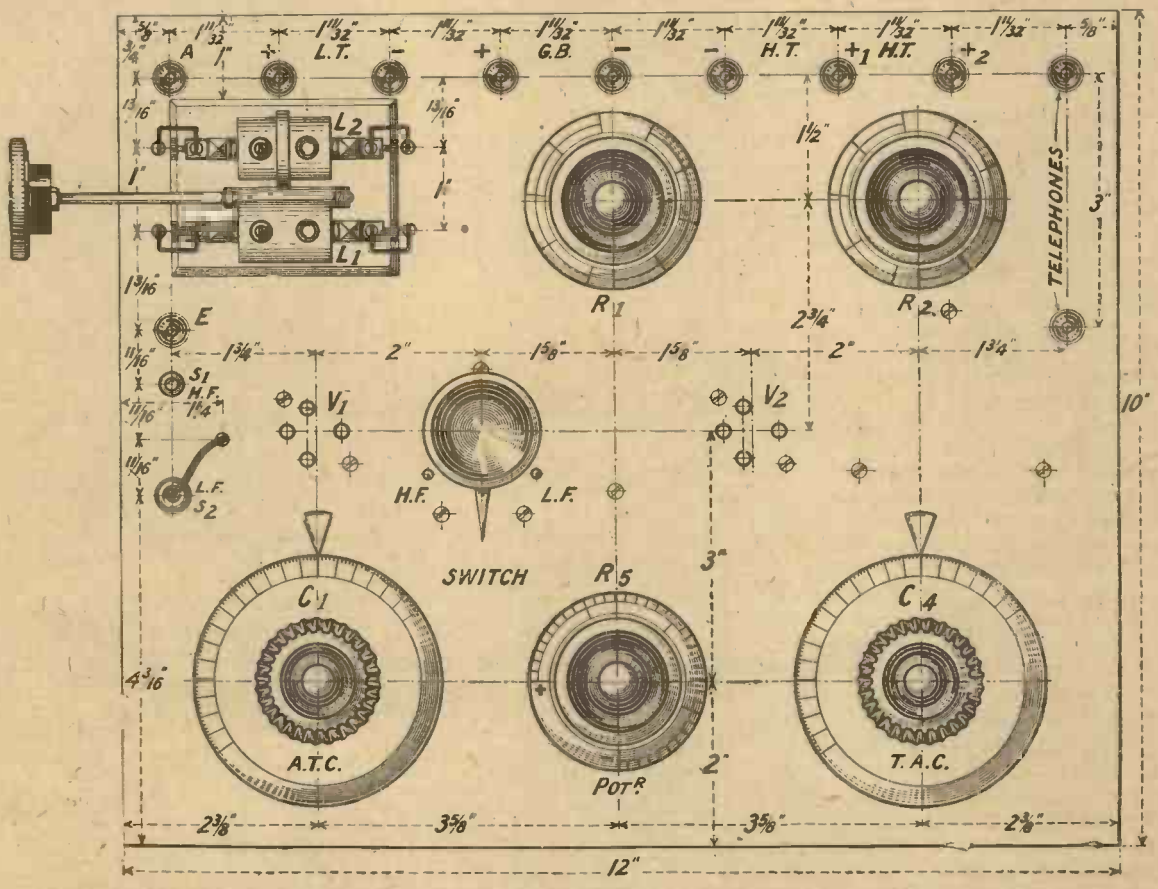
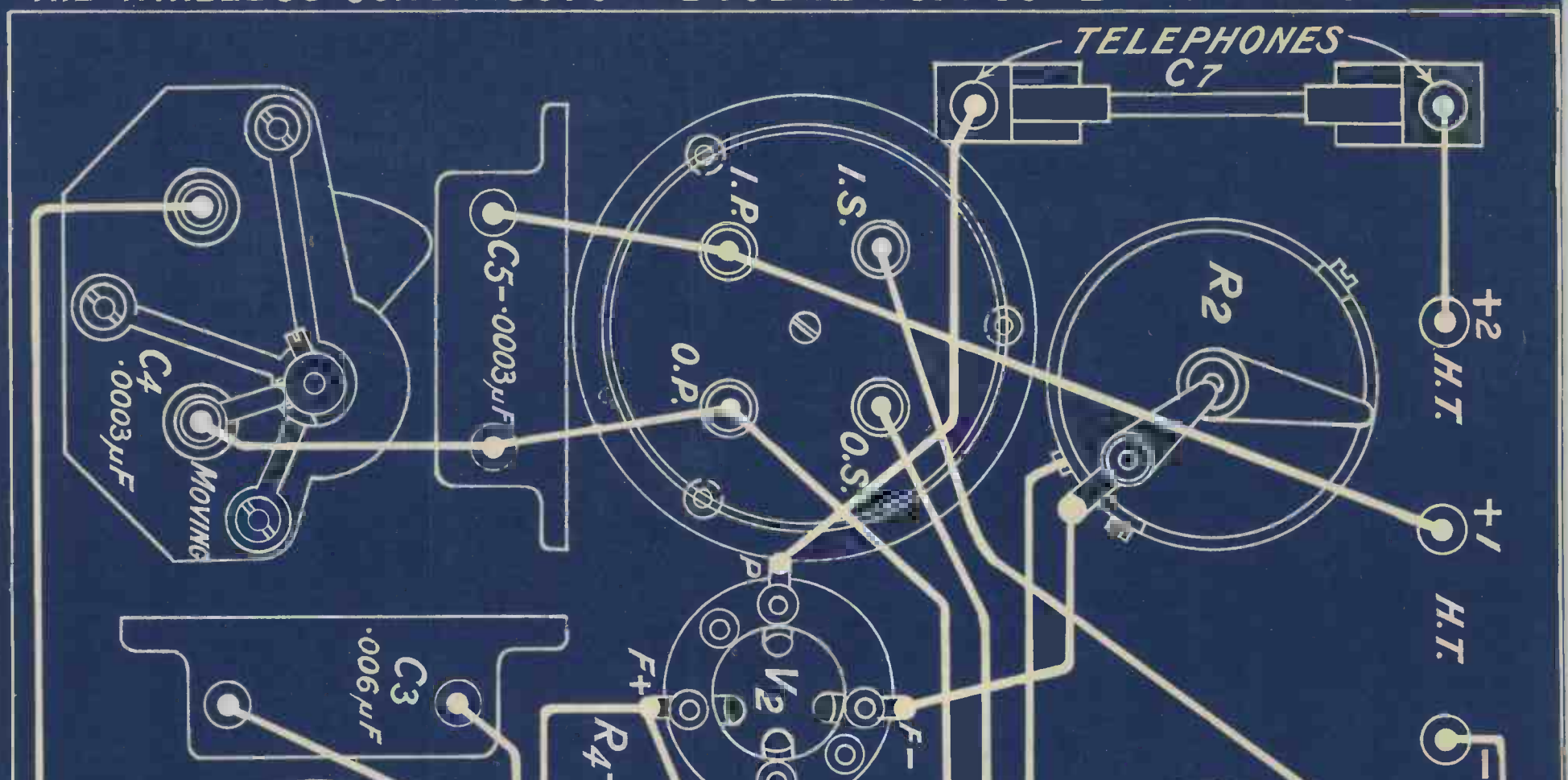
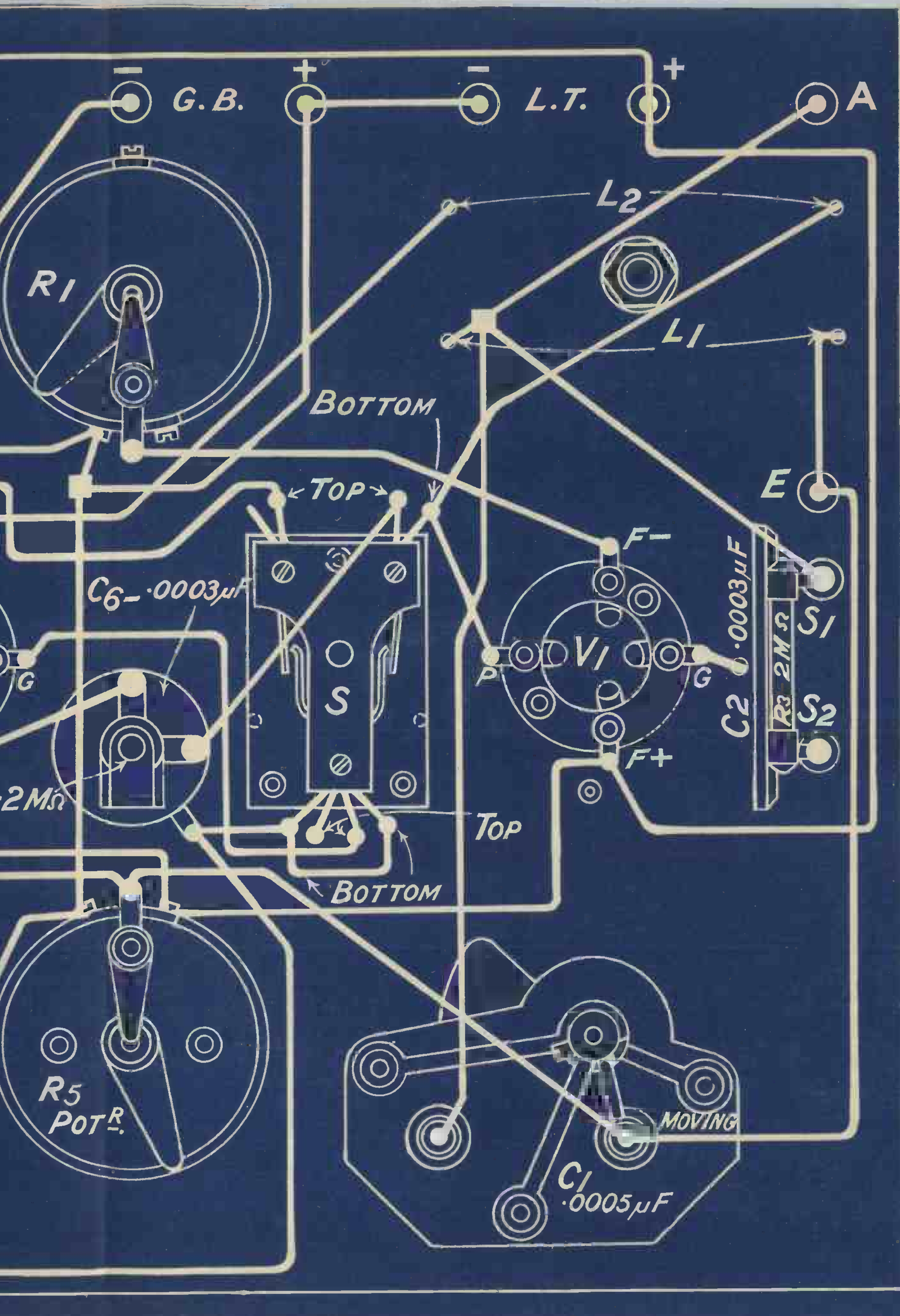


Fig. 2.—A dimensioned front-of-panel drawing, showing how the various parts are placed. Full size blueprint No. C1016A may be obtained, price 1/6 post free.

"THE WIRELESS CONSTRUCTOR" DOUBLE-PURPOSE 2 VALVE RECEIVER.





RADIO PRESS LTD., BUSH HOUSE, STRAND, W.C.2. BLUEPRINT C.1016. b. PRICE 1/6

The only holes which require tapping are those to take the two stops provided for the switch, but if the constructor is unable to do this, two other stops requiring only a plain hole through the panel and fixed by a back-nut, may be substituted. The three holes for taking the fixing screws for the switch may be drilled 6 B.A. clearance, and ½ in. 6 B.A. countersunk-head screws and nuts used for mounting this component. The mounting of the remainder of the components is quite straightforward, and calls for no further comment.

Wiring Up

As far as the wiring of the receiver is concerned, if the constructor possesses average ability in soldering, little difficulty should be encountered here, provided that the free blueprint given with this issue is followed carefully in conjunction with the back-of-panel photographs, which should give a fair idea of the relative spacing and disposition of the various wires. In particular, note carefully the connections to the Dorwood grid condenser and grid leak mount.

Note also how the various fixed condensers are mounted and connected. The soldering tags of the first grid condenser (a Dubilier) are inserted and soldered into the ends of the Lisenin sockets, while the Paragon condensers across the primary of the L.F. transformer and the potentiometer winding have their tags soldered to convenient wires and are, so to speak, suspended in the air. Clips to take a McMichael clip-in fixed condenser are secured under the fixing nuts of the telephone terminals.

Connections to the Coil Holder

In the actual set the connections to the coil holder are made with square section wire passing through small holes drilled in the panel, but the connections may be more easily made if thinner wire or flex is substituted. When the wiring has been satisfactorily finished, the set may be completed by applying the panel transfers to mark the various terminals, etc.

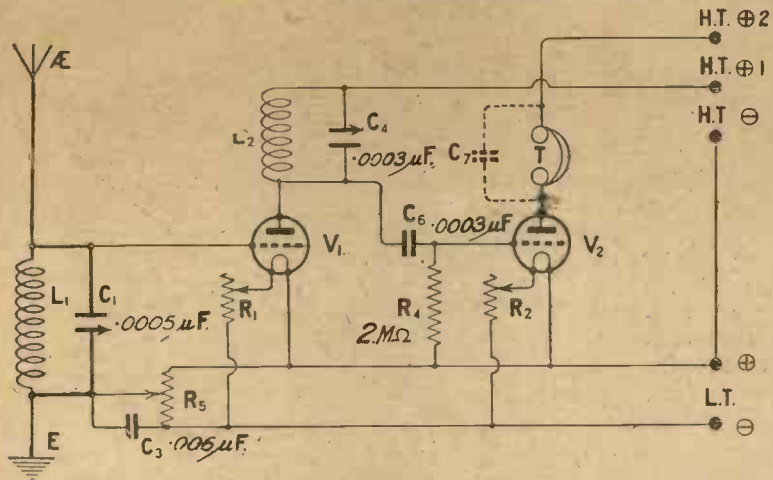


Fig. 3.—The H.F. and detector circuit in simplified form. Note that the moving vanes of the variable condensers are marked with an arrowhead.

When operating the set for the first time use the detector, L.F. circuit, plug in two suitable coils, and insert the two valves you intend using. Then connect up the accumulator, and having ascertained that the L.T. circuit is in order, set the potentiometer to the positive side, and connect the H.T. terminals to appropriate tappings on the H.T. battery.

A Preliminary Test

For a preliminary test using, say, general purpose valves, the two grid-bias terminals may be shorted, and also the H.T.+1 and H.T.+2 terminals joined with a wire and connected to the 60-volt tapping on the H.T. battery. Then, having connected the aerial, the earth and the telephones to their respective terminals, set the two coils at right angles, and adjust the filament temperature of the valves. Search for the local or nearest main station by varying the condenser C_1 and having found it verify that signals become louder as the coil L_2 is moved gradually towards L_1, with a slight re-tuning on the condenser C_1.

Reaction Leads

If the set has been made as specified, this should be the case, otherwise the leads to the reaction coil L_2 may need reversing. The receiver will work well with general purpose valves, either bright or dull-emitter, or a small power valve with a suitable value of H.T. voltage applied to terminal H.T.+2, with the appropriate grid-bias, may be used in the L.F. stage. If the set is used with a loud-speaker for reception of local broadcasting, a tone-control condenser of the clip-in type with a value between ·001 μF and about ·006 μF, dependent on the loud-speaker used, may be required across the telephone terminals, and this condenser may be left in when switched over to the H.F. detector circuit.

It will be noticed when the detector L.F. circuit is used, that the variable condenser C_4, the grid condenser C_6 and the grid leak R_4, all in series, are connected from the H.T.+ end of the reaction coil to L.T.+. In actual practice this is found to have no noticeable effect whatever on the working of the receiver, whether the connection

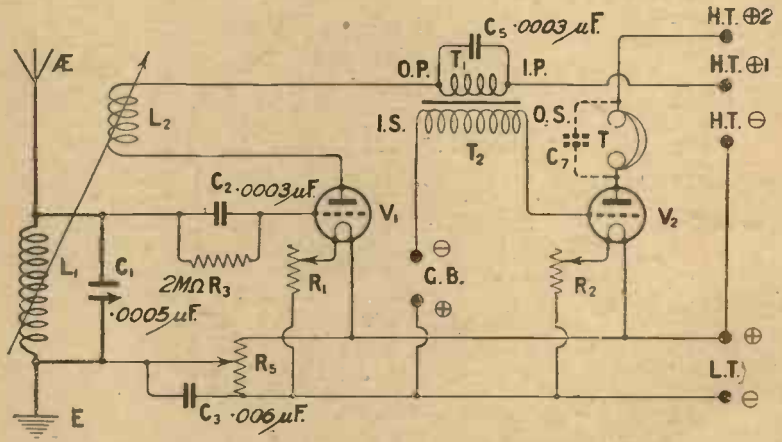


Fig. 4.—The detector and note magnifier arrangement. The lettering corresponds with that of the other two circuits.

is complete or is broken by removing the grid-leak from its mounting.

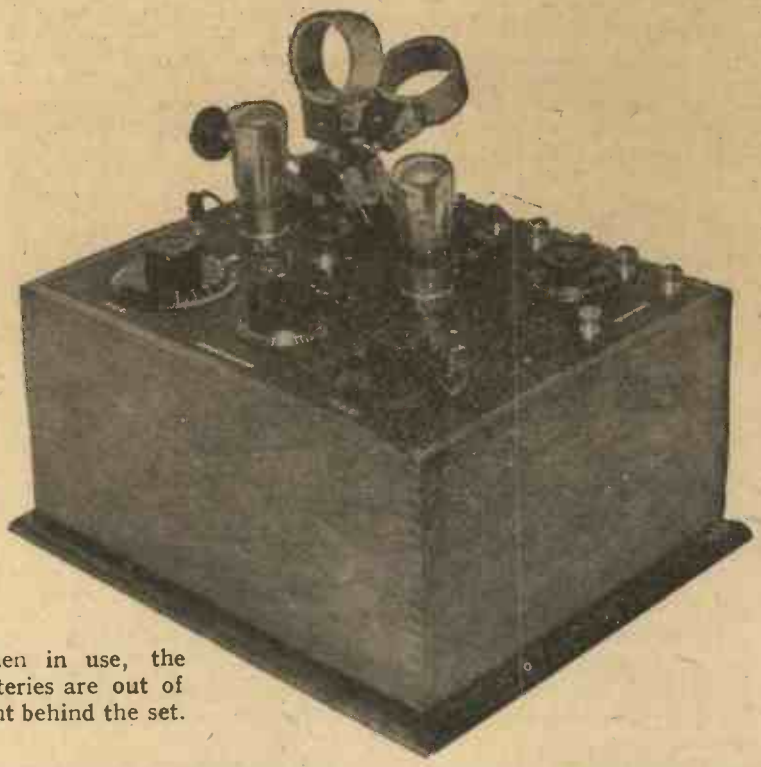
Coil Coupling

When the H.F. and detector circuit is used, the coils L_1 and L_2 are always kept at right angles, and tuning is effected by varying the condensers C_1 and C_4 simultaneously. The H.T. voltage applied to the first valve, and the filament temperature, should be so adjusted that when the aerial and the anode circuits are tuned to resonance, satisfactory control of oscillation is obtained by means of the potentiometer. It should be found possible under these conditions to make the receiver oscillate smoothly by turning the potentiometer contact more towards the negative side of the windings, and to stop the oscillation as it is moved towards the positive.

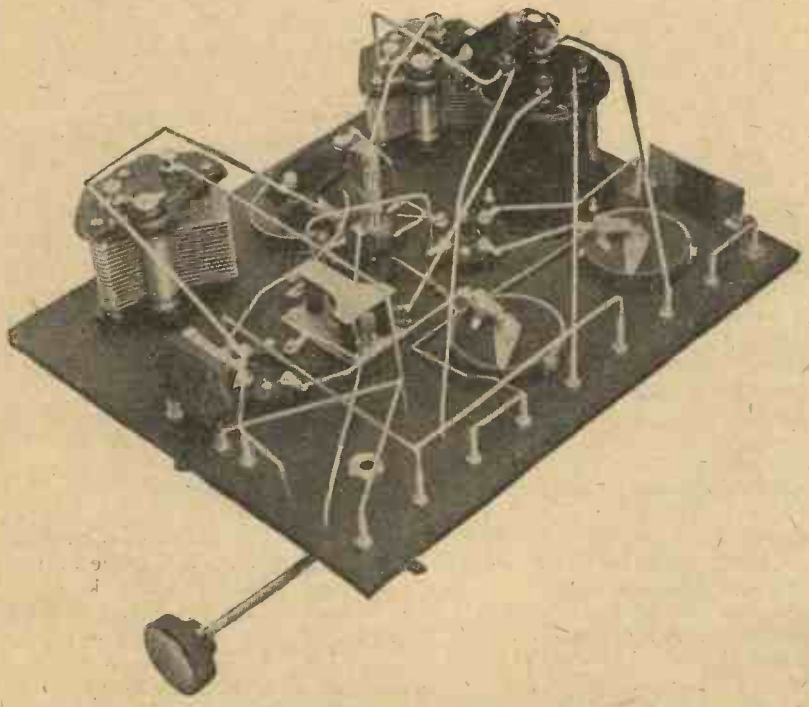
Any difficulty in producing self-oscillation may be overcome by bringing the anode coil a little closer to the aerial coil.

Sizes of Coils

Suggested coil values, when using the detector-L.F. circuit for the broadcast band of wavelengths, are Nos. 35 or 50 (Gambrell A or B) for L_1, and for L_2 always choose the smallest coil that will give ample reaction with adequate control. (No. 35 should be large enough with an aerial-earth system of low resistance, but a No. 50 or even No. 75 may be required.) For 5XX use a No. 150 in the aerial, and for Eiffel Tower a No. 200. With the H.F.-detector circuit try a No. 35 or 50 for the aerial coil L_1, and a No. 50 or 75 (Gambrell B or C) for the anode, these values being for the broadcast band of wavelengths. A No. 150 for L_1, and No. 200 for L_2 should be suitable for 5XX, while a No. 200 for L_1 and No. 250 or 300 for L_2 should be tried for Eiffel Tower.



When in use, the batteries are out of sight behind the set.



The connections to the Dorwood Condenser may be followed from this photograph, which also gives a good idea of the heights of the various wires.

Results Obtained

When the receiver was tested on a fairly good outdoor aerial, about 8 miles from 2LO, very good loud-speaker strength was obtained on the detector-L.F. circuit from this station. 5XX also came in very well on the loud-speaker. Other stations heard on the circuit included Brussels (Radio-Belg.) and Eiffel Tower at loud phone strength, Hilversum, Radio-Paris, Ecole Supérieure, Birmingham, and Madrid at good 'phone strength, while Newcastle, Glasgow and Aberdeen were also heard at fair strength in the 'phones. In addition a German station working on about 300 metres was received at quite good strength on the loud-speaker. Interference from 2LO when receiving stations on wavelengths near to that of 2LO was, of course, experienced, but in the case of the H.F.-detector circuit this was noticeably less and absent in some cases.

On the H.F.-detector circuit the stations given above were all received with Belfast in addition, and in general the strength of the nearer ones was less than with the detector L.F. circuit, but signals were "cleaner," of better quality, and therefore more pleasant from a listening point of view, since less reaction was required.

The "Twin-Valve" Receiver constructed by Mr. Collins, whilst in hospital

Some Readers' Experiences with the "Twin-Valve" Loud-Speaker Receiver

This receiver, which employs a two-valve reflex circuit, was described in the January issue of this magazine

SIR,—I am forwarding herewith a photograph of a "Twin-Valve" set constructed by Ex-Warrant Officer Collins whilst a patient in hospital.

As a model of neatness and accuracy it would be hard to beat, even if we put aside the fact that Mr. Collins cannot sit up.

You will notice very little deviation from Mr. John Scott-Taggart's original design (WIRELESS CONSTRUCTOR, Vol. 1, No. 3), therefore it is sure to work well, and you are sure to get an enthusiastic report later on.

Yours faithfully,
W. WATSON.

Harlesden.

SIR,—I have made the "Twin Valve" set as described by Mr. John Scott-Taggart in the January issue of your journal, and thought you might be interested to know the results obtained.

As instructions for making the set were completely ignored and the panel arrangement was to my own liking, I think that the results are marvellous. I am situated about 3½ miles from Birmingham, and pick that station up at very loud loud-speaker strength. Manchester, Bournemouth, London, Cardiff and Glasgow are all moderate loud-speaker strength, and most Continental stations come in at moderate loud-speaker strength. On one evening I picked up WGY, CKAC, and KDKA, WGY, and KDKA quite loud enough to work a small loud-speaker. The following week I added a further L.F. valve to the set. KDKA on 326 metres was very good on loud-speaker, also WGY. This is the best circuit that I have ever tried out, and I can certainly recommend any amateur wishing to make a good selective two-valver to construct this set.—Wishing you every success,

Yours faithfully,
C. LAW.

Edgbaston,
Birmingham.

SIR,—May I congratulate you on your "Twin-Valve" loud-speaker set, as described by Mr. John Scott-Taggart in the January issue of THE WIRELESS CONSTRUCTOR.

I have not placed the components as in your design, as I have put the L.F. transformer at the other end of the panel, and am using a ·0002 μF. condenser instead of a ·0003, as stated in the article. Using two home-made honeycomb coils, a 50 and a 65, and a Sterling "Dinkie" loud-speaker, Edinburgh, Glasgow, Aberdeen and Birmingham come in clearly. The set is also very selective, as I am within 300 yards of the Edinburgh station and can cut it clean out and get Glasgow at good volume, which can be heard all over the house. I use a Dutch for the first valve and a Cossor for the second, using respectively 42 and 60 volts on the plates. When I use grid-bias the set won't stop howling—I don't know why—so I leave it alone. I am only 15, and as I took "Hot-Wire's" hints(?) for soldering—but not his circuit—you can imagine the job.

However, the set gives excellent results, and that is all I want. Thanking you again,

Yours faithfully,
ALICK POLSON.

Edinburgh.

[We do not advise any departure from the instructions.—ED.]

SIR,—It may interest you to know that I have built the "Twin Valve" loud-speaker receiver from details contained in THE WIRELESS CONSTRUCTOR, No. 3. At the outset please allow me heartily to congratulate Mr. Scott-Taggart on the design of a "two-valver" of such marked efficiency.

Cardiff (30 miles) and Bournemouth (60 miles) come in extraordinarily loud and clear, and Glasgow at 'phone strength is all that could be desired. My aerial is approximately a level 35 ft. high, P.O. pattern, and earth only about 4 ft. from the set and very efficient.

I use a "Watmel" variable grid leak in place of fixed one, McMichael H.F. transformer, and the valves are, Marconi Osram D.E.R. (Detector), and Ediswan A.R.D.E., (H.F.); plate voltage 35 and 80 respectively.

I use ordinary basket coils and find them satisfactory.

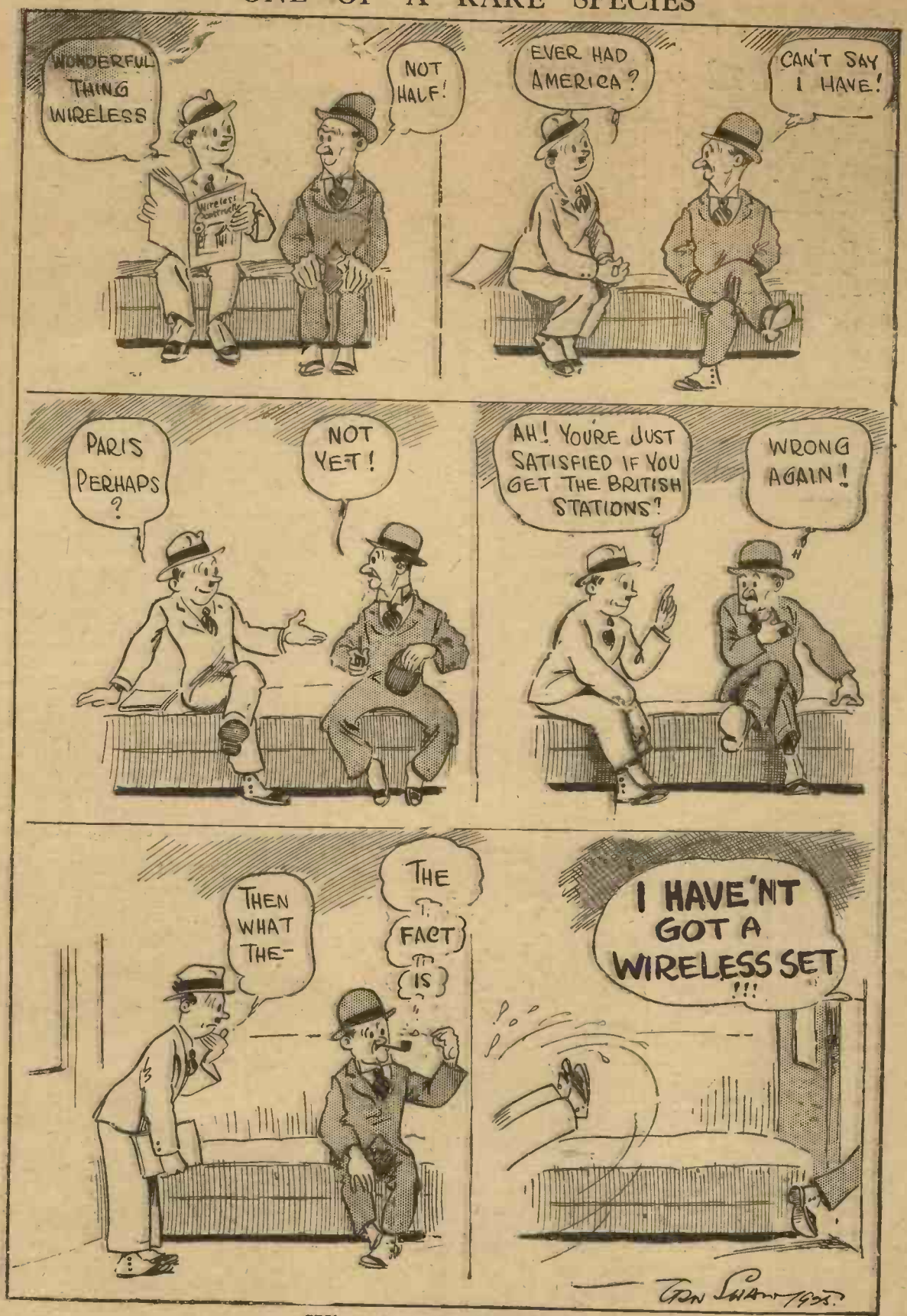
Altogether I am quite proud of my set, more so from the fact that this is my "very first" in wireless construction of any kind, which, I think, speaks volumes for your lucid and "understandable" diagrams and drawings and the instructions accompanying them.

I should say without hesitation that the new way of showing wiring diagrams by leaving out the semi-circles and giving the wiring by stages is much preferable; in fact, I fail to see any difficulty whatever in wiring up from the present method.

Yours faithfully,
P. R. WOODLAND.

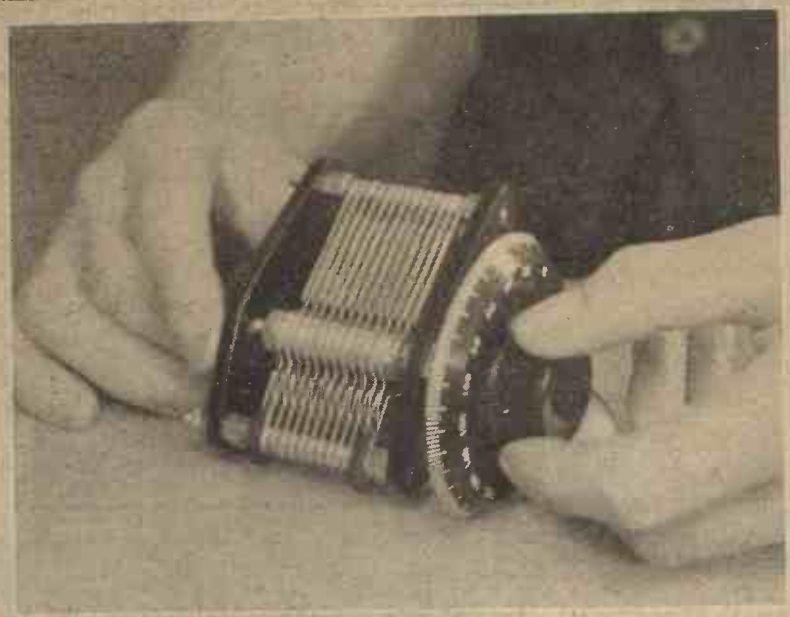
Bridgwater,
Somerset.

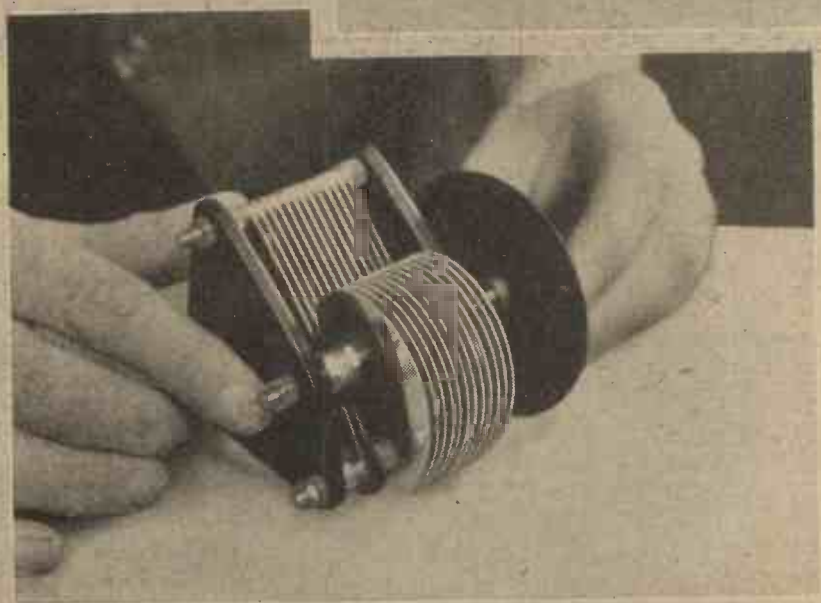
ONE OF A RARE SPECIES



What *does* he live for?

Facts About Your Tuning Condensers





IT may seem a very obvious point to the old hand, yet many a novice is puzzled, and excusably, as to which position of the vanes of the condenser really gives the maximum capacity and which the minimum. Our first photograph shows a condenser of a commonly used type adjusted to the maximum capacity position, which is also the position of maximum wavelength when the instrument is used in a tuned circuit.

The minimum capacity is obtained when the moving plates are turned as far out from the fixed ones as possible, and this state of affairs is seen in the second photograph.

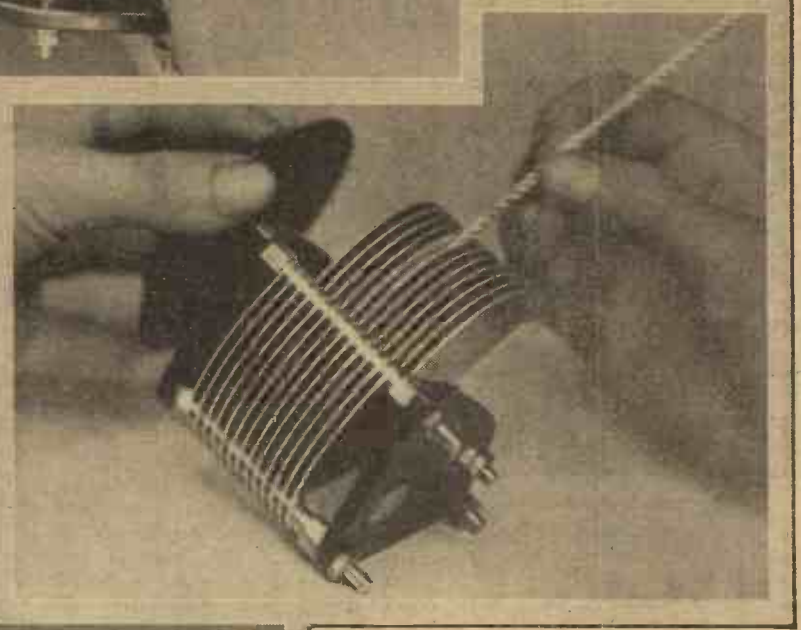
Remember that no condenser gives you absolutely zero capacity in this position, since there always remains what is known as the minimum capacity of the condenser.

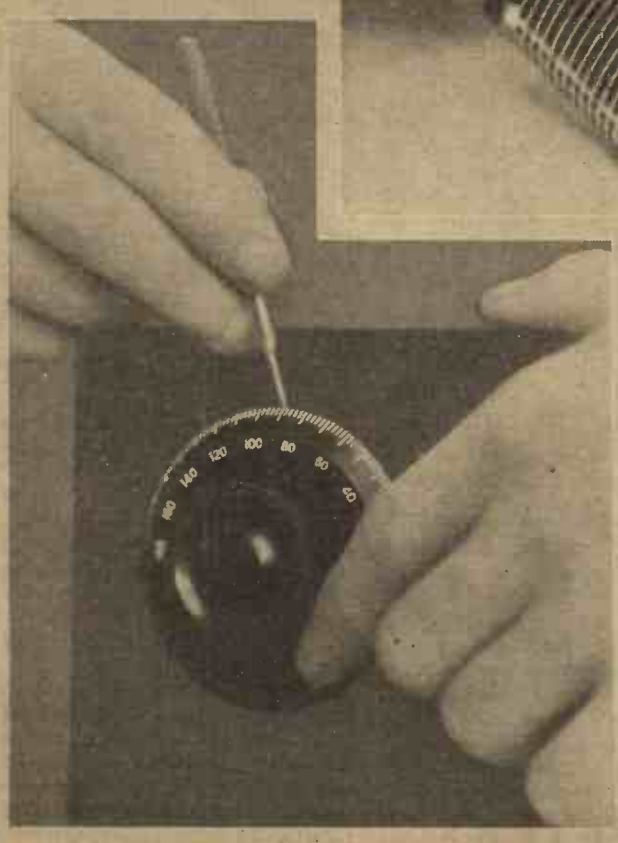
Some of the faults which develop in variable condensers manifest themselves in the form of a grating or a scratching noise when the dial is turned, and this is usually due to one of the moving plates touching the fixed

paper behind it, so that one can look through and observe whether any plates are touching.

In extreme cases, a touching plate can be seen quite clearly without the aid of the sheet of white paper, and such a defective specimen is shown in the fourth picture. Here it will be observed that the second moving plate, counting from the dial end, is touching the fixed one, as indicated by the arrow head.

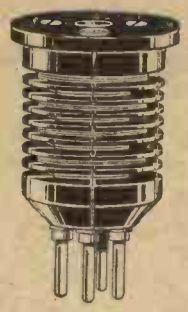
Another possible cause of noises on revolving a dial is dust, or other dirt, between the plates and the ones as it revolves. The easiest way to discover whether this is happening is to turn the moving plates to the maximum capacity position, and then hold up the condenser as shown in our third photograph with a sheet of white





fifth photograph shows how a pipe cleaner may be used as a remedy. This operation should be carried out with considerable care, so as not to bend the plates about, and the cleaner should be passed carefully between each pair of both fixed and moving plates, until it can be seen that both are reasonably clean when held up against a piece of white paper.

When a condenser has just been mounted in a new set, some sort of mark must be made upon the panel to serve as an indicator. A good way of doing this is shown in the last photograph, and it will be observed that a scriber is used for the purpose of making a short, deep scratch in the desired position, this scratch being afterwards filled in with some white material, such as wax or even certain brands of tooth paste. This last may, perhaps, sound somewhat unsatisfactory as a filling medium, but it must be remembered that once it has dried there is little chance of it being rubbed out, and it actually proves quite effective in practice.



Faults in H.F. Transformers

By G. P. KENDALL, B.Sc., Staff Editor

When trouble develops in a receiver, the H.F. transformers often escape attention, but the fault may be located therein, and below are given some useful hints on testing these components

MOST of us, I think, are rather apt to take most of our plug-in units for granted, and when something goes wrong with the set, they are often the last components to be suspected. True, most such units are usually very reliable, and there is always the feeling that if one falls under suspicion it is a very easy matter to replace it with another; but, nevertheless, the substitution test is not a very easy one as a rule, because one does not generally possess, for example, two plug-in high-frequency transformers for the same wavelength range, and therefore such comparisons are difficult. As a result, most of us rather neglect such things, and I hope that the following notes will serve to show what a simple matter it is to ascertain whether high-frequency transformers are in working order.

A Common Fault

One of the commonest faults in high-frequency transformers is that of a simple break in the primary or secondary, and the latter may, under certain circumstances produce very puzzling results. A break in the primary winding, on the other hand, usually stops the set from working altogether and the matter, therefore, is a relatively simple one. Those who possess a milliammeter will have no difficulty in identifying this fault, by adopting the following procedure: put the milliammeter in the usual position for measuring the total anode current of the set, viz., between the high-tension positive terminal on the instrument and the high-tension positive socket of the H.T. battery. With all the valves alight, note the reading of the milliammeter, then replace the suspected high-frequency transformer with any other which you may possess, regardless of the wavelength range, and again take the milliammeter reading. If it has increased considerably, say, half or one milliampere, you may be fairly sure that the suspected high-frequency transformer has a broken-down winding. The break may be actually in the winding itself, but it will more usually be found where the wire is brought out and connected to the two pins, either by soldering or screwing beneath nuts.

A Simple Test

Those who do not possess a milliammeter can still test their transformers by means of the invaluable "telephones and dry cell" method. The procedure in this case is as follows: remove the transformer from its socket, and place it upon the table with the legs upwards. Now take a single dry cell and a pair of telephones, and screw one of the tags of the 'phones under one terminal of the cell. Take a wire from the other terminal of the cell with one hand, and the free tag of the 'phones in the other, and touch these two upon the two primary pins of the transformer. If the 'phones are worn, a loud click should be heard upon doing this—practically as loud, in fact, as if the telephone tags had been connected straight across the dry cell itself. It is to be noted that if there is a breakdown in the primary winding, it is probable that a *faint* click will still be heard, and it should, therefore, be made a rule that unless a really loud click is obtained, the winding is to be assumed to have broken down.

Breaks in the Secondary

Breakdowns in the secondary winding are less easy to identify, and the symptoms of such a case are sometimes very peculiar, ranging from complete deadness on the part of the set to quite good signals accompanied by an extremely persistent tendency to oscillate. The simplest method is undoubtedly to repeat the telephone and dry-cell test upon the secondary winding in the manner which we have just considered; but, as before, do not be content with anything but a really clear and loud click, a faint one betokening trouble just as surely as complete silence. Having decided that there is a break in the secondary circuit, it may be looked for in the same places as were mentioned in dealing with the primary winding, and if no break can be discovered, probably the best thing to do is to return the transformer to the makers.

Insulation

It is not often found that the insulation between the primary and secondary is defective, at any rate in those types of transformer in which the primary and secondary are wound in entirely separate slots; but this fault is a possible one, and should, perhaps, be given a little attention. The telephone and dry-cell test will again serve our purpose, being carried out this time between either of the primary pins and either of the secondary pins. The result should be practically complete silence on a good transformer.

The only other common fault affecting high-frequency transformers is that sometimes met with in the matched type, where two or more are simultaneously tuned by means of a double or treble condenser, the fault in question being inaccurate matching. The symptoms are usually poor signals, and in some cases great difficulty in making the set oscillate, with a very flat tuning upon the transformer tuning condenser. Probably the easiest method of checking the matching of a pair of transformers is to take them to a friend who possesses a set which incorporates only one stage of tuned transformer high-frequency amplification, and get him to substitute one of them for his own, tune in a distant and fairly weak transmission, then pull out the one transformer and insert the other, noting whether any serious difference in the condenser reading results.

Separating Chelmsford and Radio - Paris

Receiving Radio-Paris without interference from the high power station at Chelmsford has previously been very difficult at any position within about 75 miles of Chelmsford. The high power used by the British Station, has necessitated the use of a loose-coupled circuit, or other selective device, with the attendant difficulties of operation.

BY means of the new LISSENAGON "X" COIL No. 250, the necessary selectivity can be obtained without any addition to the existing tuning arrangements of the receiver. A very selective circuit is obtained by using a LISSENAGON "X" COIL No. 250 in the anode circuit of the H.F. valve. Any tuned anode circuit can be altered in a few moments by removing the wire connecting the plate of the H.F. valve to the anode coil, inserting the "X" Coil and connecting the plate of the H.F. valve to one of the tapping points on the "X" Coil. The connection from one side of the anode coil to the grid condenser of the next valve remains unaltered, whilst the other side of the coil is still connected to H.T. Positive. It should be noted that the latter connection should be to the socket of the LISSENAGON "X" COIL, and the connection from the plate of the H.F. valve should be tried on each of the two terminals to prove which gives best results. The tuning condenser remains across the whole of the coil and tuning is carried out as usual.

The LISSENAGON "X" COIL can also be used as an aperiodic aerial coil, and in cases where interference is exceptionally heavy a LISSENAGON "X" COIL can be used in both aerial and anode circuits. For use as an aperiodic aerial coil it is only necessary to plug the coil into the aerial coil holder and connect the aerial to one of the terminals on the side of the coil mount. Note that the socket of the coil should be connected to earth.

In addition to the No. 250 LISSENAGON "X" COIL, we are also making LISSENAGON "X" COILS Nos. 50, 60 and 75. Used as described above, they give a great degree of selectivity, stability and smoothness of reaction control on the broadcast band of wavelengths. The LISSENAGON "X" COIL No. 60 covers the 300 to 600 metre band of wavelengths, but the No. 50 "X" Coil is recommended for the lower band of wavelengths, and the No. 75 for the higher wavelengths.

The Sunday Programmes

AND THOSE WHO CONTRIBUTE TOWARDS THEM

By "CARRIER-WAVE"

The Bishop of London, whose sermon at St. Martin's was recently broadcast.

The Archbishop of Canterbury, who has also been heard at 2LO.

THERE is possibly no greater problem faced by any entertainment manager than the framing of a programme for that day which "comes between a Saturday and a Monday," as the old song has it.

If he allows too many comedy items, he gets into the black books of those who may be able to interfere with his licence. If he keeps to the "straight and narrow path" of religious music only, he opens to an empty house, so he is on the horns of a dilemma.

The B.B.C.'s Problem

But the B.B.C. has not these difficulties to contend with: there is no vital question of pounds, shillings and pence to trouble its financial spirit, neither can its existence be endangered by the antagonism of sects, and therefore, had it but been content to provide entertainment for a listening world, this problem would never have existed for it.

But having abrogated to itself, rightly or wrongly, as opinion may differ, the right of propaganda, and to make its studio an unconsecrated pulpit to millions of people of varying faiths, the B.B.C. is faced with the problem of satisfying all classes.

To the unprejudiced "onlooker," the one who is supposed to see the most of the game, a wiser course would perhaps have been to give the public what it so evidently wants, the best in music and entertainment, and leave the clerics to look after the moral welfare of their own flocks, thereby avoiding all schisms and arguments. The plea that the Church is harmed by wireless does not really hold good, for the average church-goer does not find the broadcast service an adequate substitute for personal attendance at his usual place of worship. Wireless would no more keep a devout church-goer at home when the bells ring out than it would from his business the following morning, while it is incongruous, to say the least of it, to think that the average man coming from the religious atmosphere of the service would go across the road "one minute" later to a restaurant for its band, however good, or even attend a concert of light music.

The Church of St. Martin's-in-the-Fields, London, the services from which are frequently heard by listeners.

The Present Arrangement

On the whole, the present arrangement leaves little to be desired. While the service part of the programme does not keep listeners from church, it undoubtedly brings religion into thousands of homes, and the studio often becomes the pulpit for some of the greatest preachers, who, in many cases, would otherwise never be heard.

To invalids, also, broadcasting provides almost the only way of keeping in touch with religious services.

The Clerical Side

However, it is right to say that in its efforts to make the entertainment-loving "lion" lay down with the clerical "lamb," the B.B.C. has given the highest prelates and all sects opportunities never before made possible.

At Wembley

Possibly one of the most interesting was the Empire Thanksgiving Service in May last year, when their Majesties the King and Queen were present at the first British Empire Exhibition, and an address was given by his Grace the Archbishop of Canterbury, with a massed choir of 3,000 voices conducted by Sir Henry Walford Davies. Such an event is, of course, of national moment.

Mr. Percy Edgar, the Station Director at Birmingham, takes a prominent part in Sunday services.

A favourite service has been found, too, in that of St. Martin's-in-the-Fields, the old Charing Cross church, from where a sermon by the Rt. Rev. the Lord Bishop of London was recently broadcast.

2LO has been quite broad-minded as to sects, for it has given us opportunities from time to time to hear the famous dignitaries of all sects—Methodist, Presbyterian, Catholic and Jewish—and has even taken the trouble to give us the Salvation Army and the service conducted

Miss Dorothy Silk, a famous singer, has been heard several times.

at the Royal Albert Hall by Gipsy Smith last year.

In the Provinces

A high standard is, of course, maintained in the provinces, and at Birmingham, Mr. Percy Edgar, the Station Director, takes a very prominent part. Services are relayed from the Cathedral Church, St. Philip's, preceded by a broadcast of the cathedral bells, while apparently one of the most appreciated features of the evening programme is the reading by Mr. Edgar of a poetical extract, immediately before closing down.

Relayed Services

At the other stations, services have been relayed from York Minster, Bristol Cathedral, and quite recently Canterbury Cathedral. Amongst the prelates who have been heard over the aether by this means, in addition to the many popular local preachers, such as the Rev. L. Sheppard, at St. Martin's, London, may be mentioned the Rt. Rev. The Bishop of Hereford, the Lord Bishop of Llandaff, the Bishop of Durham, and the Bishop Suffragan of Dover.

The Entertainment Side

This has been covered by means of afternoon and evening concerts of a more or less classical nature.

Frequent organ recitals are given, opportunity being first taken in London of using the Æolian Hall organ, under Mr. Frank Armstrong; later came that of the National Institute for the Blind, and here have been heard Mr. William Wolstenholme, the blind composer and organist, Reginald

Mr. Gipsy Smith, who conducted a service at the Albert Hall.

Goss-Custard, Whittaker Wilson, and, perhaps best of all, Mr. Stanton Jeffreys, Assistant Director of Music to the B.B.C.

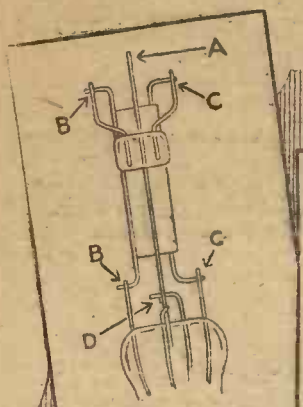
The Vocal Section

For this have been found some of the finest artistes in the country, including the two great Wagnerian and oratorio singers, Miss Carrie Tubb and Mr. Horace Stevens. Both were heard recently when at Easter, the "Messiah" was relayed and Mendelssohn's oratorio "Hymn of Praise" was performed at 2LO.

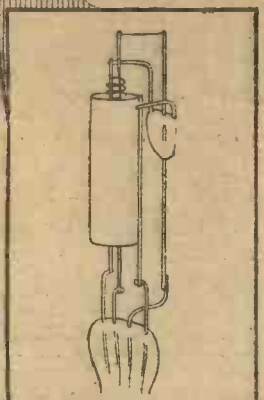
Miss Dorothy Silk is another

The Catterall String Quartet, led by Arthur Catterall, who was the leader of the Hallé Orchestra.

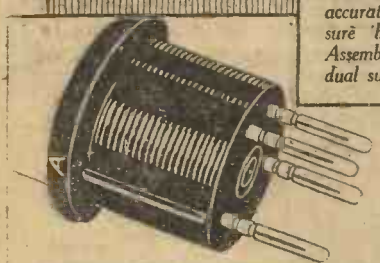
Get the *best* out of your set!



D.E.3 electrode system, front view. Spot welded at A (filament support), B (anode support), C (grid support), and D (filament support).



D.E.3 electrode system, side view. All parts accurately made to measure by machine jigs. Assembled under individual supervision.



All-Bakelite base. Low self-capacity. Wide collar at top (firm grip for inserting and withdrawing valve). Moulded rib on same side as anode pin (ready identification of anode pin, by touch. Obviates "burnout" due to incorrect insertion).

To get the best out of your set, put the best into your set. Fit the right valve for your individual needs.

The most efficient electrode system for one type of valve is not necessarily the best for other types. The electrode system of each type of the "*Valve in the Purple Box*" is the result of scientific determination of the best design for the conditions under which it is to be used.

A noteworthy example is

TYPE D. E. 3.

a general purpose valve for use with dry batteries, or 4-volt accumulators.

REDUCED PRICE 16/6

Outstanding features :—

FILAMENT.

Although current consumption is only .06 amp., electron emission equals that of bright emitter taking over twelve times the current. The filament does not depend for its emission on a substance coated on the outside which rapidly wears away in use. The *active material* permeates the *whole* of the filament.

GRID.

Special machinery provides for abnormally high exactness of manufacture. Spiral grid, each turn welded to grid support. Full control over electron emission ensured.

PLATE.

Most rigid construction employed (spot welding). Active portion of filament *entirely* enclosed.

The most economical valve in the World!

MARCONI VALVES

MADE AT THE OSRAM LAMP WORKS

SOLD BY WIRELESS AND ELECTRICAL DEALERS, STORES, ETC.

favourite singer. She has made a special forte of Bach arias and old folk songs, many of which she has unearthed from obscurity. She was heard at her best, perhaps, when Cardiff, pioneer of good programmes, devoted a Sunday night to the works of Gustave Holst, and included his short opera "Savitri," in which Miss Silk took the title rôle, and which she created when the opera was produced last year at Covent Garden.

Amongst the innumerable favourite vocalists, too, may be mentioned Miss Kate Winter, whose voice, we believe, is most frequently recognised in query programmes, Miss Constance Willis and May

Mr. De Groot, the leader of the Orchestra at the Piccadilly Hotel.

Miss Irene Scharrer, a well known solo pianist.

Blythe, both famous members of the B.N.O.C., while enthusiasm is always expressed when the other members of this company, especially Walter Hyde, Frederic Collier, or Robert Radford, are heard.

The Instrumental Element

Naturally, classical music has been a vital factor in Sunday programmes, and has given listeners opportunities to hear the best players of chamber music as well as soloists, for the former have been represented with the Catterall String Quartet, led by Arthur Catterall, late leader of the Hallé Orchestra, the London String Quartet, with its famous personnel (Messrs. James Levey, Thomas Petre, H. Waldo Warner and C. Warwick Evans), the Spencer Dyke, the Snow String, the Kutcher String Quartets and the Æolian Players, all artists of highest note.

On the solo side, the piano has been in the safe hands of such players as Irene Scharrer, Mr. William Murdoch, the Australian pianist, Mr. Maurice Cole, one of the earliest of all pianists to broadcast, and Mr. Gordon Bryan. The violin with Daisy Kennedy, Constance Izard and Albert Sammons are names to conjure with at any great hall, the 'cello with Cedric Sharpe, the harp with Jeanne Chevreau, and the old-world music of the Chaplin Trio are all examples of real music.

The famous De Groot Orchestra, whose music is so thoroughly enjoyed on Sundays.

The Lighter Side

It is, however, in the evening that to most people the real music of the day begins, and it is this part of the programme, if any, that should be extended.

The Military Band

The brass band has often been described as "the national instrument." Certainly, England dearly loves its military band, and here again we have had of the best, including the Royal Artillery, the Royal Air Force, the Grenadiers, the Life Guards, Princess Patricia's Canadian Light Infantry, the Kneller Hall military bands, to say

Miss Kate Winter, a favourite singer, is frequently recognised in query programmes.

nothing of 2LO's "very own," formed and conducted by Mr. Dan Godfrey, and who should know better than he how to make this a great success?

There is, however, one provider of classical music whose name has become a household word, and that is Mr. De Groot, the violinist-conductor of the fine orchestra at the Piccadilly Hotel. "King of meal-time music" has he well been called, for from the cutset he determined that he would not play jazz, but would make his audience enjoy the finest music and, like Oliver Twist, "ask for more."

Well, too, has he succeeded—Puccini, Leoncavallo, Wagner, Tchaikowsky, Sibelius, to quote but a few of the great composers, have all been "fed" to the patrons of the hotel and of the aether, and right well have they appreciated the change.

The Studio Menu

At 2LO also the studio has given the finest in miniature orchestras, for the two most hard to equal J. H. Squire's Celeste Octet, which came early in the musical history of the B.B.C., and Casano's Octet soon proved their ability to give the public just what it wanted.

These, too, have given opportunity to bring forward singers whose voices have since become known to every music-lover.

From the De Groot concerts first came to us Miss Mavis Bennett and Miss Wynne Ajello, the freshness of their voices and their ability to interpret coloratura music making the deepest impression.

Miss Jeanne Chevreau, of the B.N.O.C., with her harp, which has been heard over the aether.

Favourite Singers

Favourite singers of the studio have become Miss Kate Winter, Winifred Fisher, Dorothy Bennett, Elsie Suddaby, Roy Henderson, Leonard Gowings, Bertram Ayrton, amidst a host of others, while best of all have been the studio performances "all along the line" of the artists of the British National Opera Company. Their solo performances, as well as performance of opera in studio and at Covent Garden and their other theatres, have done more to revive the love of opera than any foreign company existent.

These names represent but the tiniest part of the vast army of musicians who make the Sunday programme what it is and redeem that day from being what it is termed by so many foreign visitors—the national "day of penance."

Some Causes of Poor Reception

Faults in Crystal Receivers and How They Were Remedied

By H. BRAMFORD

ON several occasions I have had receivers handed to me accompanied with the remark, "I can't make this go; I don't know why. I carefully followed the instructions when I made it, and it ought to go; I am sure I have done everything right," and then, rather sceptically, "Perhaps it is no good." Such remarks, strange to say, often apply to such simple things as crystal receivers of the most elementary type.

Examples

On one occasion a set was handed to me in this manner. On examining the receiver I saw that all details had actually been faithfully carried out, and was at a loss for the moment to trace the fault. However, on perceiving a questionable make of variometer on the receiver my suspicions immediately turned in this direction. The rotor revolved on a spindle and socket, but the adjustment was so loose that there was practically no contact taking place between the rotor spindle and stator bush as was essential with this style of instrument. On removing the fault and making connection secure, and attaching aerial, earth and 'phones to the set, results were excellent.

On another occasion I had a set to overhaul. In this case instructions had been badly followed. For one thing the aerial terminal was a minus quantity. Also not a single nut was firmly secured, and not a single contact was good. In fact, a remarkable disregard had been paid to small but essential details. Having checked the connections, and tightened up generally, results obtainable were very poor. In this case, the variable condenser was at fault. The fixed vanes were connected properly, but the moving vanes were not connected at all.

Faults

The best way to look for or guard against faults in crystal receivers is as follows:—

1. Be quite sure that all connections are correct.
2. Test continuity of connections or windings with a flashlamp or buzzer and battery.
3. Where connections are secured under nuts, see that the nuts are tight, and, if possible, add a lock nut.
4. See that no bare wires are touching one another.
5. Carefully examine rubbing contact connections, such as are found on variometers and variable condensers.
6. See that the moving vanes of variable condensers do not touch the fixed vanes.
7. See that the aerial and earth are connected to the receiver when trying out.

The "Sharp Tuning" Single-Valve Receiver

SIR,—You will be interested to know that I have made your single-valve "Sharp Tuning" receiver which was described in THE WIRELESS CONSTRUCTOR, March issue, by Mr. Stanley G. Rattee, and I am very pleased with it.

I have used a 2 megohms grid leak and a ·0005μF. ordinary type variable condenser; instead of the rheostat I used a Lissen Minor. I have received the following stations: Birmingham (almost too loud), Manchester, London, Liverpool, Nottingham, Stoke-on-Trent, and a French and German station, but I do not know which stations they were. All these were received on 50, 75, 50 coils.

Yours faithfully,

Birmingham. H. HEYNES.

The "Comparison" Crystal Receiver

By JOHN W. BARBER

This instrument makes possible the comparison of many forms of crystal, each specimen being tried against a standard detector of the permanent type

When not in use the lid may be closed down, thus excluding dust.

MANY crystal enthusiasts spend a great amount of time in trying out various specimens of crystals in an endeavour to find "the best," and derive much amusement and instruction therefrom. It is, however, very advantageous if a "standard" is at hand by means of which comparisons may be made, at the same time providing a means whereby the whole receiving circuit may be used as an ordinary crystal set should occasion arise.

It is with these generalisations in mind that the crystal receiver illustrated herewith has been designed, and the writer has found the "contraption" very useful for such tests as arise from time to time, as,

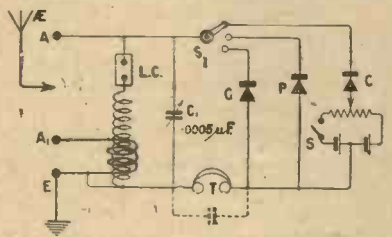


Fig. 1.—The switch S_1 determines which crystal is in use.

for example, when some enthusiastic friend makes great claims (possibly unwarranted) for a "new" crystal which he has "discovered."

The Standard Detector

The "standard" detector may consist of any of the "permanent" types now on the market, but in this particular function it is as well if one which possesses no adjustment whatever is used, owing to the fact that no comparisons of any real use can be made if the standard is by any means variable.

A receiver which is primarily intended for the purpose of comparing crystals must inevitably involve apparatus for the testing of carborundum crystals, and as these demand special treatment in respect of applied voltage, and special metallic contact, it is essential that a separate detector of the carborundum variety be incorporated. Considering the design of the outfit as a receiver for normal purposes, some suitable containing box must be provided. It is a well-known fact that one of the greatest enemies of sensitivity in crystals is dust, so that the whole should be capable of being closed up when not in use in order to exclude this undesirable element. Another point is that any apparatus for testing or comparison purposes should be as compact as possible, and these considerations have all been taken into account in the design of the "Comparison Crystal Set."

The Cabinet

The containing box has a lid which may be closed up, and the panel measures 8 in. by 7 in. The permanent detector, or standard, is mounted behind the panel, while the detector for comparing crystals, which may be of any good make incorporating a micrometer adjustment, is mounted in a convenient position on the left of the panel. For the carborundum detector I am indebted to D. J. S. Hartt, B.Sc., of the Radio Press staff, the

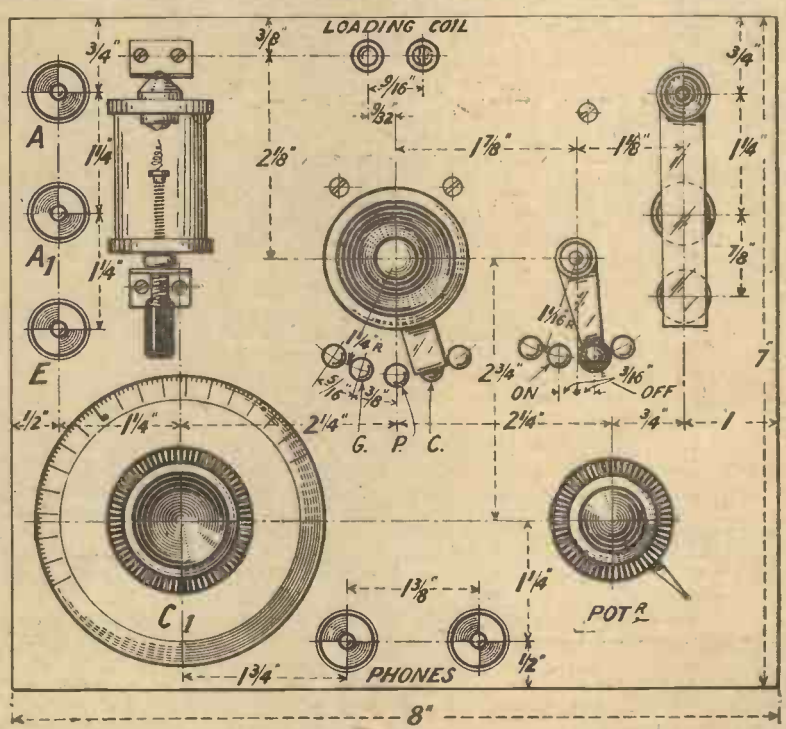
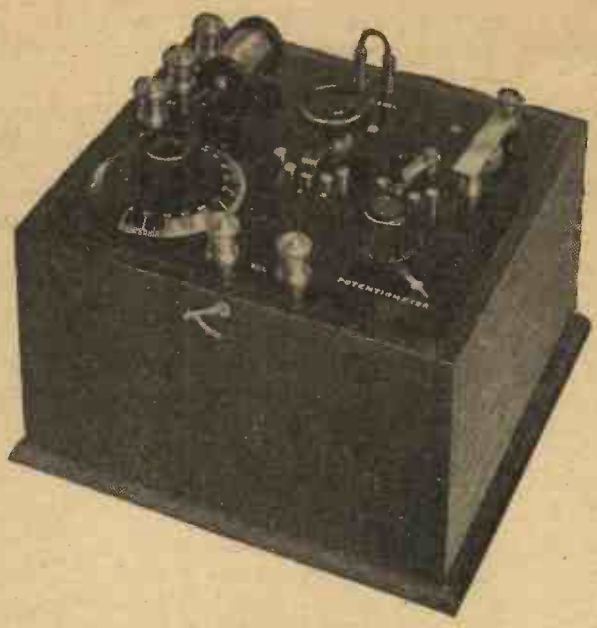


Fig. 2.—Showing how the panel is laid out and drilled. A separate drawing of the carborundum detector will be found on the next page.

design being that used by him in the "Stay-Set" Crystal Receiver in the March issue of this Journal. The construction of this device is made quite clear in the detailed drawing, and as many readers will remember the article referred to, no further remarks need be made upon this subject.

As will be seen in the circuit diagram, Fig. 1, a selector switch is provided in order that the change-over from one detector to another may be as simple as possible. The middle stud on this switch joins the permanent detector in circuit, that on the left bringing the catwhisker detector into operation, while the carborundum detector is caused to function by moving the switch arm to the right-hand stud. Another switch, to the right of the selector switch, serves to break the connection from the dry cells which operate the carborundum crystal, when the latter is not in use, in order to prevent the cells discharging through the potentiometer resistance.



The lid of the box has been removed in this view.

The Coil

In order to give selectivity, the aerial circuit is aperiodically coupled to a tuned secondary circuit, the two coils being wound on the same former, which is of the **X** variety designed by G. P. Kendall, B.Sc.

Winding, which is carried out with 22 S.W.G. double cotton covered wire, is commenced in one of the slots nearest the centre of the coil, and the wire, for the first twenty turns, is wound on double. Having reached the end of the first slot, the wire is carried over to the next higher slot, which will be found to have its end on the opposite side of the former. When twenty double turns have been wound on, one wire is cut off, leaving about 3 in. free end, and the other wire continues the winding until sixty turns have been completed, when the wire is cut and the end secured. The two wires at the beginning of the coil are secured to the earth terminal, and the end of the twenty-turn winding goes to the terminal A_1, while the end of the sixty-turn winding is connected to one side of the loading-coil socket. The other side of this socket connects to the terminal A, and to the arm of the selector switch S_1, as well as to the fixed vanes of the variable condenser, the moving vanes of which are joined to earth.

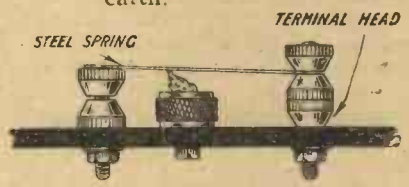


Fig. 4.—Details of the carborundum detector.

Components Required

In order to make this little receiver the following parts are required:—

One panel, 8 in. × 7 in. Thickness may be either ¼ or 3/16ths in. I have used black Radion, but any other good brand will do.

One ·0005μF variable condenser (Collinson's Precision Screw Co., Ltd.), square law type.

One "Kendall X" coil former. This may be obtained from Messrs. Burne-Jones & Co., Ltd.

One good quality catwhisker type crystal detector, with a fine adjusting screw. (Burndept Wireless, Ltd.)

One permanent type crystal detector and mounting. (H.T.C. Electrical Co.)

One potentiometer of 300 ohms or over. (R. A. Rothermel, Ltd.)

One switch arm, knob type, three studs and two stops.

One switch arm, lever type, two studs and two stops.

Five large terminals. (Burne-Jones.)

Quantity of No. 22 S.W.G. double cotton covered wire for the coil. About half a pound will suffice.

A supply of spare crystal cups suitable for the detector used should be provided in order that the change from one piece of "ite,"

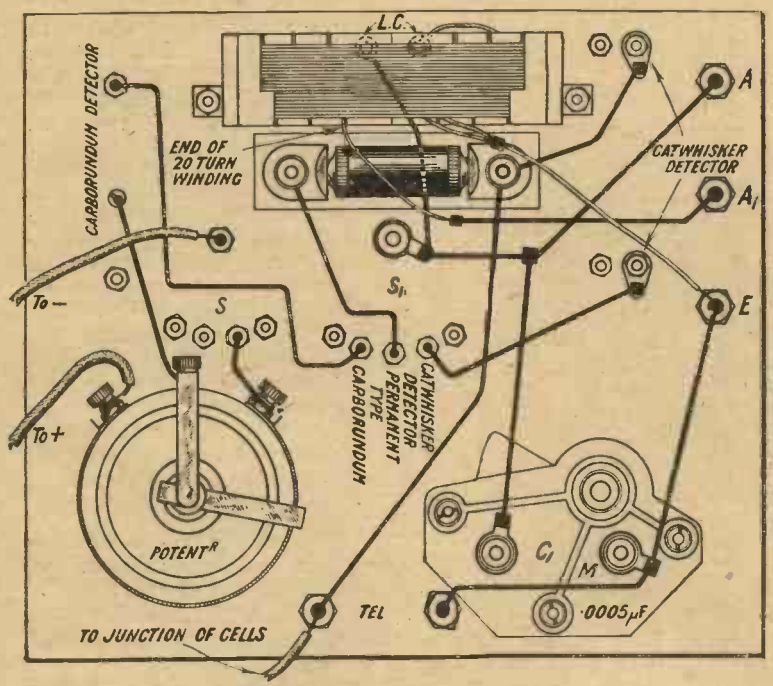


Fig. 3.—The beginning of each winding on the X coil goes to terminal **E**, the end of the 20-turn coil to A_1, while the end of the 60-turn coil is joined to the loading-coil socket.

say, to another, shall be as simple as possible.

One packet of Radio Press panel transfers.

Some 16 S.W.G. tinned copper wire, of round or square section, for wiring up.

For the carborundum detector we shall require the following :—

Two complete terminals and the head of a third.

One crystal cup.

One piece of clock spring, about ¼ in. wide and 2¼ in. long.

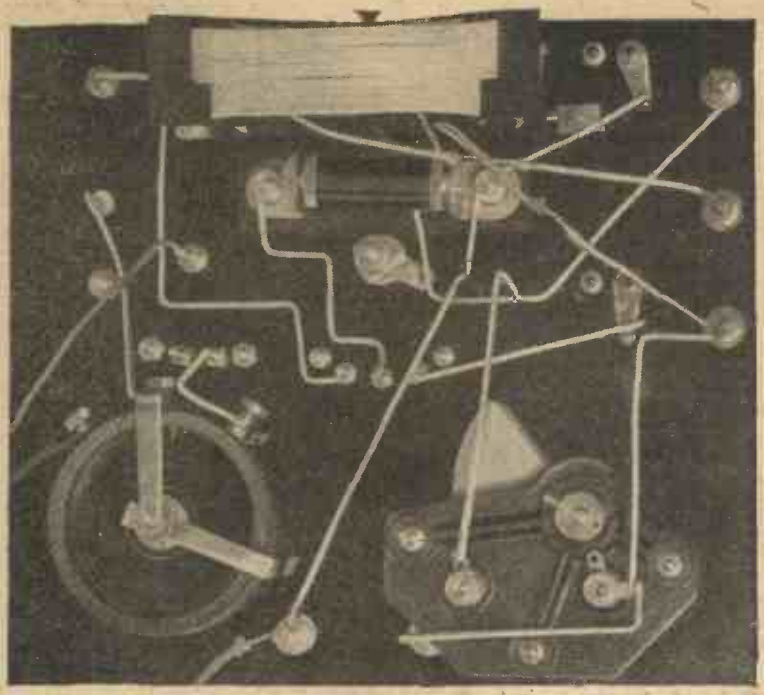
Some specimens of carborundum crystal. Among other places, some good crystals are obtainable from the Waterloo Tool Co.

Two small dry cells, 1½ volts each. Ever Ready cells No. U.W.1 will be found suitable.

The Panel

Many firms will supply a suitable panel ready cut to size and drilled, if the constructor so desires, provided that it is clearly stated that a panel is required for the "Comparison" crystal receiver. Alternatively, of course, an undrilled piece of ebonite of the correct size may be purchased and drilled to the markings given in Fig. 2.

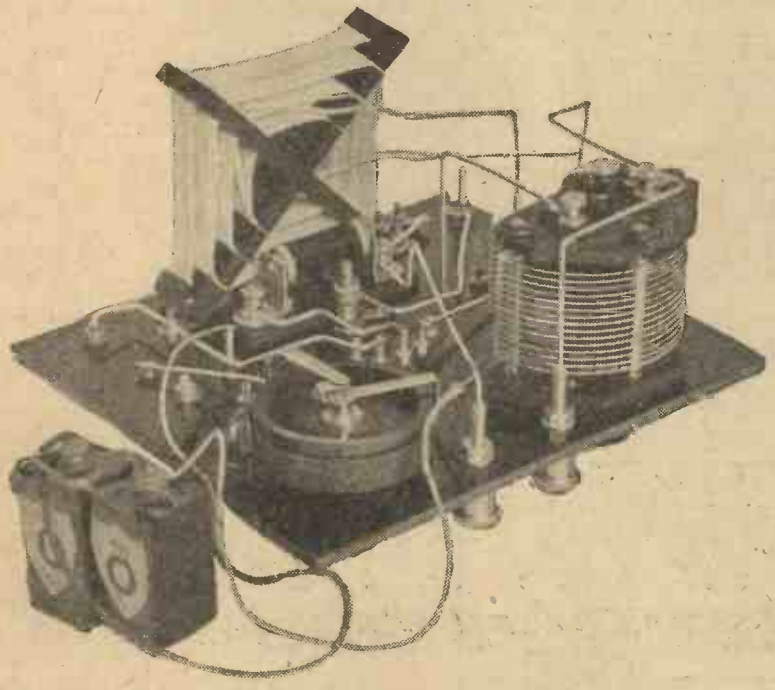
If you use the parts specified, you may drill the panel exactly in accordance with this drawing, but should you vary the specification, make sure there is sufficient space and that you drill the panel in a suitable manner.



This view, which is taken looking down upon the back of the panel, gives a very clear idea of the wiring. Note the connections to the switches.

Wiring

The components may then be mounted upon the panel, and the wiring commenced. This should not present any difficulty if the diagram Fig. 3 is carefully followed. The back of panel photographs will also be of assistance when wiring up, as it will be possible to see which wires are above the others. The **X** coil is mounted upon the panel by means of two pieces of brass strip, bent to shape, each being secured to the coil former and to the panel.



The cells used in this view are of a convenient type, but those mentioned in the text will be quite suitable. The connection to the end of the 20-turn winding is clearly visible in the above photograph.

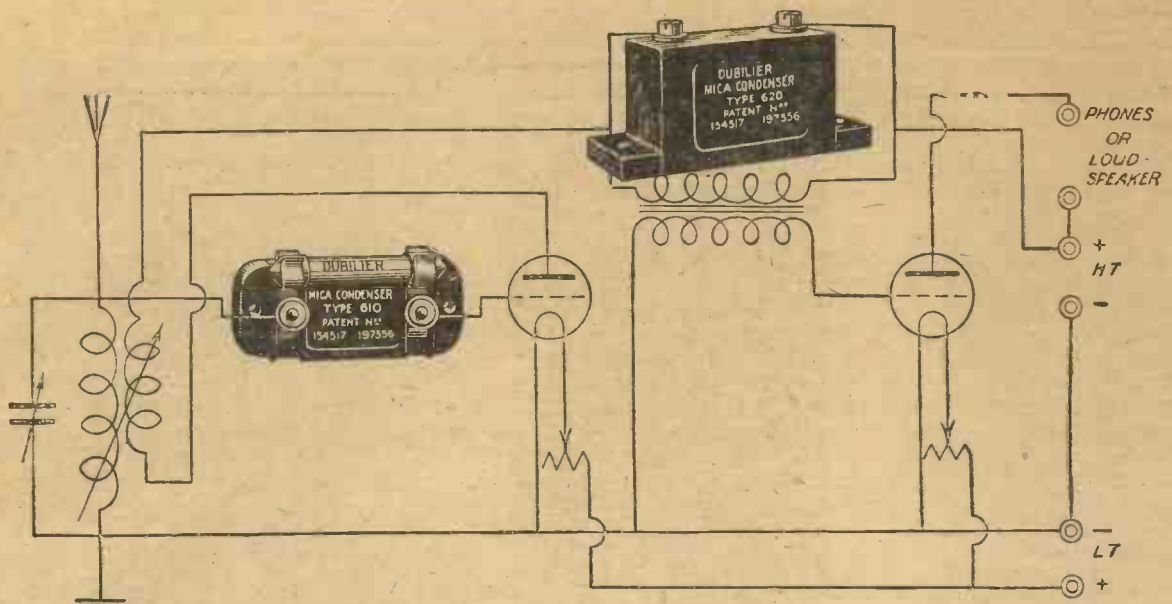
Battery Leads

To join the flexible leads up to the battery proceed as follows: Take the flexible wire from the potentiometer to one terminal (say the positive) of one of the cells. The remaining (negative) terminal or wire of this cell is joined to the positive of the other cell, and also to the flexible wire coming from the telephone terminal, while the remaining negative terminal of the second cell is joined to the flexible wire which joins up to the "on-off" switch. The cells are now placed in the bottom of the box, and, if desired, may be secured in any convenient manner. The panel is then placed in position, and secured if necessary with wood screws, when the whole is ready for use.

Operation

To listen to the local short wave station, join the aerial to terminal A_1, earth to E, and place a shorting strap across the loading coil socket. Join up the telephones, and place the selector switch on to the middle stud, thus placing the permanent crystal detector in circuit. Tune on the variable condenser until the

(*Concluded on p.* 849.)



Little things that matter!

It has always been difficult to pick out the little things in life that matter. It takes accountants to find the little errors in accounts; engineers those little failures in a machine that mean so much; and experts to tell what is really wrong with an inefficient wireless set.

This last is always a troublesome affair; a number of very minor defects and mal-adjustments, each insignificant in itself, may together make a good set apparently useless.

For example: condensers, which are really essential in EVERY set, can, if defective, cause rapid exhaustion of H.T. Batteries, and in a grid circuit, they can prevent the grid from reaching its maximum efficient potential, thus weakening the signal strength.

It always pays to have the best, in Wireless as in everything else. That is why, for condensers for all purposes, it is wiser to

Specify Dubilier

Type 610
For all purposes of Wireless Reception. Fitted with screw terminals & detachable Grid Leak Clips.

Type 620
Similar to Type 610 but for vertical panel mounting.

In capacities of
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E.P.S. 135

Stations he had never heard before

AMONG bright emitters there is no Valve in the country which ever earned such praise for long-distance reception as the Cossor P2—the valve with the red top. Indeed, it can be said—without fear of contradiction—that this Valve exerted tremendous influence in popularising long-distance reception. Before its introduction the reception of distant Continental Broadcasting Stations was a matter of luck. If conditions were favourable—if your aerial was efficient—if your Set was good, then you might reasonably hope to pick up Stations six or seven hundred miles away. But when the Cossor P2 was placed on the market long-distance reception became a matter of habit.

And now the same measure of popularity is being extended to the Wuncell Dull Emitter W2—also the valve with the red top. This valve is identical in characteristics with the famous P2. Wherever you have used a P2 with such excellent effect you can replace it with the Wuncell W2 and get even better results.

Glowing at the dullest of red heat—practically invisible during daylight—the Wuncell consumes only .3 amps at 1.8 volts. With Wuncells your accumulators will last six times as long—in less than three months the Wuncells will have saved their extra cost in accumulator recharging alone. Unlike many other Dull Emitters, there is nothing fragile about the Wuncell. Its filament—the only vulnerable part of any valve—is quite as stout as that used even in a Bright Emitter. As a result the Wuncell is becoming known as the *long life* Dull Emitter—the valve that should easily outlast several bright emitters.

Before buying any more valves, think carefully how much you will save by choosing Wuncells—you save money on accumulator charging, you get a valve with almost indefinite life, and you get a valve with a reputation for pure tone, sensitiveness and volume which has never been equalled by any other Dull Emitter.

A. C. Cossor Ltd., Highbury Grove, N.5

Wuncell Dull Emitters

Types W1, W2 & W3

W1 is the Detector Valve, W2 (with red top) is the H.F. amplifier specially designed for long-distance use. W3 is the new Cossor Loud Speaker Valve. All function at 1.8 volts.

Types WR1 & WR2

To enable users of multi-valve Sets to try out Wuncells along with their existing bright emitter valves from a 4- or 6-volt accumulator, we are also supplying them with a resistance incorporated within the base. In all other respects the WR1 and WR2 correspond exactly to the W1 and W2. When not required, the resistances can be short-circuited and the valves operated at their normal voltage of 1.8 volts.

Important Reduction in Prices of all Cossor Valves

Bright Emitters:

	Old price	New price
P1	11/-	8/-
P2	11/-	8/-

Wuncell Dull Emitters:

W1	18/-	14/-
W2	18/-	14/-
WR1	20/-	16/-
WR2	20/-	16/-

Loud Speaker Valve:

W3	22/6	18/6

¶ These prices come into force at once.

Cossor Wuncell — the long life Dull Emitter.

Gilbert Ad. 2811

How to Connect Your High-Tension and Grid-Bias Batteries

By PERCY W. HARRIS, M.I.R.E., Editor

Dealing with the correct connections of separate H.T. and grid-bias terminals, this article will remove the uncertainty which at present exists in the mind of the beginner in this matter

LATELY I have heard of several cases where readers of THE WIRELESS CONSTRUCTOR have been a little uncertain of how to join up their high-tension and grid-bias batteries to the terminals which are provided for in THE WIRELESS CONSTRUCTOR and other Radio Press sets. To make this matter clear to them, I am this month devoting a short article to the connecting up of batteries, and everything said in these notes can be taken to apply to any set which has terminals similar to those shown. I hope in this way to provide information which can be looked upon as a standard for all the Radio Press sets and to which readers can refer at future dates.

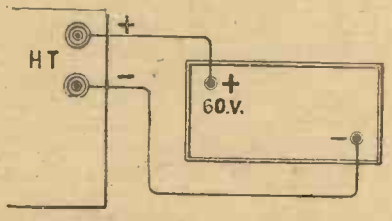


Fig. 1.—The connections to be made where only one positive and one negative terminal exist.

Where the set has but one pair of high-tension terminals marked respectively positive and negative few people go wrong in their battery connections. The terminal on the set marked H.T.+ is connected by a lead to a wander-plug which is plugged into the socket giving the voltage it is desired to use on the H.T. battery. The terminal marked H.T.− is connected similarly to a lead which goes to a wander-plug plugged into the negative socket of the high-tension battery. With very few exceptions the voltages on a high-tension battery are numbered from the negative end, so that we get a socket marked negative and a number of other sockets marked with numbers such as 6, 9, 12, 18, etc., and so on up to the maximum voltage of the battery. To apply

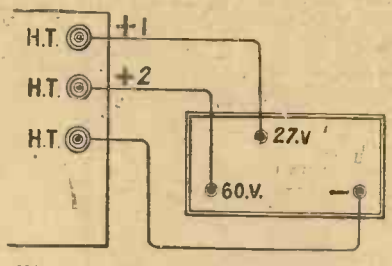


Fig. 2.—How a second tapping is used.

45 volts high tension to a set, it is thus only necessary to plug in the negative lead into the negative socket and the positive lead into the socket marked "45." Most high-tension batteries are numbered in sets of 3 volts.

Current from the H.T. Battery

It is quite a mistake to imagine that the current taken from a high-tension battery is negligible. The current is quite appreciable,

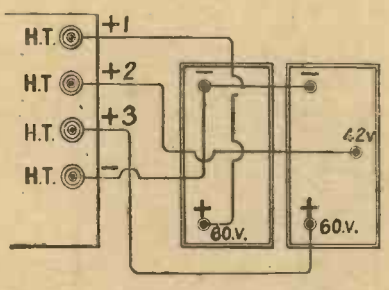


Fig. 3.—Two separate batteries are here used, their negative sockets being both connected to the H.T. negative terminal.

although it does not compare in quantity with that used to light the filament of a valve. As it is not a negligible current and as every valve takes a certain current from the high-tension battery, we can soon reach a limit of current which an ordinary high-tension battery can be expected to give satisfactorily. Personally, I never like to run more than four valves off one ordinary-sized high-tension battery, as if more valves than this are run, and especially if one or two are power valves, the battery will be very rapidly exhausted and may develop noises quite early in its life. These noises are caused by irregularity of discharge, and set up sounds which closely resemble those given by atmospherics.

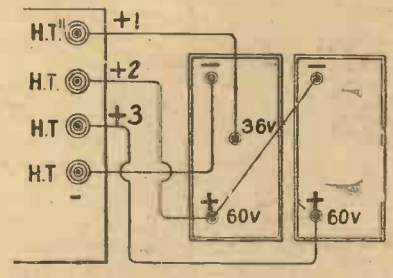


Fig. 4.—In this case the two batteries are in series, the positive of the one on the left being joined to the negative of the other.

The H.T. Accumulator

If you require to take more current from a high-tension battery than the ordinary size will safely give, there are three ways of doing it. The safest way of all is to use a high-tension accumulator, but this is a somewhat expensive piece of apparatus and occasionally presents difficulties in the way of charging, so that many people will not care to purchase one. The next way is to buy a high-tension battery of an extra-large size. The ordinary wireless dealers rarely stock these, and they must be specially ordered, but the big makers, such as Siemens and

Ever Ready, will supply them through your dealer when asked for them. The price is considerably

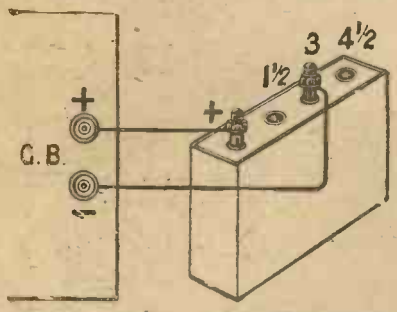


Fig. 5.—How a grid-bias battery is connected up.

more than that charged for the ordinary size of battery, but you get excellent value for your money, for such batteries supply far more current than the smaller sizes and will have an appreciably longer life. The third way, and one which I often use personally with multi-valve sets, is to use several separate high-tension batteries. In this way the load can be distributed, and, if we have, say, a six-valve set and four separate batteries, then one battery need never give current to more than two valves.

Separate H.T. Batteries

Fig. 3 shows the way of connecting up two or three high-tension batteries. In the actual illustration two batteries are used. To join them up in this way it is necessary to connect the two negative ends of the battery together and to take a lead from them to the common H.T. negative terminal on the set. You will notice that where a set has several H.T. positive terminals, there is only one H.T. negative terminal. The reason is that this

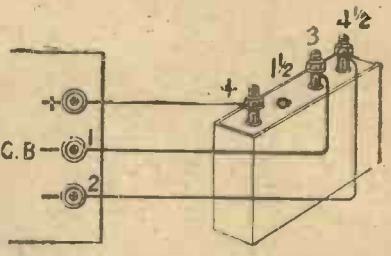


Fig. 6.—In this case two separate G.B. terminals are provided, and are joined up as shown.

terminal serves as a common negative to all the H.T. supplies. When using two or more batteries, the positives are connected to whatever voltages we require.

Batteries in Series

Fig. 4 shows how two or more high-tension batteries can be connected in series, if you want to get a higher voltage than that given by one of the high-tension batteries. In this case the negative high-tension terminal of the set is connected to the negative of the first high-tension battery, the highest positive tapping is then connected to the negative of the next battery, and the positive high tension of the set is connected to whatever voltage we require in the second battery. In this way we may have two separate 60-volt H.T. batteries joined in series and may require about 100 volts for our set. To do this we connect, as explained, the negative H.T. terminal of the set to the negative of the first battery and the positive H.T. lead to 42 on the second battery. This will give us 102 volts (60+42) as required. Other figures in this article show how to connect two or three high-tension tappings to one battery.

Grid-Bias

Questions are often asked by readers on how to connect up grid-bias to a set where there is more than one grid-bias negative. The illustrations show how to do this. In connecting your grid-bias, you should remember that there is one grid-bias positive only, although there may be two or more grid-bias negatives.

If you have two grid-bias negative terminals for two separate valves and both valves require the same negative voltage, then there is no reason why you should not connect the two negative terminals together by a piece of wire and take one pair of leads only to the grid-bias battery.

This view, taken at a window of the Managing Director's room in the offices of Radio Press, Ltd., shows Mr. John Scott-Taggart discussing with Mr. Percy W. Harris, details of the latter's American trip.

OUTDOOR RADIO

Charging Accumulators at Home

By G. P. KENDALL, B.Sc., Staff Editor

Some further notes upon a vital subject

Extent of Discharge

THE question of how far to run down any battery in the course of use is an important one from the point of view of the health of the accumulator, and some definite rule should be made. A safe and convenient one is this: Obtain from the label the actual ampere hour capacity of the battery, remembering that the "actual" capacity is half the "ignition" capacity, and then work out how many hours this should run your set, which can be done quite easily if you know the rated filament current of each of your valves. Thus, supposing that it is a four-valve set using bright emitters, you might take it that something a little less than 3 amperes will be used, and if you use an accumulator of 30 ampere hours actual capacity, you will then get 10 hours of light. The rule should now be made that the battery is never to be taken right down to its lowest possible discharge point, according to its rating, so that one should stop short after, say, 8 hours' use, and recharge it. In this way it is easy to keep it in good health, without trouble from that bane of the accumulator, sulphating. As a matter of fact, of course, the example quoted is of a battery of the very minimum size to run the set in question, a much larger one being desirable, since it is a nuisance to have to recharge the battery every four or five nights of use.

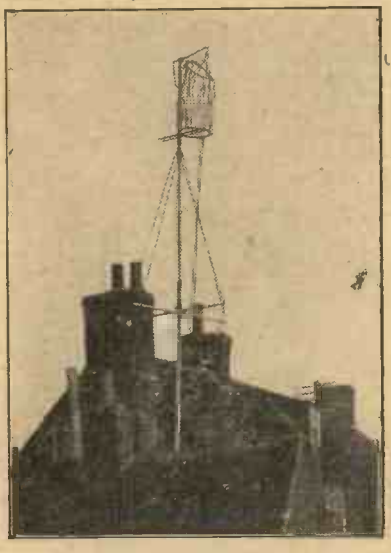
Accumulators for Dull Emitters

The one exception to this method of working occurs in the case of very low consumption dull emitters running from an accumulator, in which case it is possible that the battery would not be run down in, say, six months' use. For its health's sake, however, it should be given a "refreshing" charge about once a month.

These brief instructions will cover the charging of accumulators by practically any method since so far as the battery and its treatment are concerned, the same procedure is always adopted and need not be repeated when considering the other methods.

Waste of Power

The objection to the method which we have been considering of charging from the D.C. mains is, as was pointed out, that considerable waste of power takes place, in view of the fact that a very large series resistance has to be used, and practically the only way of overcoming this in a simple manner is to use a small motor generator, which consists of a small-power motor driving a dynamo giving a suitable output for the charging of batteries. There is such a small motor generator upon the market, and it is no doubt a real economy in the long run, once the purchase price has been cleared off by the saving in charging current. This machine actually resembles a rotary converter in that the two functions are combined into one machine, its appearance being that of an ordinary motor, but for the fact that there are commutators at each end of the armature shaft.



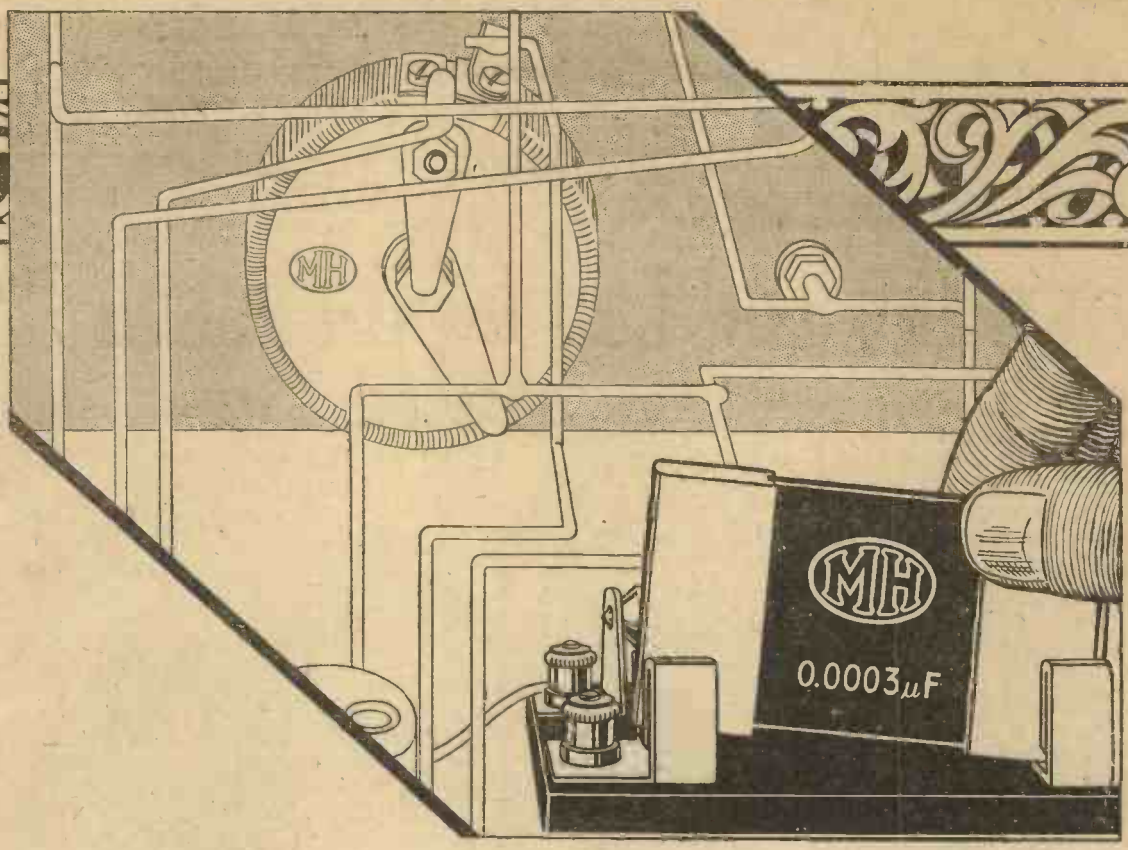
A curious aerial seen at Burnham-on-Crouch.

The Motor-Converter

The use of such a machine is extremely simple: the motor end is provided with a long flexible lead and an adaptor, which is plugged into a lamp socket in the ordinary way, whereupon the machine runs as a motor. At the other end of the machine is a small charging board carrying an ammeter and a variable resistance, and a pair of terminals marked positive and negative, and from these terminals leads are taken to the battery in the ordinary manner, the charging rate being suitably adjusted by moving the slider of the resistance and watching the ammeter. There is no need, with this machine, to identify the polarity of the terminals, since this is automatically attended to by the machine itself. The only points to be observed here are those concerned with the actual charging of the accumulator, and these have already been covered.

The House Wiring System

A very simple makeshift which can be used to give economical charging from D.C. mains without the use of any expensive accessory, is illustrated in Fig. 1 herewith, and consists merely in the placing of the battery which is to be charged in series with the house mains, so that the current normally flowing to light the house will charge the battery on its way. This arrangement is not very convenient, since one can only charge when the lights are in use, and thus for only a limited number of hours in the day, but for a small sized battery it is certainly the most economical method. What has to be done is simply to break *one* of the leads going from the mains to the house system, and insert in series therewith the battery, after identifying the negative and positive leads. The best point at which to do this will depend upon the actual house system, but it should be emphasised that it should only



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Barclays Ad.

be done on the *house* side of the main fuses. It will usually be found that there is a simple double-pole switch which is used for turning the house system on and off, and that on the house side of these two switches will be found either a pair of smaller fuses or leads going off to some sort of fuse distribution box. These provide a convenient point to break in, and the greatest possible care should be exercised to see that your operations are entirely restricted to *one* of the leads. On no account adopt any scheme which involves the use of both leads, and of course see that the house supply is turned off before you commence. In this instance it is not possible to adjust a charging rate very accurately to the needs of the battery, but so long as it is found that the house system does not take more than 25 per cent. above the correct charging rate, or 50 per cent. below it, fairly satisfactory results can be obtained. An ammeter should, of course, be inserted for checking purposes in series with the battery.

Appliances

It is not the purpose of this article to deal with the construction or improvising of charging appliances for one's self, and therefore this will be the only instance in which we shall consider any actual construction or wiring work. In all the other cases we shall be dealing solely with bought apparatus which can be connected to the mains simply and without any particular knowledge on the part of the operator.

Of the methods considered, it will therefore be seen that the most suitable for anyone who wants to keep down expenses to the very limit is the last one, while for those who are prepared to spend a certain amount at the start and obtain economical and really satisfactory results, a rotary converter is, perhaps, to be preferred, the other scheme being a happy medium which will appeal to the greater number.

Charging from A.C.

Charging from alternating current mains is really, to my mind, a simpler matter even than charging from the direct current variety, since there are a greater number of convenient charging devices which can simply be connected to the various lamp sockets, wired up to the battery, and left to carry out their work economically. These devices differ from those we have been considering, in that they incorporate some means of converting the alternating current into direct current.

Alternative Methods

As before, there are a number of different alternatives, the one adopted usually depending largely upon the amount which it is desired to spend upon the charging equipment. Where large batteries are to be charged, and a considerable capital outlay is allowable, once more the rotary converter, consisting essentially of some sort of combined motor and dynamo, or commutating device, which, by a sort of rapidly revolving switching arrangement, converts the alternating current into direct, is usually adopted. Such appliances, however, do not, as a rule, appeal to the private user who requires to charge only medium sized batteries at not very frequent intervals, and we may, therefore, turn our attention to some of the types more suitable for home use. Of these there are three principal types—namely, the electrolytic type, the vibratory and the "Tungar" form, in which a large two-electrode valve performs the desired rectification of the current. The Tungar can be obtained in a variety of sizes, the smallest one giving a fixed charging rate of 2 amperes, which is suitable for the majority of small and medium-sized batteries.

When the Tungar is in use it gives a subdued light, a certain amount of warmth, and only a moderate amount of humming. It is, therefore, quite capable of being used in the house without causing annoyance.

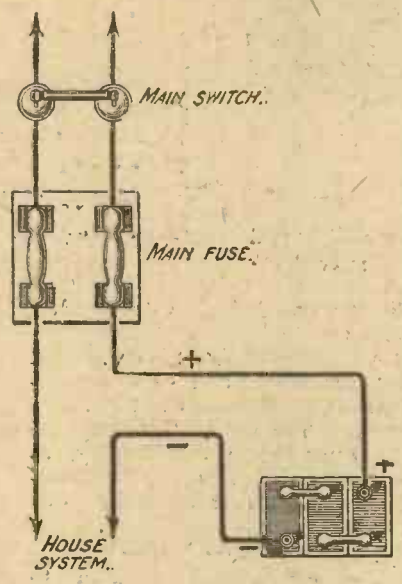


Fig. 1.—The accumulator may be placed in series with the house lighting system as shown above.

The Vibratory Type

The vibratory type employs some sort of buzzer arrangement in which a vibrating reed chops up the alternating current into direct, and it is usually found that this process is accompanied by a good deal of noise. There are, however, certain quiet types upon the market, and it is usually found that these are quite satisfactory in operation. It is often objected that the vibratory types are likely to go out of adjustment, but they are usually accompanied by a set of instructions, which makes any adjustment quite a simple matter, and some of the later types can be depended upon to run for a very long period without needing any attention whatever. It will usually be found that a quiet type, as distinguished from one of the noisy ones, will be quite satisfactory, needing the very minimum of attention. These rectifiers, as they are called, are usually provided with small ammeters which indicate the amount of current which is passing into the battery, but they are not, as a rule, fitted with any means of regulating that current. Should it be desired to charge at lower rates than that which is normally given, it is a very simple matter to insert a small variable resistance in series with the battery, a large and robust filament rheostat being quite suitable. Rheostats which are designed to carry current for a number of valves, say four, should be employed, or serious overheating will take place.

The Electrolytic Rectifier

The electrolytic type consists essentially of one or more cells containing some sort of electrolyte, which, of course, varies with the type, into which two electrodes dip, the whole arrangement forming a sort of non-return valve, through which current can pass in only one direction. There is not a great variety of these devices upon the market, probably the best known one at the present time being the "Balkite," sold by Messrs. Burndept, Ltd. This is proving to be an extremely successful device in practice, the only attention required being an occasional filling up with distilled water, and is extremely quiet and clean in operation.

There is little to choose between these three methods on the score of cost, and the choice will depend very largely upon the purchaser's taste. In most cases where the machine is to be used in the house, the question of noise is a serious one, and whatever type is chosen should be heard running under somewhat similar conditions if possible.

Handsome in appearance, this receiver will appeal to readers of "The Wireless Constructor."

The "Crystovalve" Receiver

A NEW AND ECONOMICAL RECEIVER FOR POPULAR USE

By PERCY W. HARRIS, M.I.R.E., Editor

This is just the receiver many readers have been waiting for. Its self-contained tuning coils obviate the necessity for purchasing a complete series of plug-in coils to cover the wavelength band of 250 to 3,500 metres—the scope of this instrument

EQUALLY simple to construct and to operate, the finished instrument presents a neat and handsome appearance, well up to the Radio Press high standard. Strangely enough, in wireless, as in many other arts or sciences, it is frequently the thing which is most useful that gets overlooked for a long period. Many thousands of people own crystal sets, and thousands also are the proud possessors of single valve receivers. The great majority of listeners probably live within eight or ten miles of a broadcasting station, for these have been put up in localities where many people are congregated together. Except in unusual circumstances, with skilled handling and special circuits, a single valve will not operate a loud speaker, and in ninety-nine cases out of one hundred, a single valve receiver is constructed or bought for telephone use. It occurred to me, therefore, that a receiver made up so that it could be either a crystal or a single valve set by the mere throw of a switch would appeal to many people by reason of its simplicity and economy. The receiver illustrated will operate on any wavelength from about 250 to about 3,500 metres (the upper and lower limits depend to some extent upon your aerial), and is self-contained in that no exterior or separate plug-in coils are required. By the turn of the switch the set can be converted from a crystal set, using one of the new semi-permanent detectors, of which several good examples are on the market, to a direct coupled single valve receiver with reaction.

A feature of this set is the tapped inductance coil and variable reaction coil made up as a single instrument. The use of this simplifies the construction considerably, as will be seen by examining the photographs which accompany this article.

Components Required

The components required to make this set are as follows. In accordance with our usual practice, the names of the manufacturers of the actual components illustrated are given opposite the items, but in many cases other good makes can be substituted without any loss of efficiency.

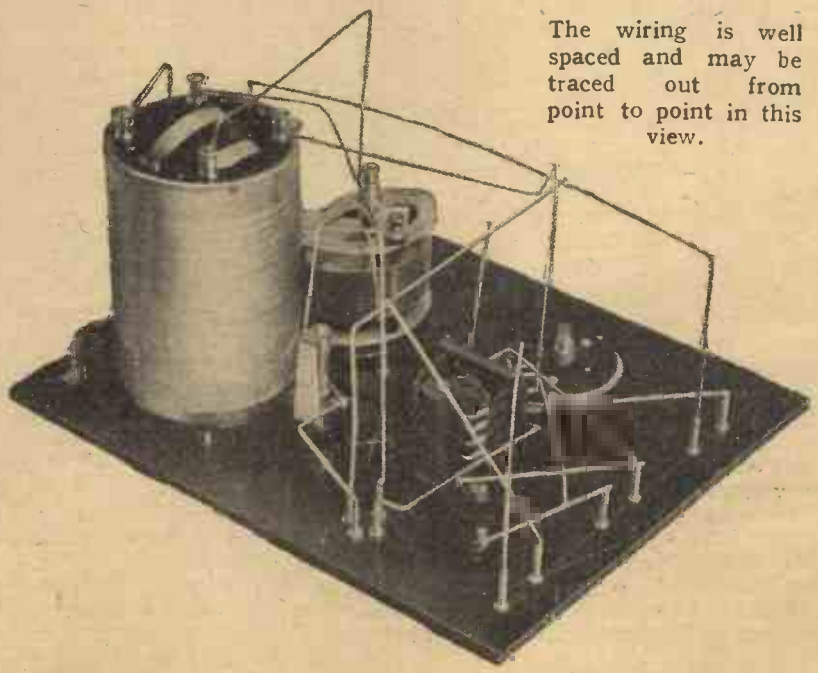
One insulating panel measuring 12 × 10 × 3/16th, or a ¼ in. (I have used black Radion 3/16ths thick).

Suitable box for same 7 in. deep internally. (Camco.)

Nine lacquered terminals with nuts.

One R.I. aerial tuning reactance. (Radio Instruments, Ltd.)

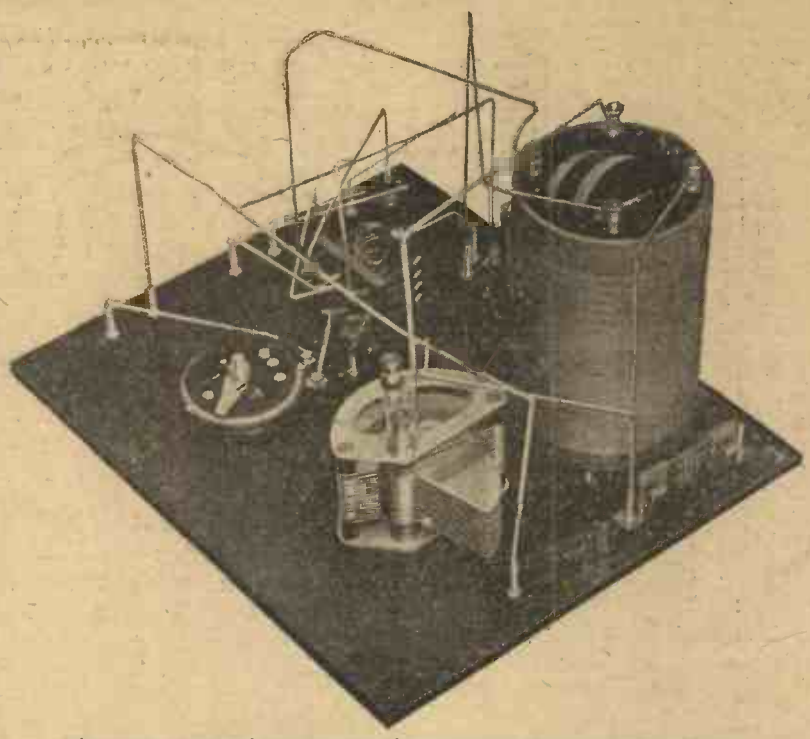
One good quality variable condenser, square law pattern. (Atlas low-loss. Capacity ·0005μF.)



The wiring is well spaced and may be traced out from point to point in this view.

Things you can do with the Crystovalve Receiver

1. *Handle it and receive with it just as simply as with any other crystal receiver.*
2. *Use it as a simple but efficient single valve receiver with reaction.*
3. *Change in a moment from crystal to valve if signals are too weak for proper reception on a crystal.*
4. *Switch back to the crystal in a moment when signals are sufficiently loud for reception in this way.*
5. *Change in a moment from the short wave broadcasting stations to Chelmsford, Radio-Paris or Eiffel Tower without changing coils.*
6. *Compare valve and crystal reception by a mere turn of the switch.*
7. *Receive all wavelengths from 250 to about 3,500 with proper reaction control throughout.*
8. *Use either bright or dull emitter valve at will.*



Showing some of the connections to the change-over switch, and method of mounting the C.A.T. condenser.

One fixed condenser, ·0003 μF. I have used a Dorwood one-hole mounting condenser here with :—

One 2 megohm Dubilier grid leak. Any of the well known grid condenser and leak combinations will do just as well.

One fixed condenser, ·001 μF. (Dorwood.)

One fixed condenser, ·0001 μF. L. McMichael, Ltd.

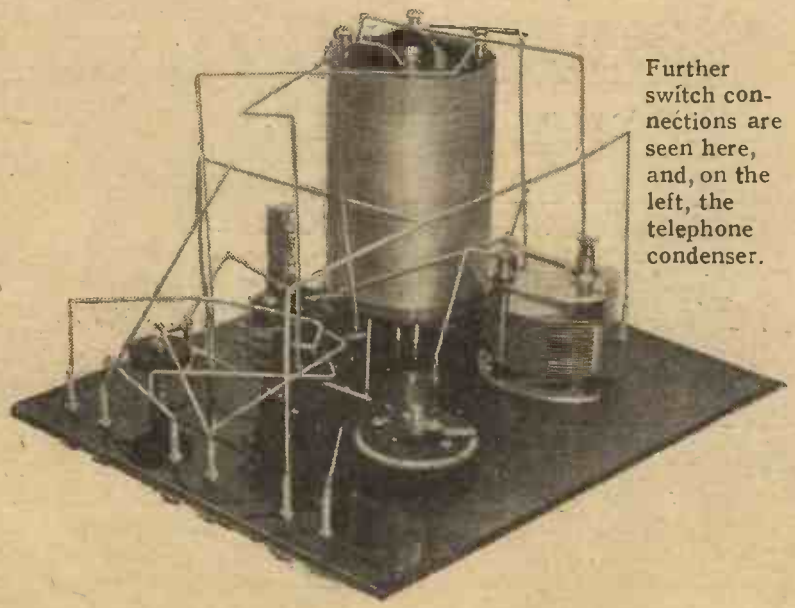
One valve holder or four separate sockets.

One filament resistance, dual pattern, for both bright and dull emitters. (Burndept Wireless, Ltd.)

One set Radio Press panel transfers.

One semi-permanent crystal detector with clips for mounting. There are several excellent makes now available. That used is a "Bronel."

One four-pole double-throw "Utility" switch for panel mounting. Actually only three of the four sets of contacts are used, and a three-pole double-way switch would do just as well. However, the four pole is always readily obtainable, and can be used as I have done. It is made by Wilkins and Wright, Ltd.



Further switch connections are seen here, and, on the left, the telephone condenser.

Valve and Accumulator

In addition to the above parts you will, of course, need a valve, which may be of any of the well-known makes, and either bright or dull emitter, according to your taste. A suitable accumulator to supply the current will also be required. For the latter I would suggest, if the valve is of the ·06 type, a ten or twenty ampere hour battery of four volts. If you are using a bright emitter, a 20, 30 or 40 ampere hour battery of 6 volts is recommended. Of course, the larger the battery the longer it will last without a new charge. I do not recommend anything less than 20 ampere hours (actual) for bright emitters, but the ten ampere hour battery is quite big enough for the ·06 ampere dull emitter, which will run for approximately 150 hours on such a battery without a new charge. You will also require a high tension battery of about 60 or 72 volts, and one or more pairs of telephones, which should be of what is known as the high-resistance variety (2,000 or 4,000 ohms).

Construction

The constructional work will give you little trouble, as the photographs and diagrams show every aspect of this proceeding. The appearance of the set will be marred if you depart from the general layout indicated, as the parts are arranged in line to give a sym-

metrical design. The R.I. reactance unit is very simply mounted by unscrewing the two grub screws which hold the two knobs to their shaft, taking these latter from the shaft, unscrewing the four screws which secure the ebonite disc into the four brass supports, and using the ebonite disc as a drilling template on your panel. Small holes will be required for the four securing screws and fairly large holes for the shafts. If you have no drill large enough to drill these large holes, do not worry if you make rather a rough hole in the ebonite with a file, or some similar device, so long as you make it larger than that in the ebonite disc, for the latter which will be screwed down on top of the panel will effectively conceal any roughness in this large hole. The "Atlas" low-loss condenser, and several other condensers, are now made with one hole fixing, which greatly facilitates attachment to the panel, but if the condenser you use is not of the one-hole fixing type, then you will probably find you are supplied with a drilling template for it. If you use four separate sockets for the valve holders, I suggest that you use one of the many excellent marking devices sold, such as the Morris template, which will give you an accurate layout for the four socket holes.

The Switch

Be particularly careful to join the connections to the switch correctly. Notice, as I have remarked, that only three out of the four sets of contacts are used, and that on one side only two of the tongues are used. For wiring up I recommend you to use thick square sectioned tinned copper wire, as the appearance of the set is enhanced thereby, and it will be easier for you to see where the connections go.

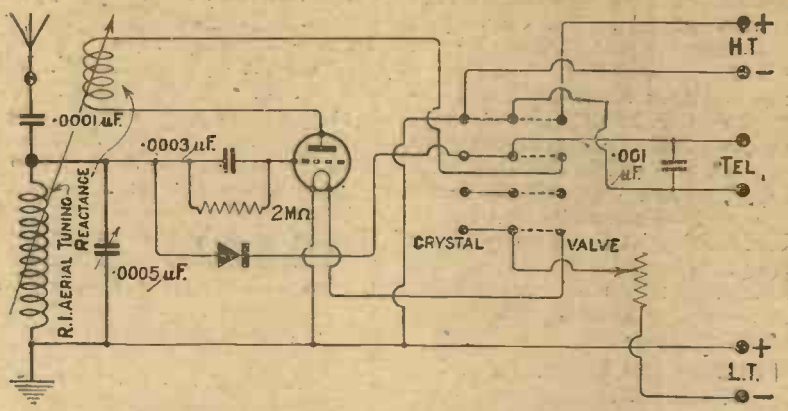


Fig. 1.—How the switch changes over from crystal to valve.

Operation of the Set

The operation of this receiver is of the simplest. Before connecting up your batteries, set the pointer of the reaction handle at zero (you will notice it can be moved to 90 on either side of zero), set the pointer of the inductance switch at A, put the filament resistance at the "off" position, and plug in your valve. First of all connect up your accumulator, leaving the high-tension battery unconnected for the moment. Now carefully turn on the filament resistance. If the valve lights satisfactorily, turn the filament resistance to the off position and connect up your high-tension battery. Now join your telephones to the two terminals marked, connect your aerial to the terminal marked A, and the earth to E and listen. Possibly on the A position of the switch you will hear nothing at any position of the condenser dial. Now turn the inductance switch to B and rotate the dial again. Soon you will probably hear your local broadcasting station and be able to stop at the condenser setting which gives the loudest results. Unless you are very close to the station (within two or three miles) you will find an appreciable increase in signal strength by rotating the reaction knob in one direction or the other. Which direction is the correct one you will find by experience. Sometimes it will be to the right and sometimes to the left. When turning in the correct direction, signal strength will gradually increase. Do not turn the knob too rapidly, but after turning a few degrees retune on your variable condenser. You will soon find the position where you obtain maximum signal strength without distortion. If on turning this knob you get into such a position that you hear a howling or a shriek, or great distortion, turn the knob back again at once, as you will be oscillating and causing disturbance to other people.

Constant aerial tuning may be tried if desired by connecting the aerial to the terminal C.A.T. instead of to A. This form of tuning should not be employed on the higher wavelengths.

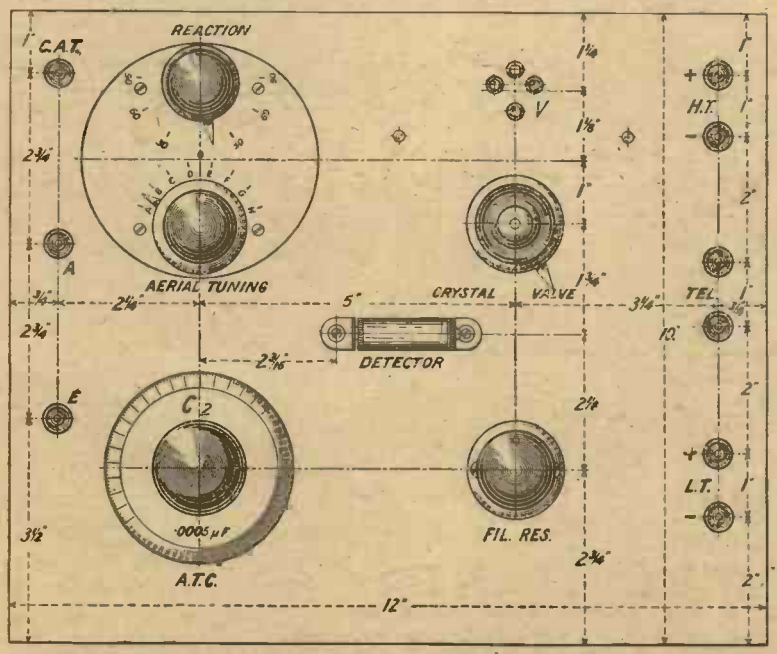


Fig. 2.—The panel is to be drilled as this drawing shows. Full-size blueprint No. C1017A may be obtained, price 1/6 post free.

Radio-Paris and 5XX

You will find on experiment that Radio-Paris and Chelmsford can be heard on this set when the inductance switch is on the last stud but one or the one previous to that.

You will tune for them, of course, exactly in the same way as for the local broadcasting station. In good conditions it is possible to hear several broadcasting stations on the shorter waves, and of course you will hear Chelmsford anywhere in the United Kingdom. Whether or not you hear Radio-Paris will depend on your locality, size of aerial, etc., but I think that in the majority of cases you will be able to hear it easily. Eiffel Tower will be found in a position above Radio-Paris or Chelmsford, and Nauen will be found towards the end of the switch. Both of these latter stations give time signals at the following times :—

PARIS—Eiffel Tower. Call FL. Spark, 2600 metres.

Times—

Greenwich mean time, a.m.	British summer time. a.m.
9.27— 9.30	10.27—10.30
10.00—10.05	11.00—11.05
10.38—10.43	11.38—11.43
10.45—10.49	11.45—11.49

p.m.	p.m.
10.00—10.05	11.00—11.05
10.38—10.43	11.38—11.43
10.44—10.49	11.44—11.49

NAUEN.—Call POZ. Spark, 3100 metres.

Times—

G.M.T. a.m.	B.S.T. p.m.
11.57—12.00	12.57— 1.00
p.m.	a.m.
11.57—12.00	12.57— 1.00

Changing Over

When you have become thoroughly accustomed to handling the valve set (or indeed before this if you so desire) try working on the crystal side. This is done by simply turning the switch from the point marked valve to the point marked crystal. Of course, the signals will be much weaker on the crystal, but in many cases the local station will come in quite loud enough for you on the crystal side. Remember that the reaction handle (that above the tuning switch) is not in action when you are on the crystal side. Your tuning will be done merely on the variable condenser and on the inductance switch. If you have picked up a station on a valve, and it is loud enough to be heard on a crystal, you will find it by switching over to the crystal position without any retuning. Conversely, if you have picked up a station on the crystal and you wish to receive it louder, simply turn over to the valve side and make a slight adjustment of the reaction setting, with perhaps a little retuning, to get the loudest results. Finally, remember that the Editor will always be delighted to hear from readers what results they have obtained on his sets. The Crystovalve is one of the most economical receivers I have ever built, for a considerable proportion of the time for listening in can be occupied on the crystal side, which means great saving of batteries and great simplicity of handling. The family man in particular will find the set useful, for the young can listen in as often as they like on the crystal side, and the valve side can be left for more responsible members of the family.

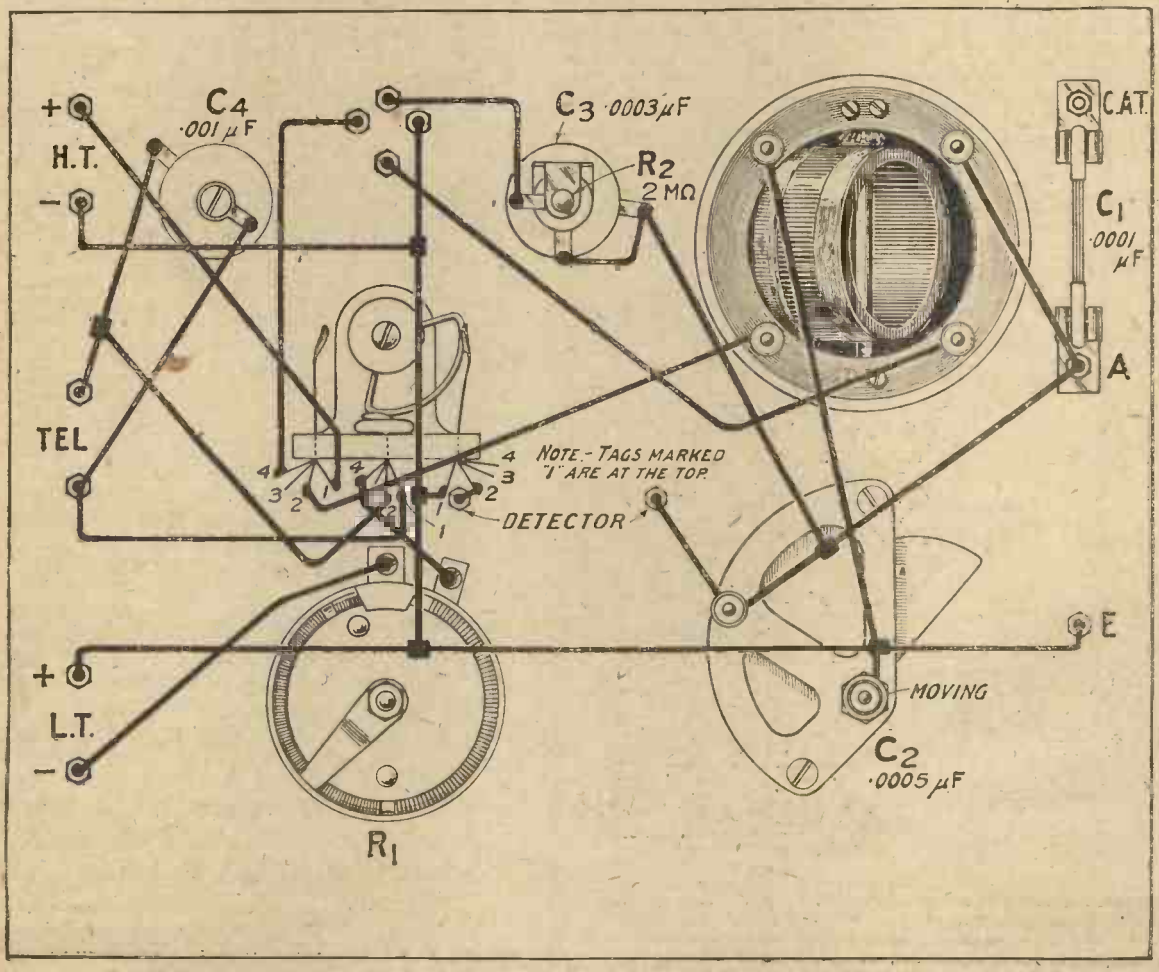
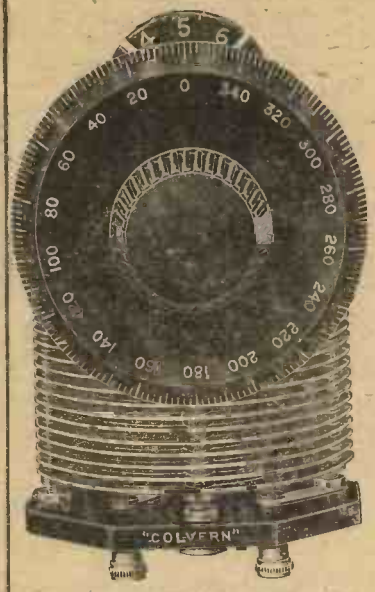


Fig. 3.—How to wire up your panel. The tags of the switch, marked 1, are furthest from the panel, while those marked 4 are nearest it. Blueprint No. C1017B.



Imagine an analytical chemist without his scientific balances or an engineer without his micrometer!

Similarly, you cannot imagine yourself tuning a receiver with a direct drive condenser once having experienced the accurate tuning of the Colvern Selector Mechanically Controlled Precision Condenser.

You can now SEPARATE STATIONS three metres apart

The dial divided over the full circle provides 360 degrees value for each rotation of the index. This enables $\frac{1}{10}$th of a degree to be actually located: AND ANY PREDETERMINED CALIBRATION CAN BE RELOCATED TO THIS ACCURACY AT WILL.

The Colvern Selector provides a mechanically controlled movement of such construction that it is entirely free from backlash and that the relative position between the moving parts is maintained since the gearing is not dependable upon friction or similar device. Incorporate the Colvern Selector into your receiver—then you can separate stations 3 metres apart—a wonderful experience after the unsatisfactory juggling with the direct drive condenser.

One hole fixing and entire freedom from hand capacity

The Colvern Selector
Capacities ·0005 mfd. 21/-
Capacities ·0003 mfd. 20/-
Type F, without gear attachment ·0005 mfd. 15/-
Capacities ·0003 mfd. 14/-
Gear attachment which is easily affixed to Type F to complete the Colvern Selector - 7/-

THE sharply tuned short wave circuits of Super-Heterodyne Receivers have shown that the direct drive condenser is an unwieldy instrument totally unsuitable for tuning these or any other critical circuits.

In practice, definite location to a scale interval is of real importance. In final tuning we must realise that a sensitive circuit is finally sensitive to a variation in capacity equal to $\frac{1}{10}$th of a degree. Thus there are 3,600 variations of capacity each of great importance and of greater importance than has hitherto been demonstrated.

The Colvern Selector is designed with a gear ratio of 20 to 1 which in the light of our own experiments is sufficient for all requirements. Provision is made (should it be necessary) to enable the original accuracy of gearing to be maintained.

COLVERN SELECTOR

LOW LOSS.

Descriptive Folder free upon request.

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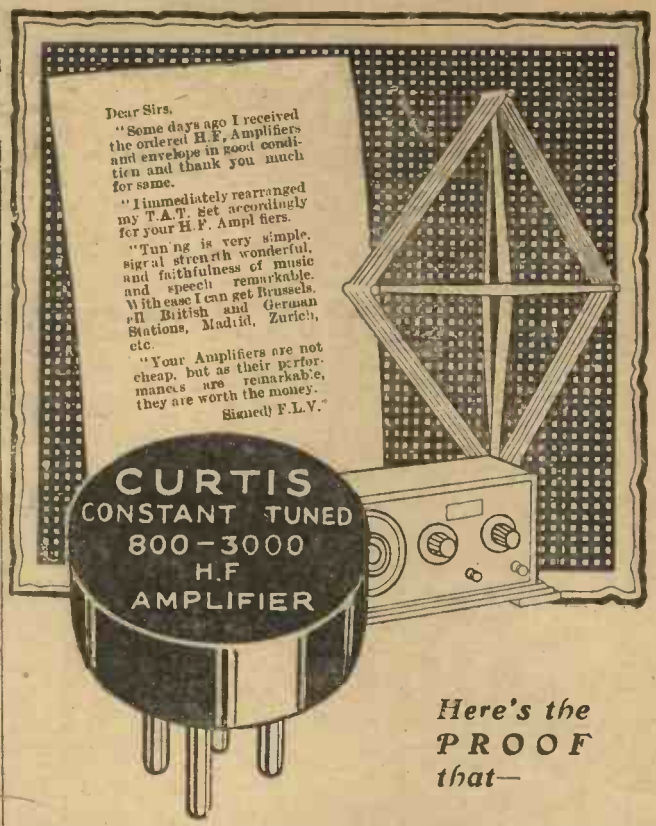

Here's the PROOF that—

The Curtis Constant-Tuned (Aperiodic) H.F. Amplifier reaches out!

Type A, 250 to 800 Metres. Price 15/-
Type B, 800 to 3,000 Metres. Price 17/6
Type C, 2,000 to 7,000 Metres. Price 18/6
Type C is especially designed for Super-Heterodynes.

The Curtis Constant-Tuned (Aperiodic) H.F. Amplifiers are obtainable from all dealers. If you have any difficulty please send direct giving name and address of dealer who could not supply.

A few old-fashioned and some very young people believe that multiplicity of tuning controls results in higher efficiency. The more knowledgeable know that multiplicity of controls increases instability and tendency to oscillate; thus efficiency is correspondingly reduced. Up-to date wireless practice tends entirely to eliminate every possible moving control on a Receiver and aims at minimum control as the ideal.

High-frequency Aperiodic coupling (*i.e.*, Constant Tuned Amplifiers) being absolutely automatic in its action, represents the most modern Radio practice.

The Curtis Constant-Tuned H.F. (Aperiodic) Amplifier eliminates the potentiometer — that hopeless bludgeon of Radio efficiency — all the tendency to self-oscillate and guarantees absolute stability with maximum Radio efficiency. Indispensable for maximum Efficiency and Purity of Reproduction, with all High Frequency and Super-Heterodyne Circuits.

BUILD YOUR OWN DUODYNE

The wholly inexperienced can build this long-range receiver with the aid of The Curtis-Duodyne Treatise for home constructors, containing:—

1. Curtis diagrams for 3 and 5 valves.
2. Simplified Lay-out and Wiring Charts for 3 and 5 Valves.
3. Instructions for Operation.
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IT was the Cosmos Valve which on May 1st led the way in price reduction. This latest reduction comes, therefore, from the firm which made the first. Cosmos Valves are made by the Metropolitan-Vickers Electrical Co., who will be remembered for their pioneer work in broadcasting. They have been pioneers, therefore, both in the science and in the selling of wireless. Having done so much to make wireless *good*, they are leading the way in making it *cheap*. The lower prices of Cosmos Valves go hand in hand with an improvement in the results they give. *There are no better valves.*

D.E. 11

THE COSMOS D.E. 11

Is an excellent "General Purpose" valve. It is a remarkably efficient rectifier, a good high-frequency and low-frequency amplifier and eminently suitable for working off a single 2-volt accumulator cell or dry batteries.

Reduced from 21/- to

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Radio Press News

Announcing the publication on June 20th of two additions to the Radio Press Envelope Series :

No. 10.—"*How to Make the Twin-Valve Loud-Speaker Receiver.*" *By John Scott-Taggart, F.Inst.P., A.M.I.E.E. Price 2s. 6d., or 2s. 9d. post free.*

No. 11.—"*An Adaptable Crystal Set and How to Build It.*" *By Percy W. Harris, M.I.R.E. Price 1s. 6d., or 1s. 9d. post free.*

WHEN reflex (or "dual amplification") circuits first began to receive attention their novelty was no doubt one of the attractions which contributed to their popularity. The attraction of novelty, however, has now to a great extent been replaced by a true estimate of the special uses and suitability of reflex sets, and to achieve real and lasting popularity a design must possess certain very definite merits.

Of these, stability, ease of working and the capability of giving good results are no doubt the foremost, and when it is remembered how completely the "Twin-Valve" receiver complies with these requirements there is little difficulty in understanding the great popularity this set has achieved.

Although there is to many a considerable attraction about a reflex receiver in which a valve is saved by the use of a crystal, a good and stable design employing valve detection has always a strong appeal to those who wish the set to be simple to operate and to maintain in as sensitive a condition as possible. This, no doubt, is an additional reason for the great appreciation accorded the "Twin-Valve" receiver which employs the reflex principle in the first valve only, the second valve being the detector.

The Twin-Valve Receiver (Envelope No. 10).

Great pains were taken in designing the instrument to obtain the maximum possible degree of stability, together with really good results, and the outcome is a set which is notable from any point of view, whether regarded as a receiver for obtaining the maximum possible volume from two valves, or as a steady and dependable set for family reception which can be left permanently adjusted to a given station.

Appearance

Although, no doubt, the discriminating constructor attaches more importance to the performance of which a set is capable rather than the matter of the symmetry of the lay-out of the panel, and so on, believing that the works are more important than the looks, no one can deny the attractiveness of a design of really pleasing appearance and good arrangement, and here again

the "Twin-Valve" receiver claims attention, as may be judged after an inspection of the illustration.

The popularity of the set is now in a fair way to being much enhanced, since it is being brought out in Radio Press Envelope form (Envelope No. 10), with all the advantages conferred by that method of publication. For example, two full-sized blue prints are provided in the envelope, showing the wiring and the exact drilling of the panel, elaborate instructions for building and working are given, and there is the usual set of reproductions of photographs showing the instrument from a great variety of angles, so that not the slightest doubt can remain in the mind of the constructor as to its exact assembly and wiring.

Distinction

For a designer to produce a crystal set of really marked distinction at the present time is no small achievement when we remember how very many and varied are the designs which have been published. There can be no question, however, that Mr. Harris succeeded in producing such a set, remarkable alike from the viewpoints of simplicity of construction, originality of arrangement and efficiency, when he described in the September issue of *Modern Wireless* a set which has come to be known as the "sixteen-gauge wire receiver."

So great has been the vogue of this set that it is now being republished in Radio Press Envelope form (Envelope No. 11), so that all those who missed it on its first appearance will now be able

The crystal set described in Envelope No. 11.

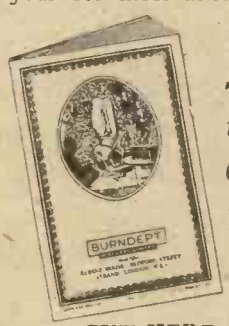
to build the instrument with the greatest possible ease, and with the aid of all the advantages conferred by a Radio Press Envelope. For example, upon obtaining the Envelope, with its attractively-coloured cover, they will find that two full-sized blue prints are included, one showing the dimensions for the drilling of the panel, and the other the wiring itself.

In addition to the customary full description of the building of the instrument, and instructions for its working, there will also be found the usual set of drawings, showing, in this case, the circuit of the instrument and the working positions for the switches incorporated in the set, with the circuit modifications which result from each of these settings. As a final aid to the constructor, there are three sheets of reproductions of photographs showing the set from every useful angle.

A special feature of the set is that there are no external coils required for the ordinary broadcast wavelengths. A special design of inductance devised by Mr. Harris is incorporated inside the box, and an additional plug-in coil is only required when receiving 5XX. A special circuit is incorporated, of the auto-coupled type, which is now receiving so much attention, and two switches are provided which enable such variations of coupling turns, etc., to be made that it is possible to suit this set to practically any conditions of aerial and earth. As an additional attraction, it will be noted that the crystal detector is mounted inside the box in a convenient and accessible position.

Before you buy a single component for your next set, consult the latest Burndept Catalogue (sent free)

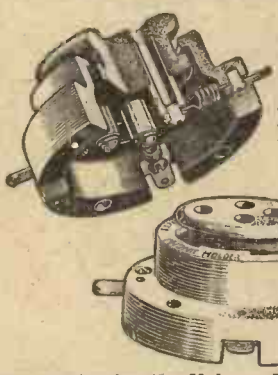
TO choose a good circuit, to construct with care, and to use Burndept Components, is to be sure of getting good results from your apparatus. For perfect reception all components in your set must be really efficient. Every Burndept Component is the subject of much research before it is offered to the public. Many experiments are conducted in our well-equipped laboratory to make sure that the design and materials are perfectly satisfactory. Every stage of manufacture is carefully supervised. Finally, the finished product is rigorously tested—it must come up to a definite standard of efficiency—and so, because of this careful manufacture, we are able to guarantee our apparatus and to know that *it will fulfil all that it is claimed to do.* By using Burndept Components, you can expect good tone, great volume, sharp tuning and ease of control. Moreover, the neat appearance of Burndept Components will make your set most attractive.



Send for this free Catalogue TO-DAY

The Burndept range, which includes everything from components to complete installations, is fully described in an 84-page illustrated catalogue which will be sent free to any address on receipt of the coupon below. When you are selecting the parts for your set, consult this catalogue; then call on the local Burndept Agent, who will be pleased to show you the actual components and give you any special information you require.

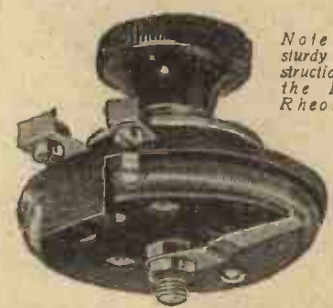
Here are two Burndept Components of exceptional interest to all home constructors—the Anti-Phonic Valve Holder and the Dual Rheostat.



Sectional view (left) shows construction of Anti-Phonic Valve Holder. View below shows actual appearance.

The Anti-Phonic Valve Holder completely eliminates microphonic noises in dull-emitter valves and will prolong the life of any type of valve. It is particularly suitable for use in portable sets. As the sketch shows, the valve holder proper is supported on four springs which absorb mechanical shocks and vibration and so protect the valve. The insertion or withdrawal of a valve does not strain the springs. An important feature is that the valve sockets are countersunk and thus the risk of short circuits is eliminated. Soldering tags are provided on the outer insulated shell.

No. 401. Anti-Phonic Valve Holder, for panel or base mounting, in carton, with screws, 5s.



Note the sturdy construction of the Dual Rheostat.

The Burndept Dual Rheostat is a most convenient component, as it may be used *without alteration* to control the filament current of a bright or a dull-emitter valve. The first half of the element is wound to a resistance of 25 ohms and the second half to a resistance of 5 ohms. The whole 30 ohms resistance is used to control a dull-emitter valve and the 5 ohms resistance a bright valve. The movement of the brush over the windings is practically noiseless owing to the special construction of the former on which the wire is wound. The windings cannot be displaced, and they yield slightly to the brush and so ensure good contact.

No. 222. Burndept Dual Rheostat, 5-30 ohms, for panel mounting, in carton, with drilling template, 7s. 6d.

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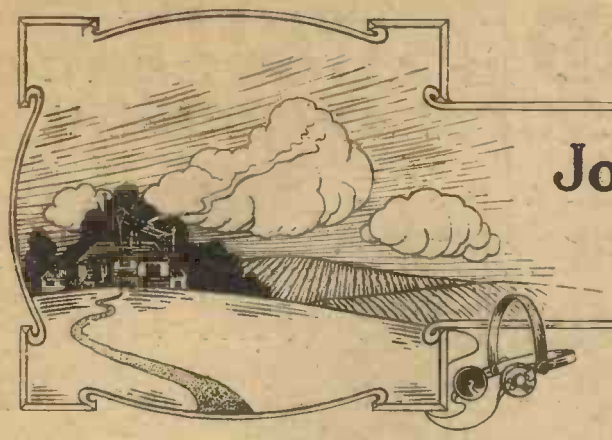


John Anstruther's Wireless Talks

On Crystal Set Efficiency

"IF I remember rightly," said John Anstruther, as we took our seats for the next of our enjoyable meetings, "we agreed on the last occasion that this evening should be devoted to a discussion upon the ways of obtaining real efficiency in the crystal set. Is that so? Good. Well, now, who is going to fire the first shot at me?"

"First of all," said Painter, "I think that we ought to understand just what is meant by efficiency—it's a word that we are always seeing used in articles and books on wireless—in any receiving set."

"That's a good idea," smiled John, "and as soon as I have got something like efficiency in this wretched pipe of mine we will go on with it. I suppose nobody's got a hairpin? Ah, thank you, Ainsworth; it is not everyone that carries a pipe cleaner."

His pipe was soon in full swing, and, puffing away, John started his talk on crystal set efficiency.

"What," he asked, "was wrong with my pipe? No prize is offered for the answer, but I will get Painter to tell me."

"Why, it was partly stopped up, of course," answered Painter; "but I cannot see what that's got to do with crystals."

An Analogy

"Well," John went on, "I just want to give you quite a simple analogy. When I pulled away at this pipe before Ainsworth came to the rescue with his cleaner, I was expending a good deal of energy and getting very little return for it in the way of smoke. Instead of doing useful work, my energy was being spent in overcoming resistance. And that's just what happens in the vast majority of crystal sets. People rig up excellent aerials and perfectly sound earth connections; they spend pounds in purchasing all kinds of crystals, each of which is, of course, guaranteed to be better than any other; they try every kind of catswhisker; in fact, they take any amount of trouble in an endeavour to secure just a little better working in their sets. But as a rule they get hold of the wrong end of the stick, and they allow a very large proportion of the energy brought in by the aerial to be wasted in doing useless work. Now, what exactly do we want the receiving set to do for us? What do you say, Richmond?"

Our Requirements

Richmond thought for a moment and then said: "Well, I suppose we want it to respond well even to weak impulses and to give us the greatest possible volume of sound in the receivers that can be combined with purity and clearness."

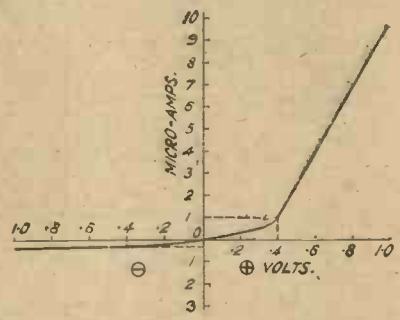


Fig. 1.—A crystal characteristic.

"I don't think we can better that," said John. "Richmond has put our requirements in a nutshell. In the crystal set we are not concerned with distortion due to the misuse of reaction; that is, we shall not find our signals become indistinct if we work them up to the greatest obtainable strength. The whole thing comes to this: The aerial brings in impulses in the form of waves whose crests and troughs we may regard as having respectively a positive and negative value. For a given difference in voltage between the crests and the troughs of a signal the most efficient crystal set is the one which delivers the greatest amount of rectified current to the telephone receivers, and therefore produces the loudest sounds. Or, to come back to what we said before, the more efficient the receiver the less will be the proportion of the incoming impulses that it wastes."

"I think we all follow that," remarked Morris; "but I wish you would tell us a little more about the way in which the crystal deals with these crests and troughs and turns them into rectified current."

John picked up a writing pad from the table at his elbow, and was busy for a few moments with a pencil. Then he handed round a drawing like that which you see in Fig. 1.

The Characteristic Curve of a Crystal

"That," he continued, when we had all had a look at the "characteristic," as he called it, "is a curve showing the behaviour of the crystal. I know that people, especially beginners, are rather frightened of curves and things like that, but there is really nothing to shy at, and they are exceedingly instructive and useful things. You will see that I have marked off the horizontal line into fractions of a volt, starting from 0 in the middle and running up to 1 volt positive on the right-hand side, and down to 1 volt negative on the left. The vertical line through the middle of the other is divided into micro-amperes, that is, millionth parts of an ampere. We saw before that the crystal behaves differently to positive and negative impulses. If you look carefully at the curve you will see just what it does. Now I will get Cartwright to follow out for us what happens when a wave comes in whose crest and trough have values of +·4 volt and −·4 volt. Let us see first of all what the crest does. Can you

discover from the diagram? Take a pencil and put its point on the ·4 positive mark; then run upwards till it meets the curve. Done that? Right. Now go straight across from that point to the upright line. What reading do you get in micro-amperes?"

I made the dotted line shown in the drawing and replied: "Just about 1 micro-ampere."

"That's it," said John. "So what ·4 volt positive does is to cause the crystal to pass 1 micro-ampere of current in a certain direction. Now see what happens when the trough of the wave comes along. Take ·4 volt on the negative side, and see what current reading you get on the lower part of the vertical line."

The Negative Side

The space between the curve and the horizontal line at the ·4 volt negative division was so small that there was hardly room to dot in a line, and the reading on the vertical line appeared to be about a quarter of a micro-ampere.

"That's it," said John. "The crest of the wave gave you a whole micro-ampere in one direction—call it northwards if you like—and the trough gives you a quarter of a micro-ampere in the opposite direction. Now, if you walk a mile northwards and then come back a quarter of a mile, where are you so far as the starting-point is concerned?"

"Three-quarters of a mile to the good," replied Ainsworth.

"Just so," smiled John. "And what the crystal has done to the incoming wave is to produce a net rectified current of three-quarters of a micro-ampere. By the way, I have not drawn the exact curve of any crystal, but actually you would find that results were a good deal better than this, for the 'backward step' on the negative side would in the case of most good crystals be something so small that we can neglect it. But now look at the curve again, and you will see something that is of enormous importance in crystal reception. You will notice that as the voltage increases on the positive side we get a very rapid rise in current, though a larger negative voltage produces very little difference. For example, if an incoming wave has crest and trough values of 1 volt its positive half will cause a current flow of 10 micro-amperes, and its negative one in the opposite direction of about ·5 micro-ampere. The net result will be 9½ micro-amperes of rectified current."

"Yes, I follow that," said Morris, "but I am wondering just what you are driving at, for I can see that you are leading up to something."

"Take Care of the Volts"

"Just this," returned John. "To make your crystal work efficiently you must apply the greatest possible voltage changes to it. To paraphrase an old proverb, 'Take care of the volts, and the micro-amperes will take care of themselves.'"

"And how are we to do that?" queried Ainsworth.

John was busy for a moment with his pencil, and then passed round the diagram shown in Fig. 2.

"Take a look at that," he said. "It's a simple form of crystal receiver circuit. To tune your aerial you have the inductance marked L and the variable condenser C_1 in

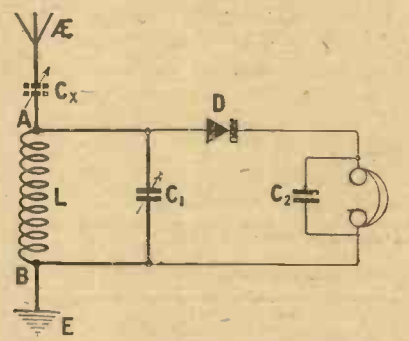


Fig. 2.—A simple crystal circuit with series condenser C_x and parallel condenser C_1.

parallel with it. The top end of the coil is connected to the aerial, the lower to earth. Now, what we want to get is the greatest possible difference in potential between the top of the coil A and its bottom B. Also we must avoid introducing into the circuit any undue amount of resistance; for resistance has the effect of deadening the sensitiveness of the set and of flattening its tuning. The arrangement which you see in the drawing is not the best one, for it is found that you do not obtain the greatest potential difference across an inductance if you place a capacity in parallel with it. Therefore, it would appear to be better to have the condenser in series as I have shown it at C_x in dotted lines."

"Yes, I am always hearing that," cried Painter. "I use a series tuning condenser, but I do not find that I get much better results with it."

"That," said John, with a smile, "is probably because of the amount of parallel capacity in your circuit."

"But," exclaimed Painter, "I have just told you that the condenser is in series."

"Quite so," said John. "But I was not talking about the tuning condenser. What sort of coil do you use?"

Painter told him, and John went on to explain what he meant.

Coil Capacity

"If you place two insulated wires at different potentials side by side there is capacity between them.

Now the turns of a coil are at different potentials. Suppose, for example, that the potential difference between A and B in Fig. 2 is 1 volt, and that the coil contains 10 turns; the voltage drop across the coil may be perfectly regular and there may be a potential difference of ·1 volt between any two adjacent turns. If we wind a coil with double cotton-covered wire whose insulation is impregnated with shellac or paraffin wax, and place the turns so that they touch one another there will be an appreciable amount of capacity between them. We shall make matters much worse if we wind the coil in two layers of five turns each, placing turn No. 6 over turn No. 1 and so on, for then we shall have a potential difference of ·5 volt between each turn of the upper layer and the one that it covers in the lower. To use a term that you have all heard, the "self-capacity" of the coil will be large. You must not forget that high-frequency voltages leak away by capacity with the greatest ease, so that in a coil whose self-capacity is large we are virtually providing short and easy paths for impulses which they will take, for, like the rest of us, they are only too ready to escape from doing work."

The effect is really very much like that which you produce by connecting a condenser in parallel with your coil, and you begin to see why self-capacity is so harmful.

Dielectric Losses

"How can you keep down self-capacity?" asked Morris.

"You must wind your coil," John explained, "in such a way that turns at different potentials are as far away from one another as possible. Air is the best separator for them, since a given thickness of it produces less capacity than any other good insulator, and it is also freer from what are called dielectric losses.

"Will you tell us," I asked, "what you think the ideal coil for the crytsal set would be?"

"Here's a recipe," replied John

"which you will find pretty good for broadcast purposes. Cut two discs of hard wood 4 in. in diameter, and with them make a kind of squirrel cage by fixing thin strips of ebonite between them with screws. In each of these strips make a row of very shallow notches about one-twelfth of an inch apart. Then wind on about 30 turns of No. 20 or 22 bare copper wire, keeping the turns in the notches. You can attach the ends to terminals mounted at each end of one of the strips. This kind of coil gives you a fairly small amount of self-capacity, and when you try it you will be surprised at the results it gives even with a parallel tuning condenser. Your results may be even better if you put more turns on and use a series condenser."

"Well, what it comes to is this," said Ainsworth. "So long as your aerial and earth and the wiring of your set are up to the mark, efficiency in the crystal receiving set is mainly a matter of the coil and the tuning condenser."

"That's so," said John. "And there is one other point that I would like to make. Don't use telephones of too high a resistance. Lots of fellows imagine that they will get better results by using 4,000 or even 8,000 ohms phones, though really phones of from 1,000 to 3,000 ohms do better with almost all the crystals that are in common use. I want to talk to you about another refinement in the crystal set, the use of the potentiometer, but I am afraid that I shall have to leave that till another evening, when we will go into the working of this most useful instrument."

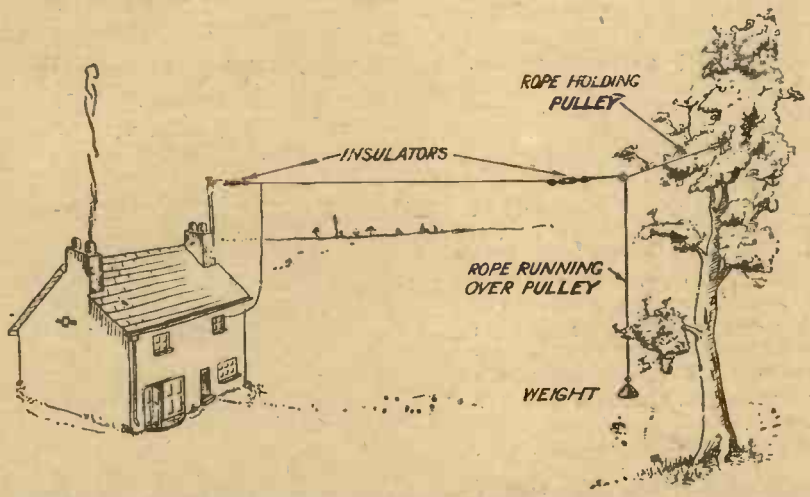
□

Using Trees as Aerial Masts

A CASUAL glance at the many aerials one sees when passing along, on even the shortest train journey, goes to show that many listeners take advantage of any conveniently high tree which may be in the garden, for the supporting of the far end of the aerial. This, no doubt, has many advantages, chief among which is that of expense, in that all costs for mast erection are eliminated; nevertheless, the aerials so erected are rarely workmanlike-looking jobs, the wire having a pronounced sag and slack appearance. Those readers who have used or are now using aerials erected in this way need little telling that the slackness is necessary in order to avoid the aerial wire breaking when the tree sways, thereby increasing the tension.

A Suggestion

A suggestion to users of trees as aerial supports is given in the illustration, where a pulley is secured to the tree and the securing rope for the aerial is passed over this pulley to be secured not by tying to a fixed anchorage, but to a good heavy weight, the actual value being determined by the length of the aerial. This weight, which should be just sufficient to hold the aerial taut, will, when the tree sways in the wind, rise or fall from its neutral position, which should be about 5 ft. from the ground. With this arrangement, no matter how strongly the wind may blow and no matter how much the tree may swing, the aerial wire will be always taut, and never will there be very much more tension put upon it than that produced by the hanging weight.



Showing how a weight may be used to keep the aerial taut when the tree sways in the wind.

When erecting aerials in this manner, care should be taken to ensure that sufficient clearance is allowed between the aerial wire itself and the branches of the tree which are nearest to it, otherwise, when the tree is swaying in the wind, there is a possibility of the twigs on the nearest branches sweeping across the wire and thereby interfering with reception. In the same way allowance should be made for further growth of the near-by branches.

When securing the pulley, it is as well to cover it with a good coating of vaseline, thereby protecting it from the weather, and, at the same time, ensuring that the pulley wheel will always run smoothly.

A Forlorn Maiden's Lament to Her Wireless Lover

There was a time, dear George, when you
Would sit and gaze into my eyes,
And swear that in their heavenly blue
Reposed your earthly paradise.

Your fingers once for mine would seek,
And clasp them fondly hour by hour.
Time was we cuddled cheek to cheek
At twilight in the garden bower.

But now your alien heart desires
Amplifiers, valves and plugs,
Batteries, diaphragms, and wires
Run in and out like making rugs.

Your fingers ever twist and turn
The tuner or some other gears;
While where my smooth cheek used to burn
The head-phones clasp your heedless ears.

JOSEPH BURY.

In Search of First-hand Information

MR. HARRIS GOES TO AMERICA

MOST British wireless enthusiasts have always taken a keen interest in American conditions, but to supply them with really illuminating accounts of American affairs has hitherto been a matter of extreme difficulty. Many articles from the pens of eminent Americans have appeared in the periodicals controlled by Radio Press, and a good deal of valuable and interesting information has been obtained therefrom, but to show in true perspective a clear picture of the technical conditions in America, the writer must be one who has an intimate knowledge of British conditions.

The problem is one which has received much consideration from the management of Radio Press, Ltd., and the outcome is a journey of investigation which is being made by the Editor of this Journal, Mr. Percy W. Harris, for the express purpose of presenting a clear account of American conditions.

The Editor's Journey

Mr. Harris sailed for New York on May 16 on board the "Berengaria," and he carried with him letters of introduction to the principal authorities upon wireless in the United States, including many of those actually conducting the broadcasting organisations. He will have remarkable opportunities of making a thorough and illuminating investigation into Transatlantic conditions, including visits to such places as the laboratories of the Radio Corporation of America, The Western Electric Company, The Bureau of Standards, and so on. He proposes to give his conclusions in a series of articles which will appear exclusively in Radio Press publications, and these should prove of very great interest.

Selectivity

Some of the investigations which Mr. Harris will make will concern the very vexed question of the selectivity of the average American receiver, as to which British experimenters have always had doubts, although they have been duly impressed by the very great need for selectivity under the crowded conditions which apparently exist in many American centres.

In addition to obtaining general impressions of broadcasting conditions Mr. Harris will, of course, devote himself to investigations into the more technical matters, upon which his opinions will be so valuable. In view of the present increase of interest in super-heterodyne receivers it is to be expected that he will spend a good deal of time in acquiring details of the latest American developments in this field. It has been arranged that he shall have opportunities of hearing and making thorough tests upon all the leading types, including the latest modifications, which are attracting so much attention in the States.

The American Home Constructor

An interesting sidelight should be thrown by the articles which Mr. Harris writes upon the ways and methods of the American home constructor, who is to most of us a somewhat mysterious person, for although the American magazines give him a good deal of attention in the way of designs for sets and apparatus, they convey very little idea of his actual methods and capabilities.

It is no uncommon thing, for example, to find a lengthy description given of a quite complicated receiving set, without any other assistance in wiring-up the set than a simple circuit diagram, and one is left to wonder whether their readers are really capable of wiring up such a set successfully without the aid of the full wiring diagram to which we are accustomed.

Valves

One of the lesser points to claim his attention will be the comparative characteristics of British and American valves, and it will be particularly interesting to learn whether Mr. Harris fully endorses the claims so often made for the somewhat "soft" detector valves which have long been popular in the United States.

The Route

When Mr. Harris leaves New York he will make a carefully-planned tour, which will take in the important centres of the Middle West, working across to the Pacific Coast, and finishing his investigations in Canada.

Last moments at Waterloo. Did his recklessness about the fastening of the door result from the consciousness that Radio Press had insured him for the sum of £10,000?

Practical Workshop Hints

Starting Awkward Screws and Nuts—Securing Vertical Panels—Improving the Hand-drill—Shortening Screws

Those Awkward Screws

EVERY wireless constructor comes across a screw placed in an awkward position, which absolutely refuses to start when ordinary methods are used. The worst screw of all is that placed in an almost inaccessible corner, which has to be inserted upwards from below. One tries to balance it on the point of the screwdriver, and every time it falls off just at the critical moment. If the screw has to be inserted downwards, one can sometimes give it the all important first turn by holding it in a pair of tweezers, but this is usually a difficult and an exasperating business. I have been using lately with great success a little tool specially made for dealing with screws in out of the way corners, which will, I think, appeal to a large number of readers. It is a very simple thing to make, and the cost is only a few pence. All that you require is a cheap ruling pen, which may be purchased from any stationer's shop. Fig. 1A shows how the tool is used when finished. As the points spring outwards, they can be wedged firmly into the notch of the screw, which they hold tightly enough to allow it to be started in its threads. The tool should *not* be used for driving a screw right home if any force is required, as the blades of a ruling pen are made of metal which is so soft that they will become bent

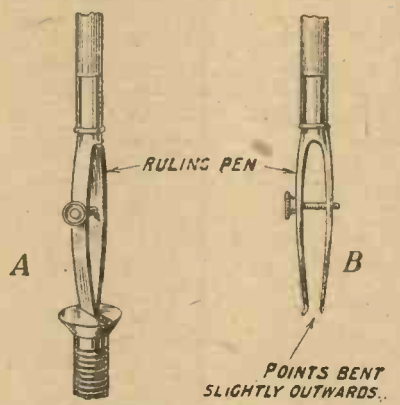


Fig. 1.—Showing how a ruling pen is prepared and used for starting a screw.

out of shape if strained at all. Once the screw has been given the half turn which usually suffices to make it "bite" in the threads, an ordinary small screwdriver should be used for tightening it up. To convert a ruling pen into a screw starter proceed in the following way: Cut off the points of the blades so that the ends left are rather more than $\frac{1}{8}$ in. in width. Trim up these ends square so that when the pen rests upon them it is quite vertical. With a small file flatten the curved outside of each blade. Now unscrew the milled nut and allow the blades to spring away from each other. Take a small pair of flat-nosed pliers and give the end of each a slight outward bend, as seen at Fig. 1 B. The exact amount of bend

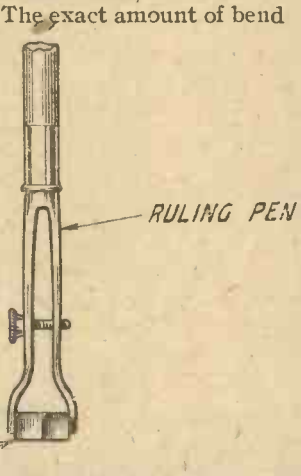


Fig. 2.—An awkward nut may be started in a similar manner.

required will be found by experiment. Keep on trying them in the notch of a small screw and shape them until they seat themselves firmly in it. Once the tool is finished it will be found to be of the greatest use.

A Nut Starter

A second ruling pen may be pressed into service for making a little tool for starting nuts difficult to deal with in the ordinary way. It is not necessary here to cut off the points of the blades, in fact they are better left as they are. Remove the clamping nut first of all and let the blades spring well apart. Then with a pair of small flat-nosed pliers shape them as shown in Fig. 2. A tool of this kind made from an ordinary ruling pen will deal easily with nuts up to 4 B.A. To use the tool, insert the nut between the blades and turn down the clamping screw until it is firmly held. You can now introduce it without difficulty into the most awkward corner and start it upon the threads of its screw. As soon as it is started properly remove the tool by pulling it off—it will come away quite easily—and finish off the operation with a box spanner or a pair of nut pliers. The warning against using force with the converted ruling pen applies here also.

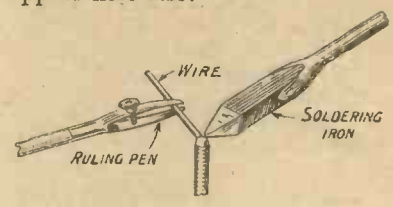


Fig. 3.—A very useful idea.

Another Use

Yet a third use for the handy ruling pen is shown in Fig. 3. When soldering is in progress it is often not easy to hold the wire in exactly the right position, particularly if it is of very fine gauge, without burning your fingers. By clamping it between the blades of a ruling pen, which in this case requires no shaping or alteration whatever, its end can be taken exactly to the place required, and it can be held without difficulty until the joint has been made with a small iron. I have found the ruling pen employed in this way especially useful for one or two of those awkward soldering jobs which come one's way every now and then. The first of these was to re-solder the lead from the "in" end of the primary winding of a low-frequency transformer to the shank of its terminal, from which it had come adrift. Without the little tool the job would have been a very finnicky one, for the design of the transformer was such that there was no room to use a pair of pliers. As it was, the repair was accomplished in a few moments.

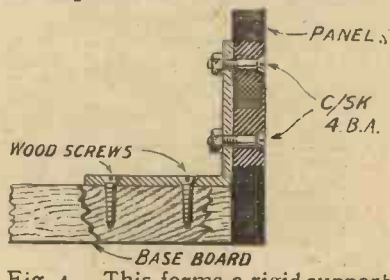


Fig. 4.—This forms a rigid support for the panel.

I have used it also to the great saving of time and trouble for such jobs as repairing a break in the windings of a potentiometer and for re-soldering connections which but for its help could not have been done without dismantling at any rate part of the wiring of the set.

Fixing Vertical Panels

A very large number of wireless sets are now made on the lines which first originated in America, with a vertical panel carrying, as a rule, only the variable condensers and the rheostats, and a horizontal baseboard which supports the valves, transformers and other components. What is required is some simple means of fixing the panel to the baseboard so that the two are at right angles to one another and are held firmly together. A simple and extremely satisfactory method of doing this is seen in Fig. 4. Here fixing is done by means of small angle pieces such as are obtainable from any ironmonger for about 2d. apiece. If by any chance these are not in stock, the brackets

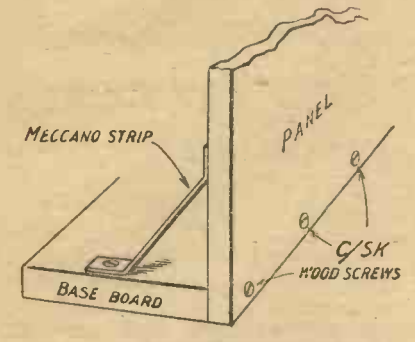


Fig. 5.—A Meccano strip may be used instead of angle brackets.

used for holding stair rods will answer quite well. With panels up to 15 in. in length an angle piece at each end will generally be sufficient, though it is as well to use additional supports for panels of greater length. The supports, again, may be reinforced by driving countersunk wood screws from the face of the panel into the baseboard at intervals of about 6 in.

Using Angle-brackets

The best way of doing the work if angle-brackets are used is, I think, as follows: First of all, fix the brackets to the baseboard with wood screws, taking care to place them so that they are parallel with the short edges of the baseboard and that the faces of the upright portions are level with its front. Now place the baseboard on a table with a perfectly flat surface. Place the panel in position, getting a friend to help you to hold it if necessary, and run the point of a scriber round each of the screw holes in the brackets so as to scratch small circles on the ebonite. It will be quite an easy matter to find the approximate centres of these, which can be punch-marked and drilled. The panel should be bolted on by means of countersunk 4 B.A. screws and nuts. A second way of fastening the panel and the baseboard together is shown in Fig. 5. Here the former is first fixed to the latter by means of countersunk wood screws spaced 4 in. apart. The holes for these should be drilled ¼ or ⅜ in. from the bottom of the panel, according to the thickness of the baseboard. Lay the baseboard on a flat table as before, place the panel in position, and drive in, first, the screws at either end. When all the screws have been inserted, the supports at either end can be made from Meccano strip suitably bent, as seen in the drawing. Either method makes a very solid job, and there is very little to choose between them.

Improving the Hand Drill

The hand drill is a very useful tool for wireless constructional work, but it has certain limitations. It is not at all easy to do accurate work with it, for various reasons. Which of us, for example, using a hand drill, can make half-a-dozen holes each absolutely at right angles to the surface of the panel? The usefulness of the hand drill can be increased enormously by the purchase of a bench attachment such as that seen in Fig. 6, which is by no means an expensive addition to the workshop outfit. Excellent holders for the hand drill are obtainable at prices ranging from about 15s. upwards. Besides making for accurate work, the use of a bench attachment results in a great saving of time, especially in cases where a large number of holes of the same size have to be made in panels. If a good drill vice is obtained at the same time, the bench attachment makes it possible to drill long holes in brass or in other metals—a very difficult feat with the hand drill unaided, since drills are so apt to bind and break. The hand drill used in the ordinary way enables fairly good

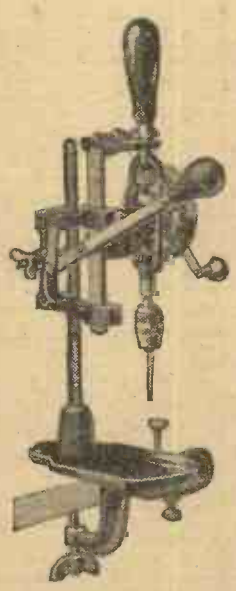


Fig. 6.—A bench attachment for the hand-drill.

work to be done in ebonite up to ⅜ in. in thickness. For thicker ebonite or for brass a bench attachment is almost essential. Many hand drills, by the way, are fitted with chucks which will not take drills larger than ¼ in. Not everyone knows that bigger chucks can be purchased to fit many types. These are not expensive and they much increase the usefulness of the drill since, when making up a receiving set or a piece of apparatus, one is frequently called upon to drill ⅜ in. holes in order to mount rheostats, variable condensers, selector switches, and so on. When a new drill is being purchased, care should always be taken to see that its chuck will take ⅜ in. drills.

Shortening Screws

It often happens when one is engaged in constructional work that it becomes necessary to shorten one or more screws. You may, for instance, wish to mount a low-frequency transformer or a fixed condenser to the underside of the panel by means of screws. If ¼ in. ebonite is being used, ½ in. screws will be rather too long for the job, for obviously their points to look neat must be flush with the surface of the panel. In the ordinary way, to shorten one screw by exactly the right amount and then to cut the others to just the same length is not an easy business. Frequently, when the job is done, one or two screws protrude a little from the panel, whilst others do not quite reach its surface. A further difficulty is that, when the end of a screw is cut off with a hacksaw, the threads are always slightly damaged, so that it shows some reluctance to start in the hole prepared for it.

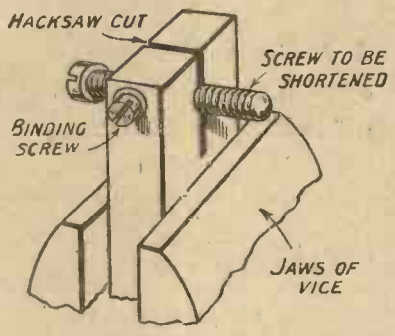


Fig. 7.—Showing the use of the block for shortening screws.

For some time now I have been using a very handy little gadget when screw-shortening becomes necessary. This is seen in Fig. 7, and consists of a piece of brass or mild steel ¼ in. in thickness and about ½ in. in width by 2 in. in length. About ½ in. down from the top of it a 4 B.A. hole is drilled and tapped. Quite close to the top another 4 B.A. tapped hole is made at right angles to the first, right through from edge to edge, to take the binding screw seen in the drawing. A hacksaw cut is now made as shown, and the thread cleared from the left hand half of the binding-screw hole. The binding screw is inserted and the tool is ready for use. To shorten a screw, determine, first of all, by measurement, the amount that has to be cut off. Then drive the screw into the metal until that amount protrudes. Lock it in position by means of the binding screw, place the gadget in the jaws of the vice, and cut off the unwanted portion of the screw with the hacksaw. Trim up the end if necessary with a fine file, slack off the binding screw a little and remove the shortened screw. Any damage that has been done to the threads will be automatically set right during its withdrawal, and when it has been slightly pointed with a fine file it will start easily in the threads prepared for it. By the use of this little gadget screws can be shortened accurately and quickly, and there is no difficulty at all in getting as many as you may require, since this is the size used in ninety-nine cases out of a hundred in wireless work. If, however, you occasionally use another size and require to shorten them, a similar tapped hole, hacksaw cut and binding screw may be made in the opposite end of the piece of metal.

□

The "Comparison" Crystal Receiver

(*Concluded from page* 816)

station is heard at the loudest. You may now change over to either of the other detectors, and compare the results obtained. It is best to adjust the condenser after changing over. The pressure on the carborundum crystal is adjusted by raising or lowering the head of the forward terminal, thus altering the pressure of the clock spring on the crystal. When using the carborundum detector, the battery switch should be in the "on" position—that is, on the left-hand stud—and the potentiometer adjusted for best results.

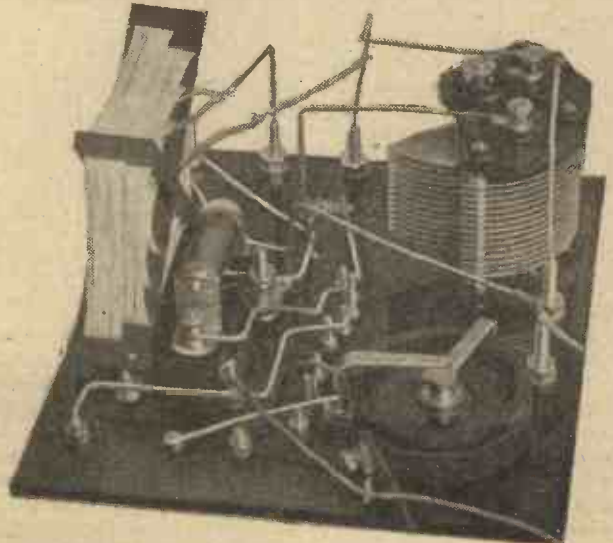
To listen to the high-power station, at present situated at Chelmsford, the aerial lead is transferred to the terminal A, the shorting strap across the loading coil socket is removed, and a No. 150 coil inserted. On rotating the variable condenser the station will soon be picked up, provided, of course, that you are within crystal range.

On the short wave stations, with aperiodic aerial coupling, which is incorporated by joining the aerial to A_1, and earth to E, the set will be found to be very selective, and therefore will be of special interest to those who live in areas where spark and other interference is troublesome.

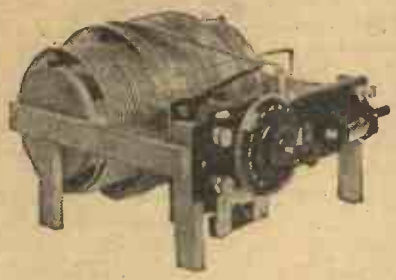
As regards results, London at roughly 5 miles comes in at very good strength, being audible in a quiet room about 2 ft. from the phones.

Chelmsford is also received at good strength, and there is no interference whatever from the short wave station.

This receiver should prove very useful to the man who wishes to find the best in crystals, at the same time having a receiver on hand by means of which both the long and short wave stations may be heard with good selectivity.



Showing the mounting of the coil and the permanent detector.

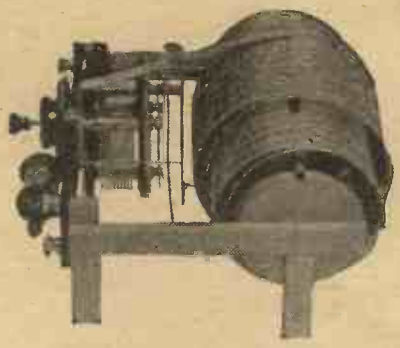


Very little ebonite is used in the construction

A Low-Loss Crystal Set

By W. H. FULLER

A description of a type of crystal receiver new to readers of "The Wireless Constructor".



Showing the position of the variable condenser

THE writer does not wish to say that the present set is the latest thing in crystal set design, but simply that it works very well, and tested side by side against a well-known commercial receiver, beat that model hands down. The receiver also works much better than one using ordinary plug-in coils. Comparisons were made by changing over the tuning systems of each receiver by means of a change-over switch, the same crystal and telephones being used.

There is nothing new in the circuit used, but the style of construction differs from the usual. The set may, of course, be mounted in a cabinet of suitable design, the writer leaving this to the wants and inclinations of the constructor.

The Coils

The main features of the set are, of course, the inductances. These are single-layer coils of

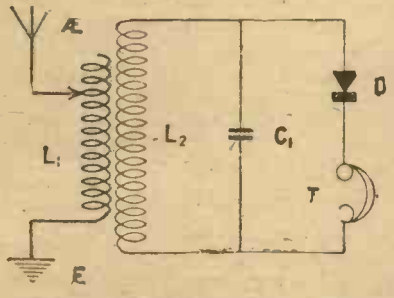


Fig. 1.—The aerial coil is "tuned" by the slider.

fairly thick wire, spaced and well insulated. There are two coils, one within the other. The outside coil has fewer turns than the inner coil, and is used as a semi-aperiodic aerial inductance. When the receiver was first built, this aerial coil consisted of only fifteen turns, and it was intended that this should not be altered, but on test better signals were obtained by tuning it—or rather, semi-tuning it—and it was then decided to make the necessary alterations to accomplish this conveniently.

Fig. 1 shows the circuit diagram, which may interest the more advanced constructors. L_1 is the

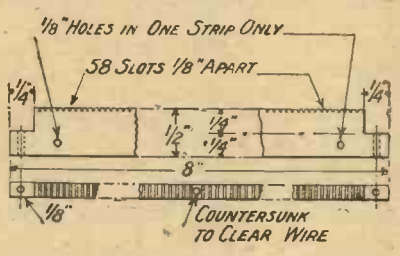


Fig. 2.—Showing how the ebonite strips are cut.

aerial tuning coil, consisting of a number of turns of thick wire, coupled to L_2, also wound with thick wire. Across the latter coil is placed the crystal and telephones in the orthodox manner. No telephone condenser is used, as this was considered unnecessary, not the slightest difference being noticed either in signal strength with 'phones, or in current flow with a micro-ammeter in circuit.

Construction

The building of the receiver should offer no difficulties to the constructor of average ability; the only point which may require explanation is the winding of the coils, which should be built first.

Three discs of wood 3½ in. in diameter are first required, and these may be cut from a suitable piece of wood about ⅜ in. thick with a fretsaw.

Next cut four strips of ebonite 8 in. long by ½ in. wide and ¼ in. thick. On one of the narrow sides of each of these strips 58 small slots are cut with a three-cornered file. These grooves are to hold the wires in position when placed on the completed former. The ends of the strips are filed down as shown in Fig. 2, so that wood screws may secure the strips to the wooden discs. In one of the strips two holes are drilled in the side to which the ends of the wire are fixed.

The strips are then secured to the wooden discs, one of the latter at each end and one in the middle, with wood screws. ¾-in. No. 4 brass screws will be found suitable for this job.

Winding the Coil

The wire is first wound on a temporary former, and the coil then transferred to the proper former. The first coil is wound on a 3½-in. cardboard tube, after the wire has been made perfectly straight. This may be done by drawing the wire through a number of holes drilled in a piece of wood. The wire should be wound on the former as tightly as possible, and

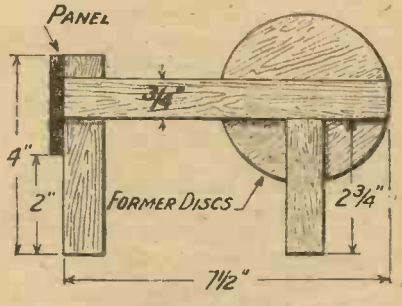


Fig. 3.—Details of the framework.

evenly. There is no necessity to space the wire. When 70 turns have been wound on, cut the wire and slowly let it untwist itself, and slide it off the former. Carefully transfer it to the proper former, lifting each turn over the grooves without straining the wire. Should the wire become

taut, give the free end of the coil half a turn, which will release the wire. When all the turns are on the former (they will look rather hopeless for the moment), pass one end of the wire through one of the holes in the prepared strip, and bend the end round so that the wire will not pull through. With the fingers, lay the wire in the grooves, taking up as much slack as possible. When all the slots have wires in them, cut off the excess and push the end of the wire through the other hole in the strip. Now return to the beginning of the coil and take up all the slack, working it towards the end of the coil. The excess should be cut off and the end bent round to prevent the wire loosening. This completes the secondary coil. The aerial coil may now be proceeded with.

The Aerial Coil

Four strips are cut and slotted as were the first four, but these are only 3¾ in. long, and are slotted on both sides. Thirty slots on each side are needed. Holes for fastening the wire are drilled in one of the strips, similar to those drilled in the previous strip.

These strips are secured to the secondary coil by sealing wax, which is sufficient to hold the strips while the wire is being wound. The strips should each be equi-distant from the ends of the coil and immediately over the lower strips. Only the smallest amount of wax should be used, and it should be applied as hot as possible, which will ensure a good fixing.

Forty turns of wire are now wound on a 4¼-in. former (the writer used a custard tin), and this is transferred to the former, in the same manner as the first coil. The ends of the wire are passed through the holes and all the slack taken up and the ends secured.

This completes the inductances, and the construction is now perfectly straightforward. The coils and the panel are mounted on wooden strips ¾ in. by ⅜ in., which may be either nailed or screwed together. Figs. 3 and 4 show the framework. The panel is 2 in. by 8 in. by ¼ in. thick, and is drilled as in Fig. 5. The panel should be of ebonite guaranteed free from leakage. The condenser used in the receiver is one of the new low-loss condensers recently put on the market by Messrs. Ormond Engineering Co., and has a maximum capacity of ·0005μF. The model has a vernier fitted, which, though not essential, is useful when a very small portion of the aerial coil is in use.

When all the components, etc., have been fitted to the panel it may be secured to the frame by wood screws.

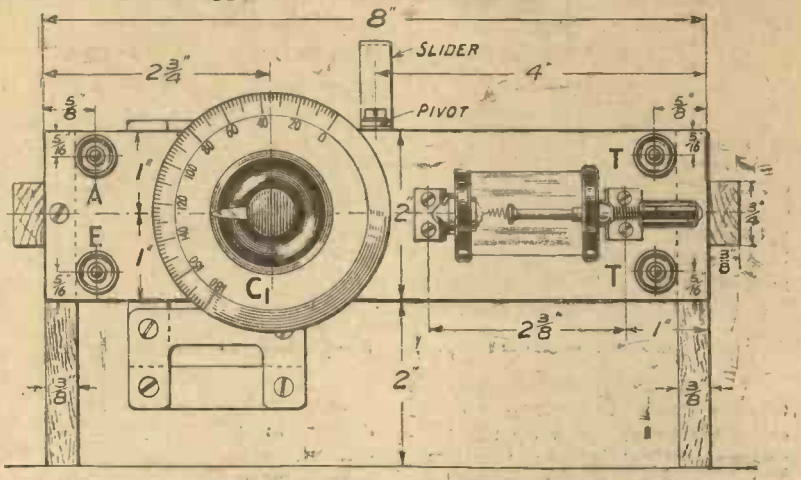


Fig. 5.—This view shows how the ebonite panel is drilled and mounted on the wooden framework.

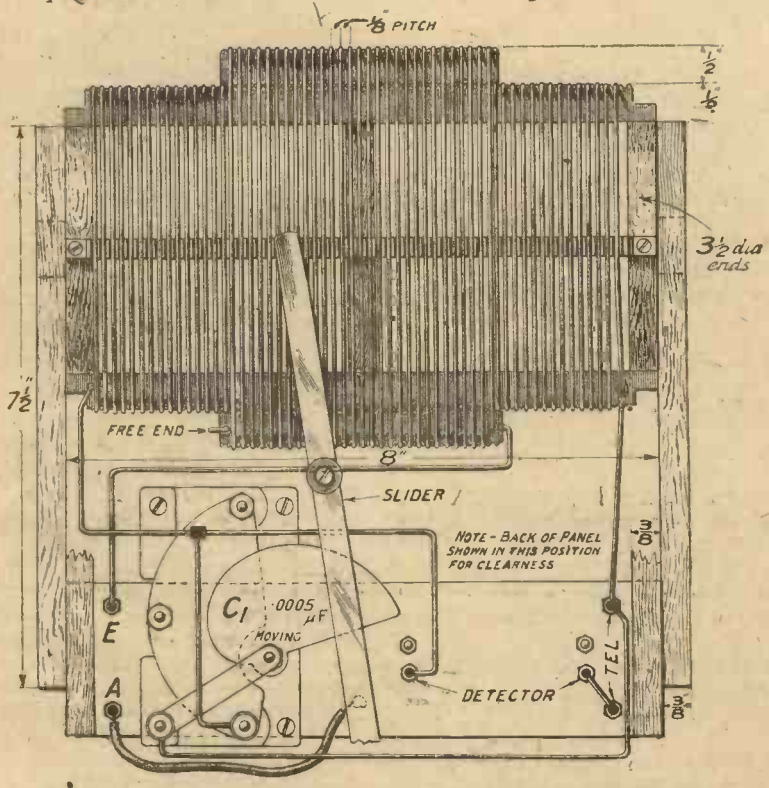


Fig. 4.—A plan view of the set, with the front panel shown dropped down in order that the wiring may easily be followed.

The Aerial Slider

The aerial slider contact is made from a piece of springy brass strip ⅜ in. wide. The end of this strip is curved so that only one turn need be touched. Two ⅛ in. holes are drilled in the strip as shown in Fig. 6 (*a*). The one in the end is to pivot the strip, and the other to hold a small ebonite knob. The writer used a "Clix" insulator. This is secured to the strip with a ½ in. 4 B.A. screw. The strip is then bent to the shape shown at (*b*), and secured to the panel by a ½ in. 4 B.A. screw tapped into the edge. Should the constructor not possess a tap to do the job with, a slightly smaller hole than the diameter of the screw may be drilled in the ebonite and the screw gradually worked into the hole.

Wiring

To avoid any mistake being made in the wiring, the following scheme

should be followed. Looking at the front of the receiver, the aerial terminal A is connected to the slider with a piece of thick flexible wire. The right-hand side of the aerial inductance is connected to E, the earth terminal. The left-hand side of the secondary inductance is joined to one side of the crystal detector, and also to the fixed vanes of the variable condenser. The other side of the crystal detector is wired to the top terminal for the telephones. The bottom telephone terminal is connected to the moving vanes, and the right-hand side of the secondary coil.

Using the Receiver

Connect the aerial to the aerial terminal and the earth to the earth terminal. Join up the telephones to the telephone terminals. Place the aerial slider on the left hand side of the coil, see that the catwhisker is making contact with the crystal, and turn the condenser dial. As soon as signals are heard, re-adjust the crystal and re-tune the condenser. The aerial slider should now be adjusted. Moving this slider will alter the tuning slightly, and the condenser should be adjusted each time the slider is moved. Signals may be obtained when only one turn of the aerial inductance is used. The adjustment of the variable condenser in this position is very critical.

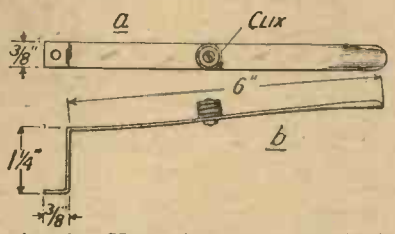


Fig. 6.—How the sliding contact is made.

Results

On the writer's aerial the best signals are obtained when fourteen turns of the aerial coil are used. The set has been tried on several other aerials of different sizes, and good results are usually obtained between the twelfth and the eighteenth turn. On the higher wavelengths—5IT, etc.—the whole of the aerial coil may have to be used.

List of Parts

A list of parts and materials which are required to build the receiver is here appended for the benefit of those amateurs who may want to try this type of crystal receiver, and the writer feels sure that they will be amply repaid for the time and trouble taken to build "Yet another Crystal Set!"

One ·0005μF low-loss square-law condenser with vernier (Ormond Engineering Co., Ltd.).

Crystal detector (Burndept, Ltd.).

Four 4 BA terminals.

Two lbs. bare or tinned copper wire, 16 S.W.G.

9 inches of ⅜ in. wide brass strip.

Odd pieces of wood.

One small knob.

The 2 lbs. of wire specified is rather in excess of the actual quantity needed, but the constructor will, no doubt, find a use for the lengths that remain.

Dry Cells for Dull Emitters

NOW that the warmer days are coming round once more a good many constructors will be turning their attention to making up portable sets both for outdoor use and for taking away on holidays. For these sets the bright emitter valve is quite out of the question, since the accumulator necessary is so heavy and so liable to accidents. Fortunately we have in the dull emitter a valve which will enable us to do all that we want with the dry cell, which is comparatively light in weight and contains no liquid electrolyte liable to damage clothes, carpets or furniture.

The Most Suitable Types

The two most suitable kinds of dull emitter are the Wecovalve (or its standard 4-pin equivalents) and the "·06s." The first require an E.M.F. of 1 volt or a little over, and have a consumption of ·25 ampere. So far as the voltage is concerned, they are therefore within the powers of a single dry cell. It should, however, be remembered that a current of ·25 ampere delivered continuously for any length of time throws too great a strain upon a cell of the size used ordinarily for working electric bells. For even a single valve set it is advisable to provide a large dry cell, and if it is desired to use two or three valves, each of them should have its own filament supply. This means that the dry cells required will mount up considerably in weight.

The ·06 Type

For anything bigger than a single valve set it is, therefore, better to use the "·06" type. These require an E.M.F. of from 2·5 to 3 volts, and are, therefore, within the compass in this respect of two new cells in series. As their current consumption is only 60 milliamperes, even a pair of bell cells will heat the filaments of two of them for some little time. A two-valve set can therefore be provided with a couple of bell cells, one of them being replaced by a new one as soon as the drop in voltage becomes too great for proper working. For three-valve sets with a total filament consumption of ·18 ampere it is best to use cells of rather larger size, though bell cells, if of good make, will supply this amount of current for some little time.

R. W. H.

A Reader's Results with the "A.A. Six"

SIR,—I am writing to tell you the results I have had on my "Anglo-American Six," designed by Mr. Percy W. Harris. London, 100 yds. away on L.S. Birmingham, about the same. Glasgow, 40 ft. away on L.S. Bournemouth, 50 ft. away on L.S. Cardiff, 50 ft. away on L.S.

I have also had Munster, Hamburg, Leipzig at good L.S. strength. Koenigswüsterhausen comes in loud. Radio-Paris is also loud. I had all these stations on January 18th and 19th. I also had London and Birmingham on 3 H.F. Det. with 10 ft. of 16 gauge square wire lying on the floor. I find the set very easy to tune. I use a Brown (large) L.S. I will write again shortly and tell you more results that I get.

Wishing you every success with your publications in the future,

Yours truly,

Oxford. R. G. J. NASH.

Great New Radio Press Laboratories

AN IMPORTANT ANNOUNCEMENT

EVERY reader of THE WIRELESS CONSTRUCTOR must by now have realised that the policy of Radio Press Ltd. (proprietors of this Journal and of *Modern Wireless* and *Wireless Weekly*) is one marked by an ever-increasing endeavour to secure for readers the best in circuits and in set designs, the best and soundest advice, and the best and most up-to-date information upon every branch of the subject which provides so fascinating a hobby.

Dependability

One of the characteristics of the work of Radio Press Ltd. which has placed them in their unrivalled position in the world of wireless publishing, is undoubtedly that feature which may be expressed in the one word "dependability": every article, from a description of an ambitious multi-valve set to one giving instructions for making a simple crystal set for the beginner, represents the outcome of the same painstaking preliminary design work, the same striving after full and lucid description, and the same care and accuracy in preparing the article for publication.

One of the recent steps taken by Radio Press Ltd. to maintain and still further increase that feeling of confidence which every reader should have in his journal and the sets described therein, was the establishment of a very completely organised Service Department.

These are some of the things which have won Radio Press Ltd. hundreds of thousands of supporters. The joint net circulations of their three journals approximate 400,000 copies, and the sales of their non-periodical publications are of the order of 500,000 per annum.

Placed, as they already are, in a unique position, Radio Press Ltd. are now taking advantage of that position to embark upon an interesting new enterprise. To develop and consolidate their position still further and to increase their prestige amongst the wireless public of this country and amongst the members of the industry, they are setting up laboratories at Elstree where research and development work will be carried out for the express purpose of supplying readers of Radio Press periodicals, books, etc., with the best possible information, the most recent developments and the most effective set designs.

The scheme under which these laboratories will be worked will be the most ambitious which has ever been undertaken by any technical publishing house.

A recent portrait of Mr. Scott-Taggart, taken in the New Offices in Bush House.

Measurement and Testing

In addition to research and development work, there will be departments for standardisation and measurement, for the testing and repairing of readers' sets (on a larger scale than hitherto), and for affording to the industry itself such assistance as it may, of its own accord, desire.

One of the fundamental differences between these laboratories and those of the commercial companies and the Government departments will be that the organisation at Elstree will exist chiefly for the *publication* of the results of its work. The Radio Press laboratories are being established for the express purpose of giving readers the full benefit of their investigations, not, obviously, as a gratuitous presentation to the public, but as a very great inducement for that public to purchase the publications of Radio Press Ltd.

Chief Engineer

The new organisation will, of course, demand a large staff, and the position of chief engineer will have been observed to form the subject of an announcement in the advertisement pages of *Modern Wireless* and of *Wireless Weekly*. This position, involving a total remuneration in the neighbourhood of £4,000 per annum, will be one of the most responsible and highly paid in British technical radio. A number of lower-grade vacancies also exist.

So far as can be judged in the early stages of such an enterprise, the completion of the main scheme of buildings will take three years. The work is beginning immediately, however, and it is being planned so that certain sections will be finished speedily, and the laboratories will begin their operations at a very early date. An almost ideal location at about twelve miles from London has been chosen, and the freehold of seven acres of land has been acquired, in order that free development may be assured in years to come. The locality is readily accessible, and it is proposed that when the laboratories are working fully they shall be open to inspection by both readers and the industry.

A great enterprise has been launched, and will have a considerable effect on the whole trend of experimental work in this country, and the Managing and Technical Director of Radio Press Ltd. (Mr. John Scott-Taggart, F.Inst.P., A.M.I.E.E.) believes that the great expense (a sum of £20,000 is allocated for preliminary expenses) will more than justify itself in public support.

THE "STAY-SET" CRYSTAL RECEIVER.

SIR,—I feel I ought to drop you a line in praise of one of your sets. I refer to the "Stay-set Crystal Receiver," described in your March CONSTRUCTOR by Mr. D. J. S. Hartt, B.Sc. It really is the best thing I have yet struck, and I have tried some dozens at least. I made this set a month ago, and the adjustment of the carborundum detector still holds good. I find it as loud as many one-valve sets I have heard, and, as I have said, it certainly gives more volume than any crystal set I have come across, while its quality of reception is beyond reproach.

The unique part about this set is, I think, its remarkable "stay-set" capabilities, and the following incident made me decide to write to you. One day I was using the Chelmsford part of this set, when I heard another band (it turned out to be Radiola), and I wanted a friend to hear this, so I turned away to get another pair of 'phones, forgetting I was already wearing a pair. This pulled the set off my table, and the whole contraption fell a distance of over three feet on to the floor with a crash. I was more annoyed because my panel is screwed down, and I expected to have to take it to pieces and remake, but on connecting up again the whole thing was exactly as before, except for a slight adjustment of the condenser. Even this bang had not disturbed the detector. I think all will agree this bears out your claim for "Stay-set."

Yours thankfully,
H. MCDONALD.

Brockley, S.E.4.

A STRANGE AERIAL.

SIR,—In the March WIRELESS CONSTRUCTOR you ask for particulars of a strange aerial. So far I have not seen a description of one similar to my own, though no doubt there may be many similar ones already in use.

The P.O. telephone (desk type) is installed, and shortly after 5XX commenced I discovered that good results were obtained by placing a spring washer, to which a short length of flex was soldered, in the slot of the pin carrying the swivel mouthpiece of the 'phone, and connecting the other end of the flex to the aerial terminal of a variometer crystal set. Similar results were obtained by taking a lead to the aerial terminal from any part of the metal casing of the phone, but the spring washer method was adopted for convenience.

Latterly I tried placing the 'phone on a metal plate which was screwed down on a piece of teak, and having a wood screw terminal making contact with the plate. This terminal was used as an alternative connection, but more inductance had to be added to bring signal strength up to normal. As the bottom of the 'phone has a rubber band projecting about ⅛ in. all round the circumference below the metal, the decrease in wavelength was no doubt due to the series condenser effect in the aerial lead. This method is seldom used, as there is not quite sufficient inductance in the above set to give results up to the first method, but this could no doubt be remedied if need be.

In passing, I may add that results are all one could wish for on a crystal set.

Hoping this may prove of interest,

Yours truly,
D. F. MCINTYRE.

Glasgow.

THE LOW-LOSS CRYSTAL RECEIVER.

SIR,—Just a line to say I have made the "Low-Loss" Crystal Set described by Mr. Percy W. Harris in your February issue, and find it gives much better results than the set we purchased, and because of the superior results we have obtained, a few others have been induced to purchase the Journal and make up the set with equally satisfactory results. We are six miles from the Dundee station.

Yours truly,
P. KILGOUR.

Monifieth,
Forfarshire.

This "Twin-Valve" receiver was made by Mr. Louis J. Collins whilst in hospital. When visiting the hospital the Queen complimented Mr. Collins on his excellent workmanship.

A group of useful tools for wireless work. A pair of round-nosed pliers is seen on the right

Tools for the Home Constructor

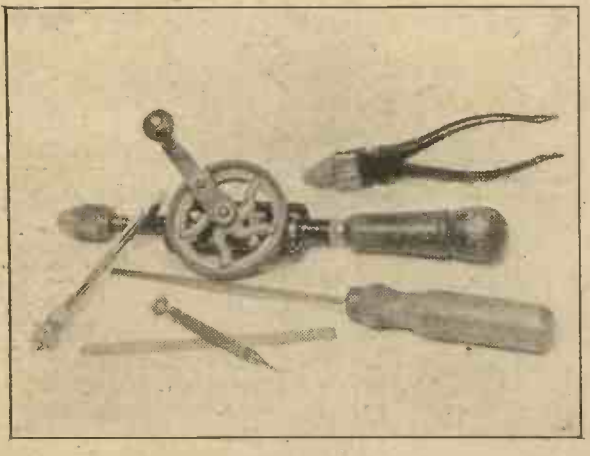
By JOHN UNDERDOWN

A chat about the implements necessary to those who construct their own wireless sets

THE choice of suitable tools for the home construction of receiving and transmitting sets is one of vital importance to all amateurs, and a few words on this subject will not come amiss. Reviewing the question generally, it will be seen that such tools fall into two groups—namely, those for constructional work, and those for wiring.

Constructional Work

Dealing with the first group—that is, tools used in construction—the first essential is some type of hand-drill, and these are generally obtainable at a reasonable price somewhere in the nature of 7s. 6d. A suitable type is one taking drills from the smallest up to about $\frac{3}{16}$ or $\frac{1}{4}$ in. Used in conjunction with this, the minimum number of drills I would advise any constructor to purchase consists of one each of No. 2, 4 and 6 B.A. clearance drills. These will be found suitable for the majority of holes for terminals, etc., whilst for the larger holes such as for condensers, valve windows, etc., a convenient method is to use a carpenter's brace, and either the ordinary wood drills ranging from $\frac{1}{4}$ to 1 in., or in conjunction with the brace a Clark's Expansive Bit, or some such device, which will drill holes up to $1\frac{1}{2}$ in. in diameter. Generally, however, for such holes as valve windows a bit up to 1 in. is suitable, and an ordinary carpenter's type will do admirably here. It is merely necessary when drilling holes with this type of bit to first drill a centre hole with a 4 or 6 B.A. drill, and using this hole as the centre, drill half through from one side of the panel and finish from the reverse side.



The Clark Expansive Bit is seen on the left, lying across the chuck of the hand-drill. In the foreground are a scriber and a steel rule.

Scribers

Where a blue print of the panel for a set is not available for setting-out purposes, an ordinary carpenter's 6 in. square will be found extremely useful. Used in conjunction with this for setting-out purposes, I would recommend some fairly stout form of scriber, such as that shown in the photograph, as with this the centres for the various holes may readily be made, thus eliminating the necessity for a centrepunch, the use of which gives rise to a certain amount of noise, often bringing disfavour on the home constructor if the work is carried out in the evening. For measuring the correct distances between centres a 6 in. or 1 ft. steel rule should be used. Where it is intended to use valve sockets and not some moulded type of valve holder, a drilling template will be extremely useful. These may be obtained in various types and for very modest prices, and their accuracy and utility amply repay the small outlay.

Screwdrivers

Usually the only other really necessary tools used during assembly consist of a pair of fairly heavy pliers and a long screwdriver. It is well worth while to obtain a really good screwdriver, with a properly ground edge and a comfortable handle.

Tools for Wiring

Under the heading of "Tools for Wiring" come a pair of sidecutting pliers such as seen in the photograph, a long pair of tin flat-nosed pliers, also seen in the photograph, and a small smooth file. This latter is extremely useful in filing terminal shanks, &c., to give a really clean surface for soldering. If a type of three-cornered file, such as is used by carpenters for sharpening saws, is purchased, this will also be found extremely handy in slightly enlarging holes for components of the one hole fixing type. A small brush is also extremely handy for brushing away the filings made, and for this purpose a small painter's brush is useful, and one of the type shown in the photograph should be obtained. Where a number of wires are to be taken under screws, such as of condensers, some types of rheostats, and under transformer terminals, a pair of round-nosed type pliers is useful. These latter are, however, by no means essential.

The Soldering Iron

Perhaps, however, the most essential tool for wiring is the soldering iron, to which very little attention is usually paid. The most efficient type the author has ever used is shown in the photograph. This consists of a 3½ in. length of ½ in. round copper rod which is fixed to a 4 or 5 in. length of ⅜ in. mild steel and inserted in the usual wooden handle. The method of fixing the round copper bar to the steel rod is by drilling and tapping the former to take a 2 B.A. thread which is cut on the mild-steel rod. A 2 B.A. nut put on before the copper bar and then tightened back effectively holds the former in position. The tapping of the copper bar is by no means an easy operation for the amateur, as a lathe is necessary. Where one is not available it will be well worth while to have such an iron made by a professional.

The Tinned Surface

The most important part of the iron is the surface, which is tinned. This is cut off at roughly an angle of 60 deg., as shown, giving an oval end. This should be thoroughly well cleaned, and then covered with flux and the iron heated in the gas. The point should not be inserted in the flame, but left clear and touched with flux occasionally to keep it from oxidising. When the iron has reached a sufficient heat, if touched with a stick of solder, with a certain amount of flux on the end, this will run evenly over the iron and give a well-tinned surface. An iron of this type will be found extremely useful, and, by having a long length of copper such as is used here, it will keep hot much longer than the usual type with a short piece of copper and pointed, and will be found to give a beautifully rounded joint in all cases. With this arrangement the iron need never have its tinned surface inserted in the gas flame.

Taps and Dies

The previously mentioned tools are all that are really essential if the constructor is to build his set of bought units. If, however, it is desired to make certain gadgets which cannot be purchased, other tools will be necessary. In this latter case I would advise that a hacksaw taking blades from 8 in. upwards, a vice with jaws from 2 in. to 4 in., a pair of shears for cutting sheet metal, and a number of taps and dies be purchased.

The most useful sizes for wireless work will be found to be 2, 4 and 6 B.A. for both the taps and dies.

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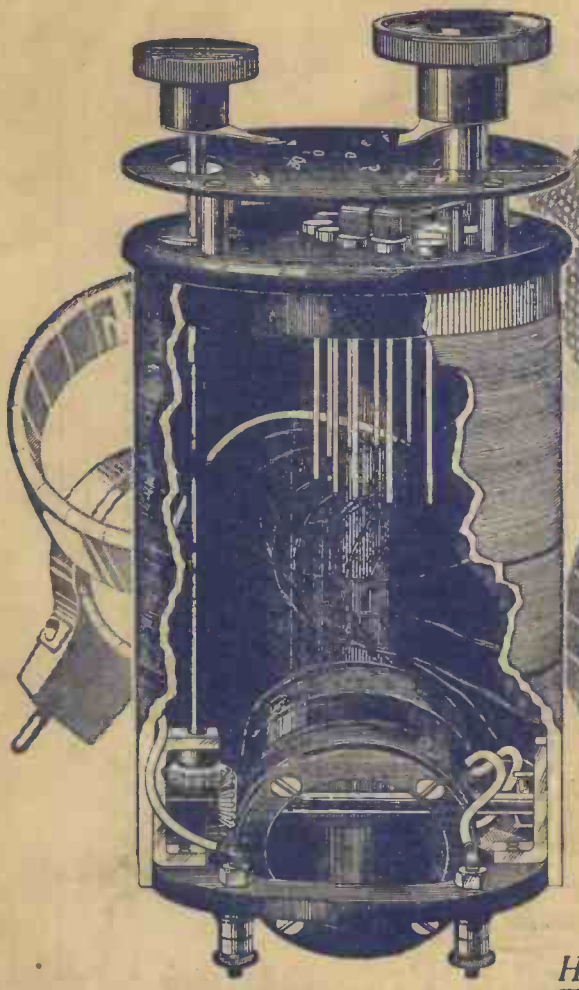

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