The Wireless Constructor

6D

EDITED BY
PERCY W. HARRIS

CONTENTS.

Vol. 1. No. 3. JANUARY, 1925.

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This fascinating article by John Scott-Taggart, F.Inst.P., A.M.I.E.E., the Editor of "MODERN WIRELESS," gives the fullest constructional details of a 2 H.F. set built purely and simply for long-range reception. The fact that this is the first straight 2 H.F. set described by the Author, whose reputation in valve circles is unrivalled, is significant in itself. Six B.B.C. Stations varying from 50 to 350 miles, figure in the detailed test report as giving excellent *loud-speaker* results.

Another very important article is a complete account of the Armstrong Superheterodyne and its recent development by Edwin H. Armstrong the great inventor himself.

Mr. Harris, Editor of "THE WIRELESS CONSTRUCTOR," also contributes a very interesting constructional article on a new 3-valve set. Mr. J. B. Barber has an article of great interest dealing with Loose-Coupled Single valve set, while Mr. A. D. Cowper, M.Sc., contributes a very special article on reception on the Ultra Short Waves, a new intriguing field of work almost unknown to many.

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MODERN WIRELESS

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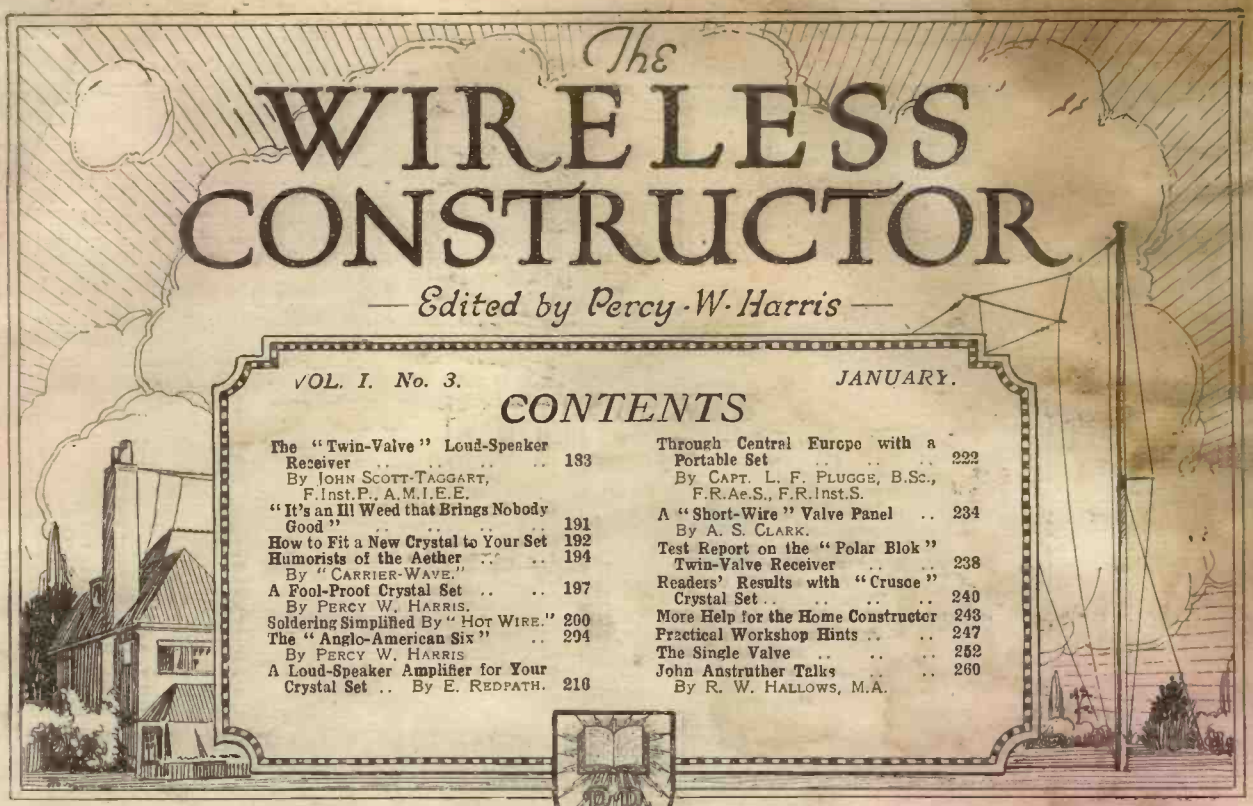

The WIRELESS CONSTRUCTOR

— Edited by Percy W. Harris —

VOL. I. No. 3. JANUARY.

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Vol. 1. JANUARY, 1925. No. 3.

The "Twin-Valve" Loud Speaker Receiver

By JOHN SCOTT-TAGGART, F.Inst.P., A.M.I.E.E.

THE ST.100 receiver has had such a very wide appeal that reflex circuits generally have aroused a very great deal of interest, and justifiably so, in my opinion, in cases where not more than three valves are used.

The great drawback of the ST.100 which most people do not seem to mind, is the crystal. The ideal set, of course, is one which will "stay put," and which will give uniformly good results. When the ST.100 circuit first appeared most people seemed to have a lot of trouble with it, and then suddenly complaints disappeared.

Exactly the same thing has occurred with the three-valve dual set described in *Modern Wireless*. Confidence and the careful following of the published design is the secret in constructing a reflex set.

Excellent Results obtained

The particular new set which I have designed and which is described here is a two-valve reflex in which the second valve acts as a detector, no crystal being employed. There is consequently no trouble due to the detector going out of adjustment, and if the set is made as described, excellent results will be obtained.

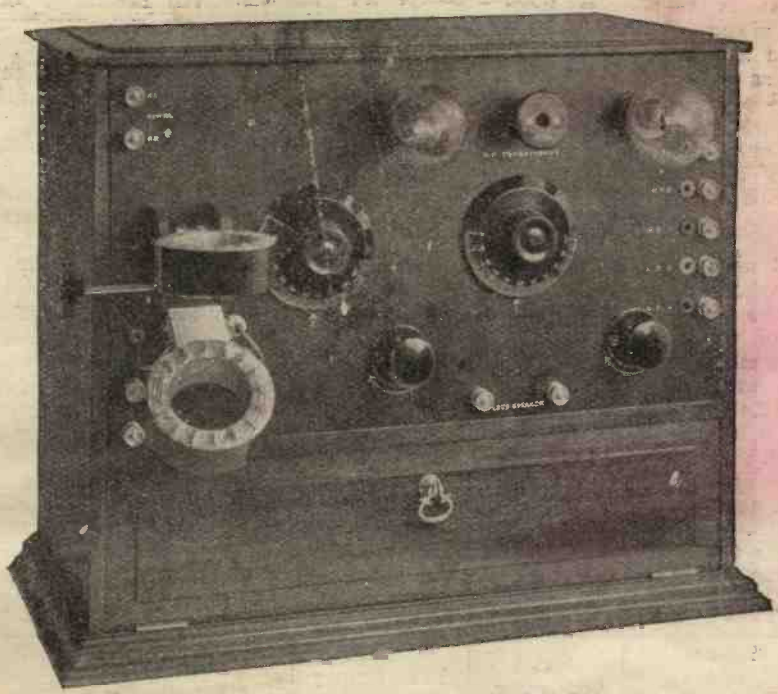


Fig. 1.—This photograph shows the handsome appearance of the completed set.

As my home is within 10 miles of 2LO, and as perfect loudspeaker reception was obtained from this station, I decided to take the set out to about 50 miles and to carry out the final tests at this distance. Consequently, on November 5th I took the set in a car to Bedford, which is approximately 50 miles from London. In the presence of Mr. Clarabut, a prominent member of the Bedford Radio Society, tests were carried out on an aerial of Post Office pattern, having an average height of 35 ft., and a much smaller aerial, only 65 ft. long and 15 ft. high. Very good results were obtained on both these aerials; the London Station 2LO was received on the loudspeaker with both aerials. With

the higher aerial very good loud-speaker results were obtained, while with the small aerial the set gave moderate loud-speaker results.

Bournemouth, Glasgow and Birmingham were all received on the loud-speaker, which was used throughout for tuning purposes.

For a two-valve set these results may be considered as very good, but for nearby work the ST.100 set gives louder results, this being inevitable because the ST.100 has two stages of low-frequency amplification, which cannot be achieved with two valves without a crystal detector.

From my own experience I should say that the results are the best that could be obtained with a two-valve set using the reflex principle, without a crystal detector. The signals are louder than those obtained with a resistoflex circuit (which principle, by the way, has just been incorporated into their sets by one of the largest electrical firms in the country).

The reason is obvious, for in the resistoflex the low-frequency coupling is effected by means of a high resistance, and it is well known that this method of coupling is not as efficient, from a signal-strength point of view, as a transformer.

The present set, however, required a considerable amount of preliminary design work before it took the form given in this issue.

Valves Used

The constant aerial tuning condenser was used throughout, the aerial being connected to the top terminal on the left of the set. A No. 50 Tangent coil was used in the aerial circuit, but no special significance must be attached to the use of this coil, which, however, is of excellent design, although the results of all the different makes of coils are very much the same, as regards signal-strength.

In some cases, as the table of results shows, no reaction coil was needed, in which case the shorting plug was inserted where the reaction coil would normally go. In some cases the reaction coil, which is a No. 35 Lissen coil, was reversed so as to assist in stabilising the operation of the set.

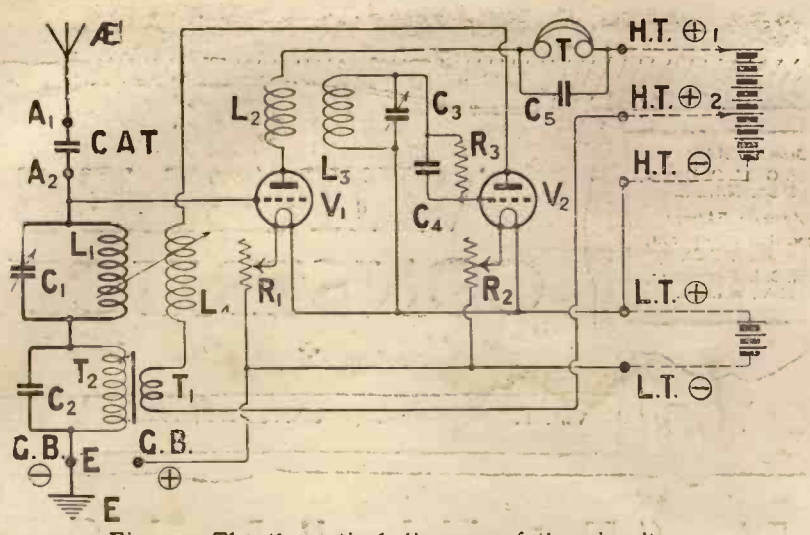


Fig. 2.—The theoretical diagram of the circuit.

A good control of reaction could be obtained by adjusting the filament rheostats, so that because the table shows the reaction coil shorted, it must not be assumed that no reaction effect was used.

As regards high-tension voltage using general purpose valves, the voltage on the H.T.+1 terminal was 100 volts, while the voltage on the H.T.+2 terminal was 42 volts. The correct voltage on the second valve is rather important because if the voltage is too high the set is inclined to buzz. This buzzing trouble, of course, is the great snag in reflex sets, and very considerable attention has been given to this in the design of this set. As far as my knowledge goes, this is the first description of a two-valve reflex using no crystal which gives good stable results, excepting the three-valve dual set which I described in the April issue of *Modern Wireless*, and which may be adapted to be used as a two valve reflex set.

Stable Working

The use of constant aerial tuning, the value of the condenser across the secondary of the intervalve low-frequency transformer, the use of separate H.T. voltages (tapped off the same high-tension battery) all contribute to the efficient working of the set without buzzing. Another very important point is the low-frequency transformer and the method of connecting it. Other types of transformer may be used than the one mentioned, but some experiment may be necessary to find out which way round the primary and secondary terminals should be connected to give stable results. In the present case if the primary windings were reversed the set would undoubtedly buzz very readily, and this fact was found out during the construction of the set. In its present form, however, perfectly stable results are obtainable without buzzing.

The notes regarding the reaction coil which are given in the table

TESTS ON THE "TWIN-VALVE" REFLEX SET CARRIED OUT AT BEDFORD.

Station and Wavelength.	Name and Distance.	Aerial Condenser.	H.F. Transformer Condenser.	Reaction Coil.	Results.
2 LO ... ... 365 metres	London ... 50 miles	57°	13°	Reversed No. 35 or shorted.	Very good loud-speaker results.
6 BM ... ... 385 metres	Bournemouth ... 110 miles	70°	15°	Loose-coupled No. 35 reversed.	Good loud-speaker results.
5 SC ... ... 420 metres	Glasgow ... 300 miles	78°	22°	Shorted.	Moderate loud-speaker results.
5 IT ... ... 475 metres	Birmingham ... 65 miles	90°	29°	Shorted.	Very good loud-speaker results.

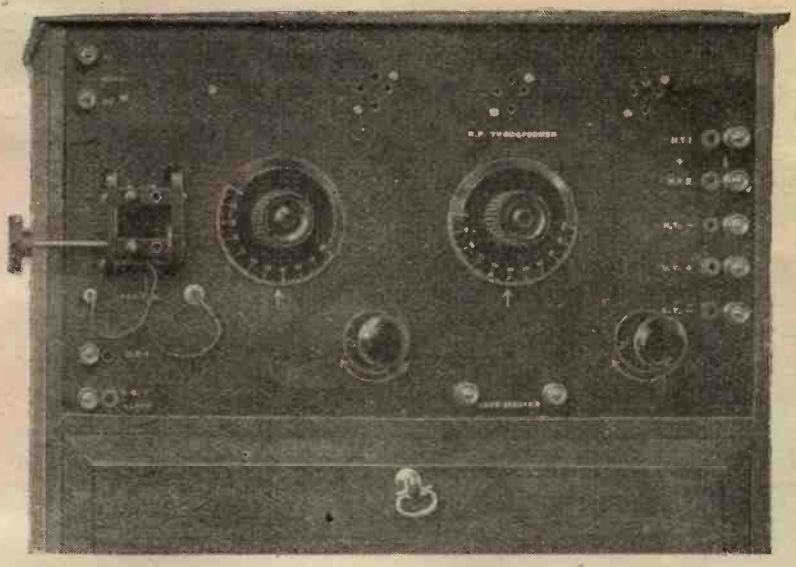


Fig. 4.—A view of the receiver with coils and valves removed.

do not necessarily apply to all conditions, as different changes in components and different aerials would modify the conditions, and the experimenter should try shorting the reaction coil socket, and also inserting a reaction coil and reversing the leads going to it.

Separate H.T. Important

As the four-valve T.A.T. receiver, as described in the Christmas Number of *Modern Wireless*, was being tested at the same time, there was not very much opportunity of extending the list of stations heard, but the possibilities of the set are indicated by the list of results given.

Adjusting the high-tension voltage is a point which must not be overlooked by the experimenter, who should, under no circumstances, connect the two H.T. terminals together, and work the valves off the same high-tension voltage. In all cases the anode voltage of the second valve should be less than that of the first, at least, this is my experience, and most constructors of this set will find that this is a safe rule to follow.

The Layout

Fig. 1 is a photograph of the completed instrument with valves and coils in position. Four terminals may be seen on the left of the panel, these being marked A1, A2, G.B.+, and G.B.—Earth, reading from the top. On the same side of the panel may be seen a two-coil holder, by means of which variable coupling between the two coils mounted in its sockets is possible. Provision is made for reversing the connections to the moving coil by means of two Clix terminals seen below the coil holder.

The valves with the plug-in H.F. transformer between them are seen at the top of the panel, and below these may be seen the knobs controlling two variable condensers. The two knobs near the lower edge of the panel are those controlling the filament brilliancy of the valves, and the two terminals between them are for the telephones or loud-speaker.

The high-tension and low-tension battery terminals are placed in a row on the right-hand side of the panel, and reading from the top are, H.T.+1, H.T.+2, H.T.—, L.T.+ and L.T.—. A small distance to the left of these terminals, holes are drilled in the panel through which rubber-covered leads are taken from the terminals to the batteries which are housed within the cabinet. With this arrangement the receiver presents a very handsome appearance, requiring no outside connections to batteries which do not generally synchronise with their surroundings. Apart from considerations of appearance, however there is no objection to placing the batteries outside the receiver should the constructor so wish, and this, in fact, is preferable if an accumulator is to be used for filament heating.

The Circuit Arrangement

A diagram of the circuit of the receiver is given in Fig. 2. The aerial is tuned by the coil L_1 and variable condenser C_1 of 0.0005μF maximum capacity, the high frequency oscillations in L_1 C_1 being applied to the grid of the valve V1, which acts as a high-frequency amplifier. In the anode circuit of this valve is the primary winding L_2 of the high-frequency transformer L_2 L_3, and the telephones shunted by the fixed by-pass condenser C_5 of 0.002μF. capacity.

The high-frequency variations across L_2 are transferred to L_3, which is tuned by C_3 of 0.0003μF, and are impressed upon the grid of V2 which acts as a detector. The grid-leak R3 has a resistance of 2 megohms, while C_4 has a capacity of 0.0003μF.

Reaction is obtained by coupling L_4 in the anode circuit of V2 to L_1 in the aerial circuit. The primary winding T1 of the low-frequency

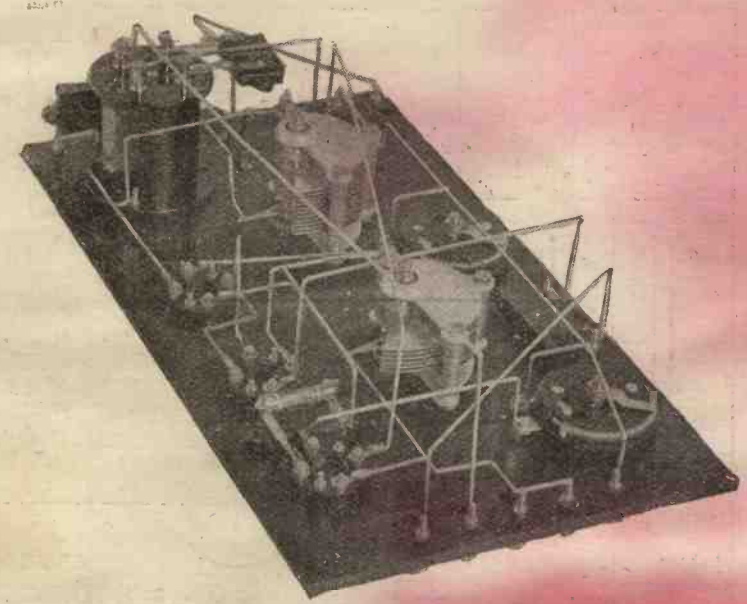


Fig. 5.—This under-panel view shows simplicity of the wiring.

intervalve transformer T1 T2, is also placed in the anode circuit of V2, the resulting stepped-up voltages in T2 being communicated to the grid of V1 which thus acts as a low-frequency amplifier. It will thus be seen that there are both high- and low-frequency current variations in the anode circuit of V1. The former pass through the condenser C5, while the latter flow through the telephones and produce sound.

Constant Aerial Tuning.

Provision has been made for the use of two forms of tuning—constant aerial tuning and ordinary parallel tuning. Constant aerial tuning is brought into use by connecting the aerial lead-in to terminal A1 when it will be seen that the fixed condenser C.A.T. of 0.0001 μF capacity is placed in series with the aerial.

By joining the aerial to A2, the C.A.T. condenser is omitted from the circuit, and the ordinary form of parallel tuning is brought into use. The earth lead is joined in every case to the terminal G.B.—Earth.

Component List

In the following list of the components used in the construction of the receiver, manufacturers' names have been included, since this is desired by many intending constructors. Other good makes could, of course, be substituted.

Ebonite panel 16 in. × 9 in. × $\frac{1}{4}$ in. (Paragon, Peter Curtis, Ltd.)

Cabinet of suitable size (to take batteries or not, as desired).

Polar junior vernier two-coil holder (Radio Communication Co., Ltd.)

"Super Success" L.F. transformer (Beard & Fitch). (N.B., this new model is in a *black* case, NOT one with a brass finish.)

2—0.0003 μF fixed condensers (Dubilier).

1—2 megohm grid leak (Dubilier).

11—4BA terminals (K. Raymond).

2 Clix plugs and sockets (Autoveyors, Ltd.).

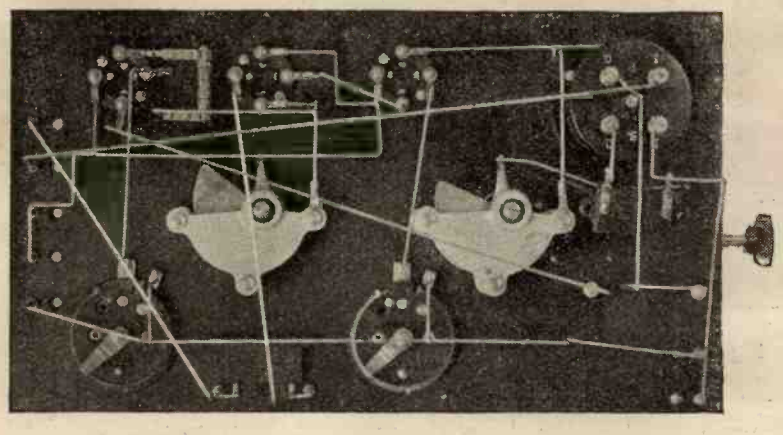


Fig. 6.—This view may be of help in connecting up when used in conjunction with the wiring diagrams.

1—0.0005 μF variable condenser ("Utility," Wilkins & Wright).

1—0.0003 μF variable condenser ("Utility," Wilkins & Wright).

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

2 filament rheostats (McMichael or Burndept, dual pattern).

1 plug-in high frequency transformer for desired wave-lengths (Burne-Jones "Magnum").

1—0.0001 μF and 1—0.002 μF fixed condensers (Dubilier).

7 Clix panel bushes (Autoveyors, Ltd.).

Quantity of $\frac{1}{16}$ in. square tinned copper for wiring (Sparks Radio Supplies).

The Panel

There is on the market at present a large amount of poor quality ebonite, which is sold at an attractive price. Such ebonite, however, should be shunned, and only reputable dealers patronised.

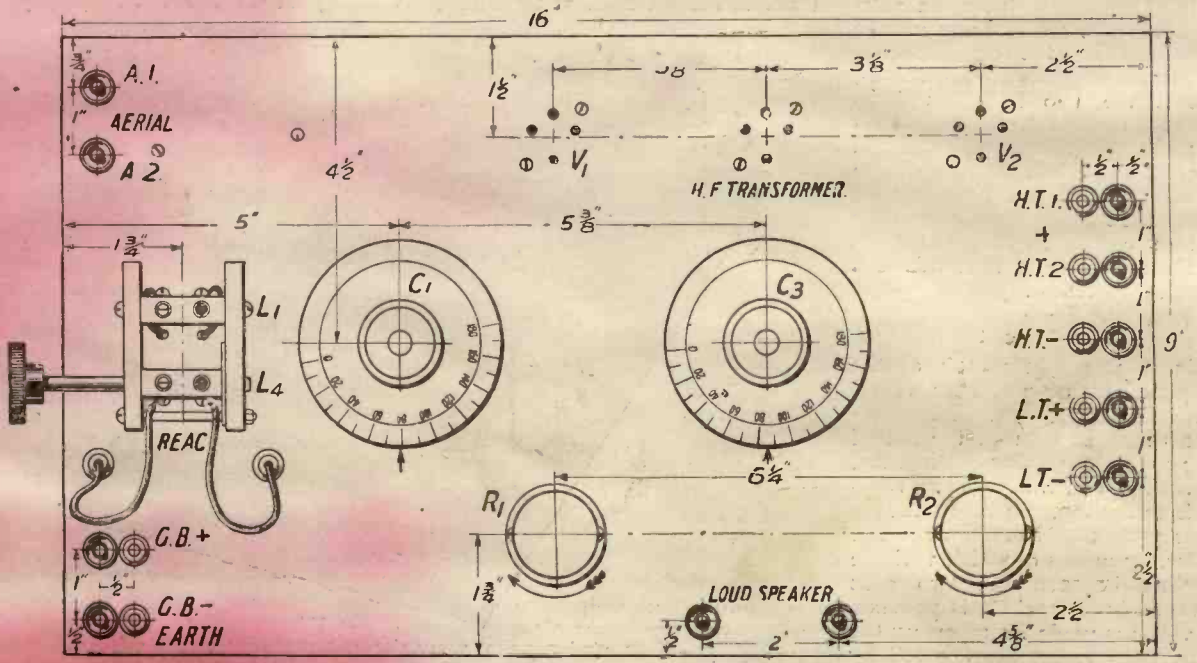


Fig. 7.—This shows the exact layout of the panel and gives all necessary dimensions. Blue print No. C 1004 A.

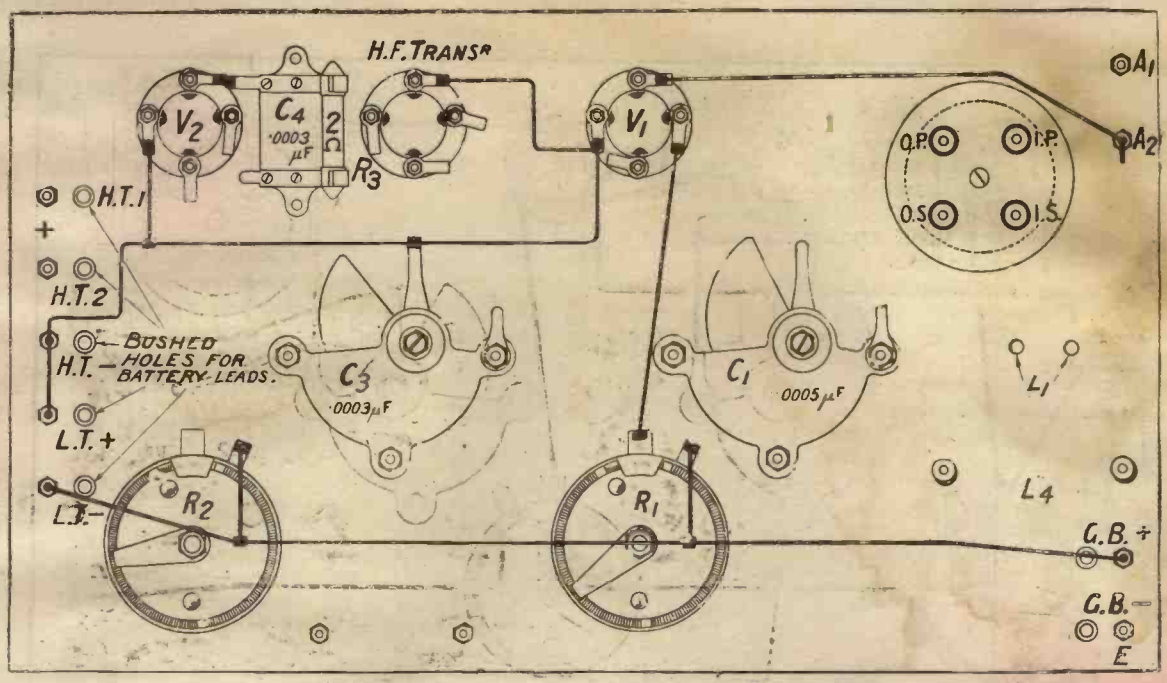


Fig. 8.—The first stage in wiring up is shown above. These are the connections that are nearest to the panel.

The drilling diagram is shown in Fig. 7, which gives all the necessary measurements for finding the positions of the holes to be drilled, and also gives a clear idea as to the layout of the components.

It is a good plan to have all components at hand before drilling the panel, as it is then easy to determine the correct sizes for the various holes.

Many readers prefer to work from a full-size blue print, and this is obtainable from the Sales Department of Radio Press, Ltd., price 1s. 6d. post free. Blue Print No. C 1004 A should be quoted.

Mounting the Components

Having drilled the panel, the mounting of the components may be commenced, reference being made to the photographs and diagrams if in doubt over any point. The fixed condensers are not placed in position until the wiring-up stage is reached.

Wiring

A full-size blue print, showing the whole of the wiring of the receiver is presented free with this issue, and is so clear that it should

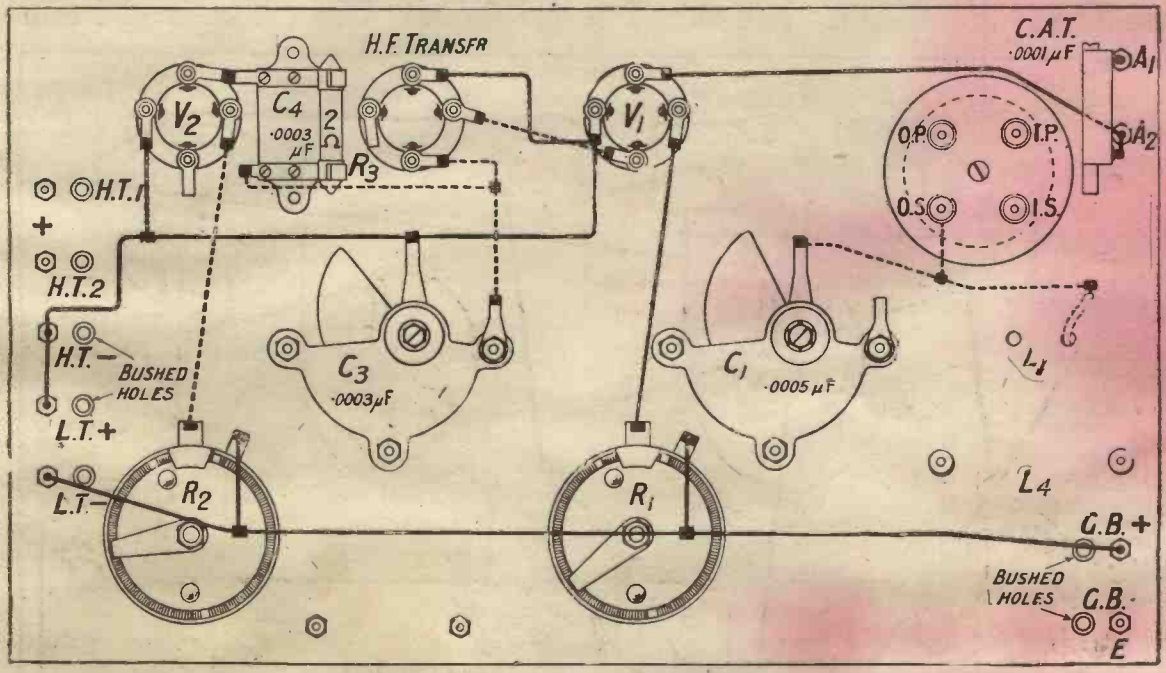


Fig. 9.—The next set of connections that go just above those first made are shown as dotted lines.

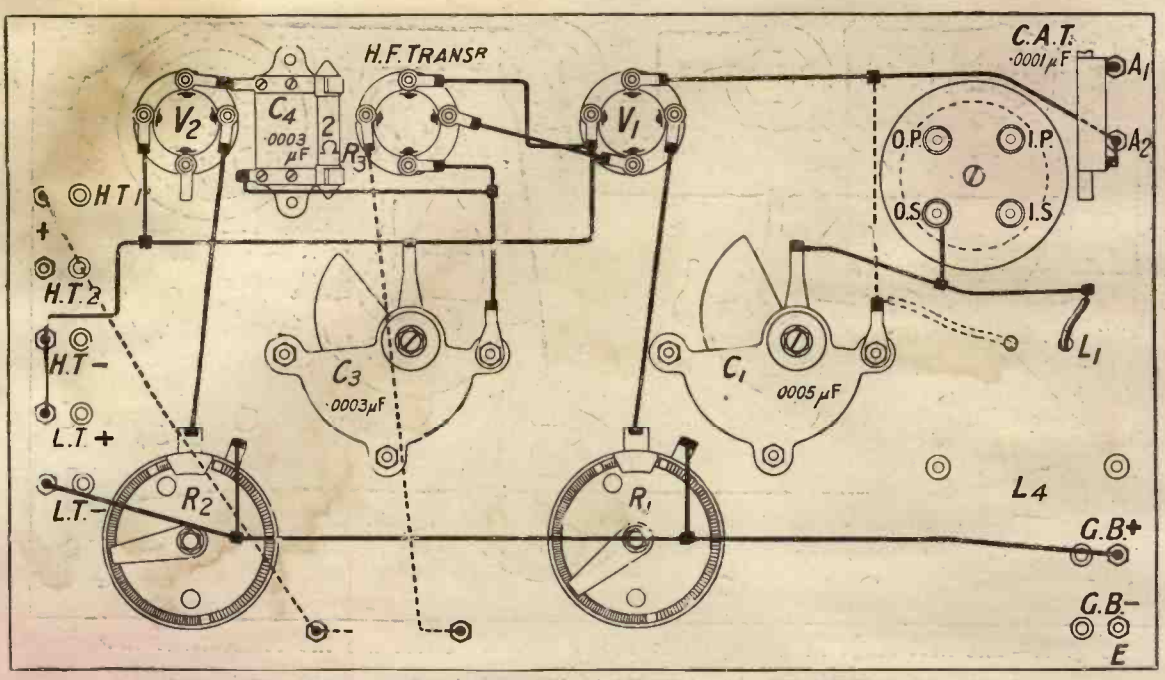


Fig. 10.—The third stage in wiring up. The dotted lines should be soldered above the full lines.

be easy to wire up the set without further aid. For the benefit of the beginner, however, four special diagrams have been prepared, which are calculated even to make wiring up easier than if the actual set were at hand as a guide. The reason for this is that the wiring is shown in stages, so that the constructor does not have to worry out for himself which wires should be soldered first. On commencing wiring, reference should be made to Fig. 8, which gives the first few wires to be soldered near the surface of the panel. Now, turning to Fig. 9, we see the same wires drawn again, and also some dotted lines. Now it must be remembered that throughout the wiring process, *dotted* wires must be soldered in *above full* lines. If this is observed throughout, the resultant wiring will very closely resemble that on the actual set described. Turning to Fig. 10 we see all the connections of Fig. 9 transformed into full lines, and some extra dotted connections again. Having soldered these, Fig. 11 may be consulted for the last few connections. In this figure it will be seen that one connection is shown as a series of

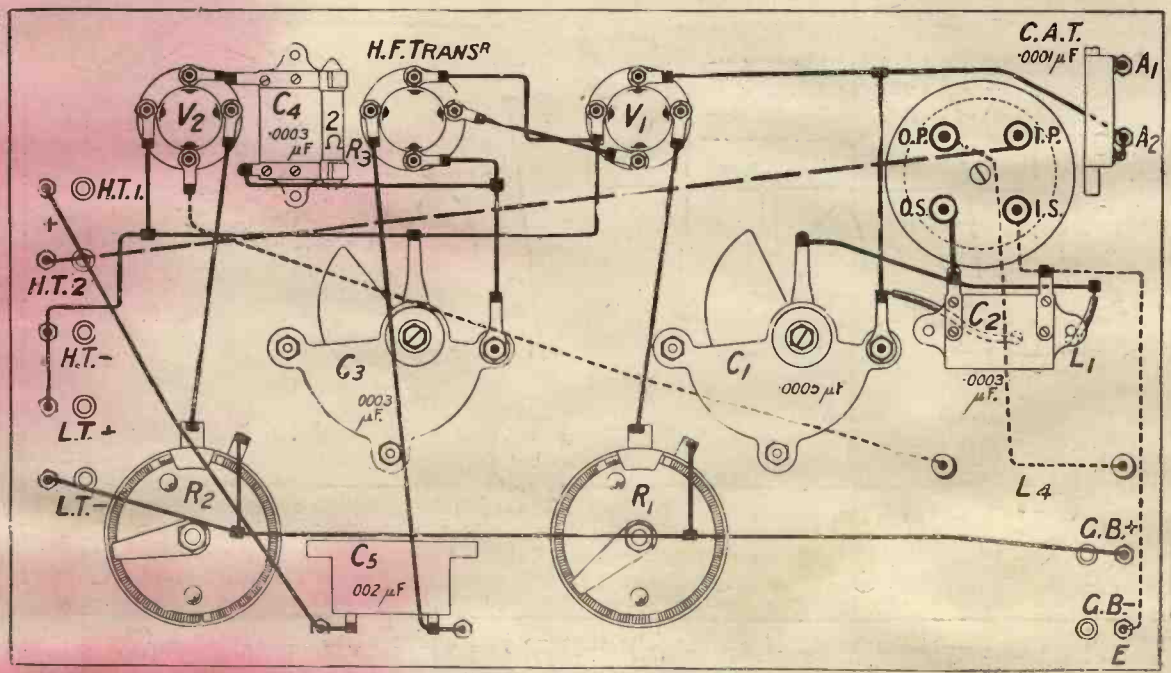
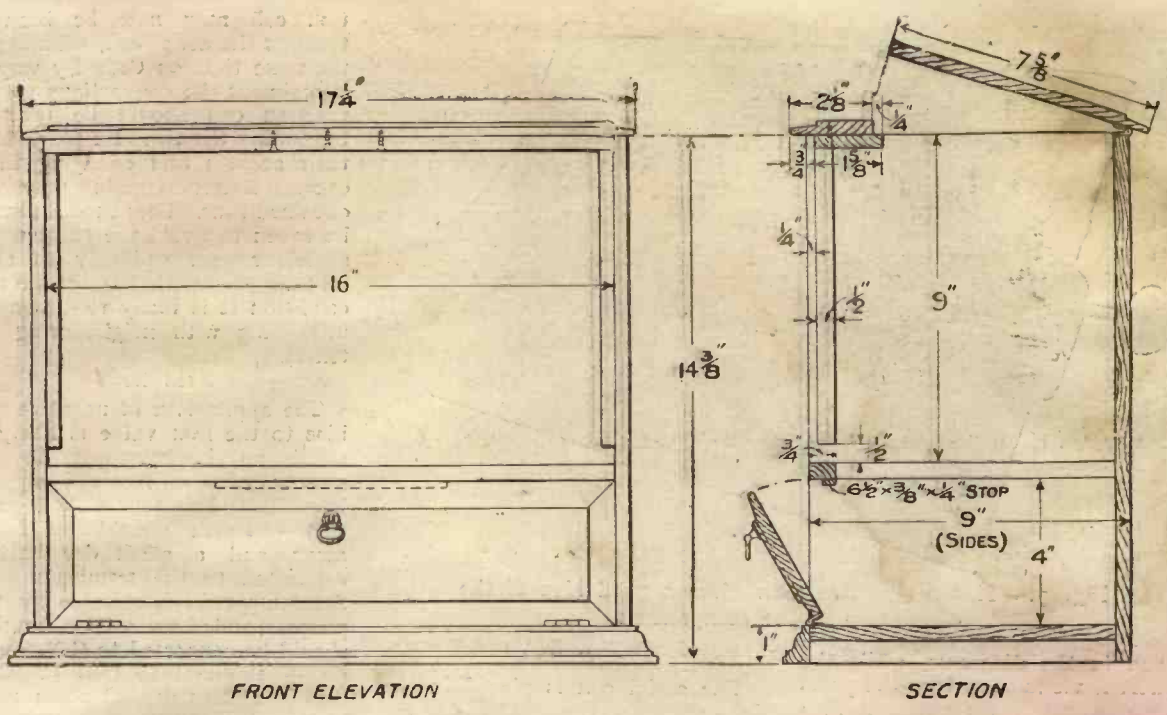


Fig. 11.—The dotted connections in this figure are the last to be made. The wire shown as a series of dashes is soldered in last of all.



NOTE:- ALL WOOD ⅜" THICK UNLESS OTHERWISE MARKED.

Fig. 12.—This shows the construction of the cabinet together with all necessary dimensions.

dashes, and this merely implies that it is the topmost wire of all. The inclusion of this wire and the other dotted connections, and the condensers C_2 and C_5, concludes the wiring.

An entirely new departure has been made in the wiring diagrams. The usual symbols indicating "no connection" where lines cross, have been omitted, and at each point where a join occurs, this is indicated by a distinct black mark (generally a square).

In following the diagrams, therefore, it must be remembered that joins are to be made *only* where indicated by a black mark. Where wires cross without being joined together they are shown exactly as they appear upon looking down on the actual set.

It is considered probable that readers will prefer this to the more usual method of drawing semi-circles all over the diagram, and reports on the subject will be welcome, as these will decide its continuance or otherwise.

The value of each fixed condenser is clearly marked, and the method of mounting them is also obvious. The stiff wiring and good soldered joints supply adequate support for these light components.

Two rubber-covered flexible leads are seen passing through two holes in the panel, and are connected on the other side to the screw terminals on the fixed socket of the two-coil holder, as shown in Fig. 7. In the same figure are seen the connections from the moving socket to the Clix plugs.

H.F. Transformer Connections

It is an unfortunate fact that different manufacturers of high-frequency plug-in transformers have not agreed upon a standard method of making the connections to the four pins which plug into an ordinary valve socket. In some cases the "filament" pins form the ends of the primary winding, while in other cases the secondary winding is connected across the same pins. The H.F. transformer mentioned in the components list, is suitable for use with the receiver, as are those of McMichael and Bowyer-Lowe.

The Cabinet

In many cases the reader will prefer to purchase this ready-made, many dealers being willing to undertake this work.

For the benefit of those who wish to construct the cabinet themselves, however, special diagrams have been prepared, and are seen in Fig. 12. No directions as to the constructional work are required, all the necessary dimensions being

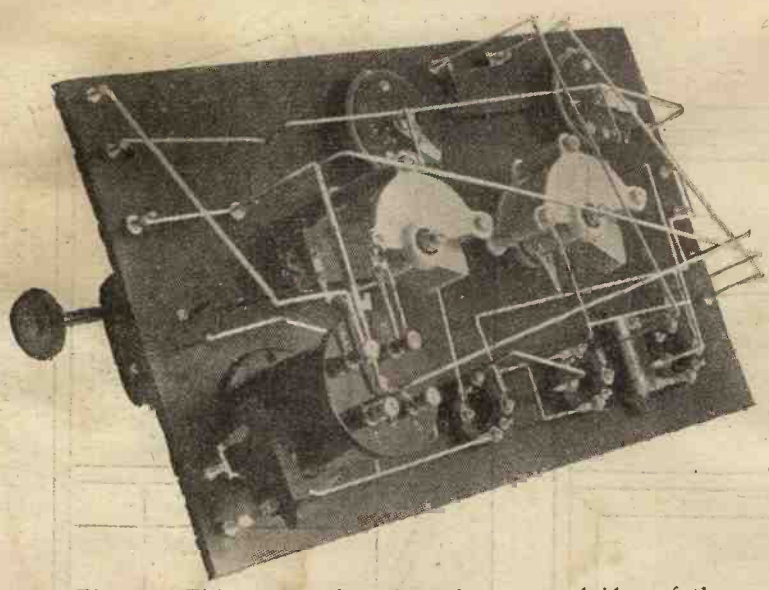


Fig. 3.—This perspective view gives a good idea of the disposition of the components.

given in the diagrams, while the different views show how the parts are arranged. An excellent idea as to the appearance of the finished cabinet may be gathered from the photograph in Fig. 1. The small door in the front of the cabinet opens to admit insertion and periodic inspection of the battery or batteries. The two hinges provided for this purpose may be seen on the lower edge of the door.

Connecting the Batteries

The various accessories may now be fitted to the set in preparation for working. The batteries, as previously mentioned, may be placed either outside or inside the receiver; in the latter case the wires from the battery terminals pass through the bushed holes in the panel, and are then connected to their respective batteries.

For the sake of simplicity when first working, the two terminals G.B.+ and G.B.— Earth may be connected together with a piece of wire. The valves and H.F. transformer may now be inserted (the latter in middle holder), the rheostats having first been turned to the "off" position. It may also save much mortification if an inspection of the battery connections is made before switching on the current by means of the rheostats. With the aid of these, the valves should be given a suitable brilliancy.

As regards the voltages applied to H.T.+1 and H.T.+2, the directions given by the makers of the valves used should be observed. In general, however, 40-50 volts for H.T.+2 and 70-90 volts for H.T.+1 is quite suitable.

Coils

The aerial coil is placed in the fixed socket of the two coil holder, and the reaction coil in the moving socket.

Using constant aerial tuning, the following sizes of aerial coils for the broadcast wavelengths will be correct. For the wavelengths below 420 metres a No. 50 coil should be used, while for those above 420 metres a No. 75 coil is more suitable. Different sizes should always be tried for the reaction socket. The plug-in transformer should be of a size suitable for covering the broadcast range.

If ordinary parallel tuning is employed, Nos. 35 and 50 should be tried for the aerial coil, while the H.F. transformer should be as before.

Parallel tuning should be used if it is desired to tune in Chelmsford. A No. 150 coil will be required in the aerial socket, while different sizes of reaction coil should again be tried. The H.F. transformer must, of course, be replaced by one of suitable size. It may be possible to tune in Chelmsford with a No. 200 coil in the aerial socket, in which case slightly better results may be obtained.

Operating the Receiver

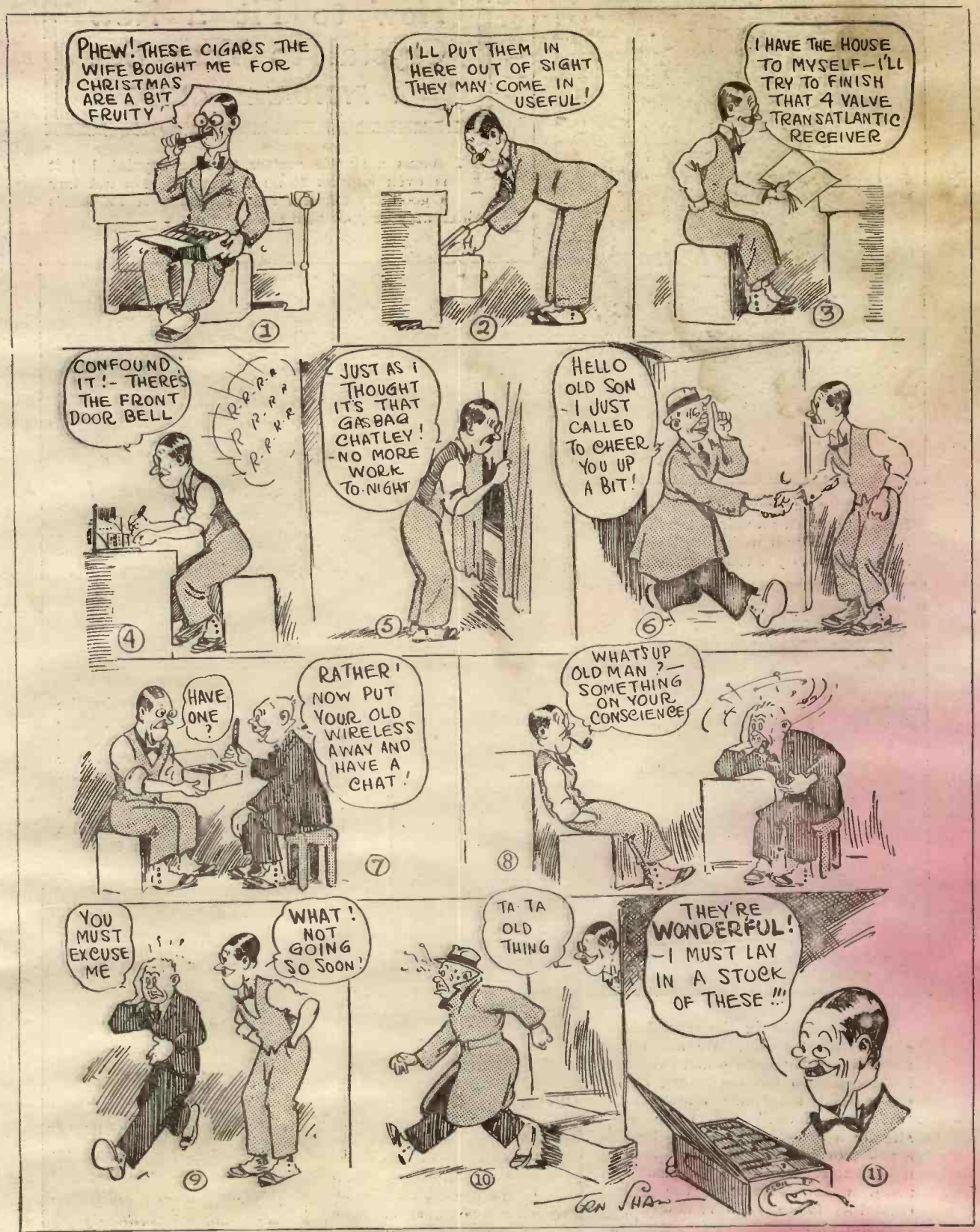
Having inserted the correct coils and transformers, and connected the telephones to the receiver, tuning may be commenced. The coils should be placed at right angles to each other, and the dials of the two variable condensers adjusted until signals are received at maximum strength. The reaction coil may now be brought towards the aerial coil, retuning at the same time on C1. By way of experiment the connections to the reaction coil should be reversed by pulling the two Clix plugs from their sockets and changing them over. Better results may be obtained thus. Care should always be taken to avoid the point where signals appear suddenly to alter in tone, for with the set in this condition it is likely that you are interfering with neighbouring listeners.

Grid Bias

The application of negative grid bias to the first valve is likely to effect an improvement in the quality of the received signals. The link between G.B.+ and G.B.— Earth should be taken away, and a small dry battery connected to the terminals. A flashlamp refill is suitable for this purpose, and of course its — terminal should be connected to G.B.— and its + terminal to G.B.+. Grid bias is always needed when using high voltages in the plates circuits of note magnifying valves.

If it is finally decided that the grid biassing battery is unnecessary, it may be taken away and G.B.+ and G.B. - shorted as before. But if, on the other hand, a noticeable improvement in quality results, the battery may be placed inside the cabinet and leads taken to G.B.— and G.B.+, as in the case of the H.T. and L.T. batteries.

"IT'S AN ILL WEED THAT BRINGS NOBODY GOOD"

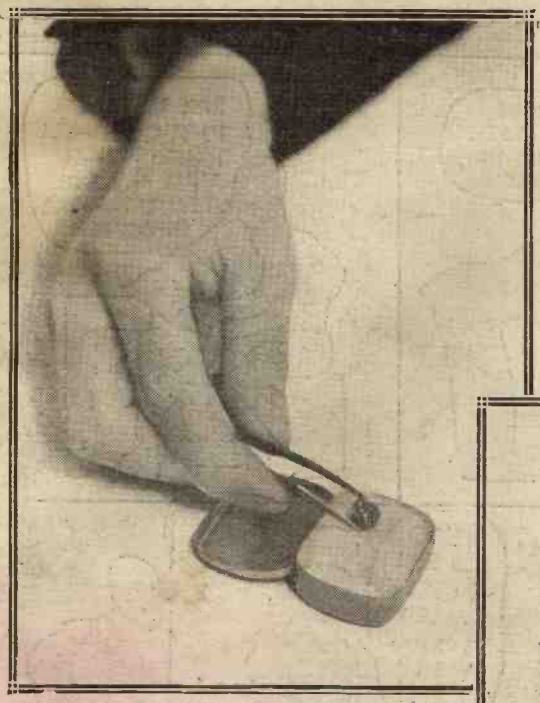


Every wireless experimenter should keep a box of "Flor de Pest's" handy

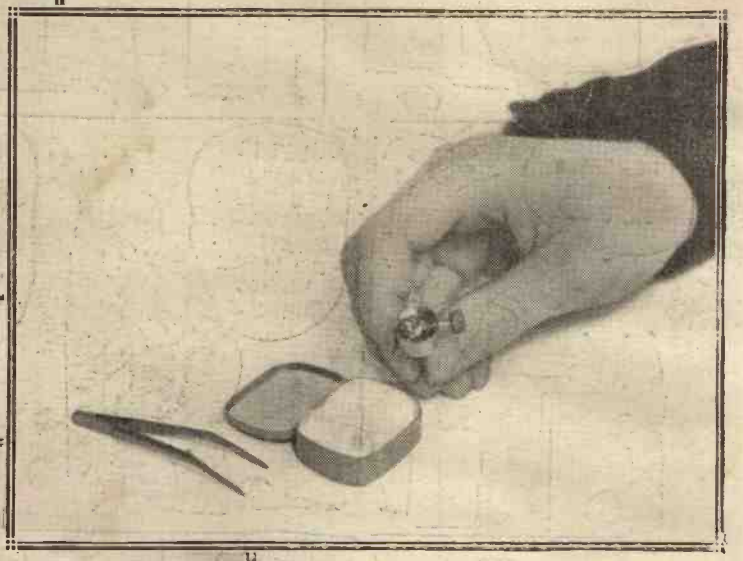
How to Fit a New Crystal to Your Set

A PICTORIAL GUIDE

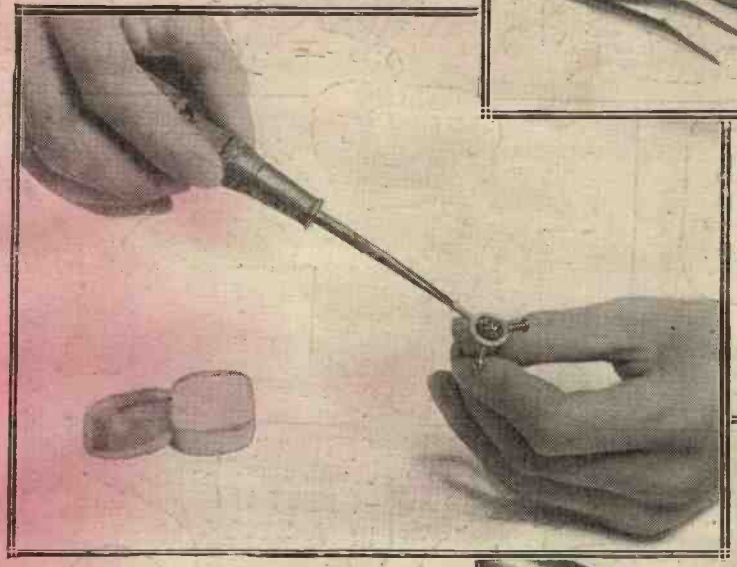
IT seems a simple matter to fit a crystal, but it is even simpler to do it wrongly. Do not buy a good crystal and then condemn it for faults which may be your own!



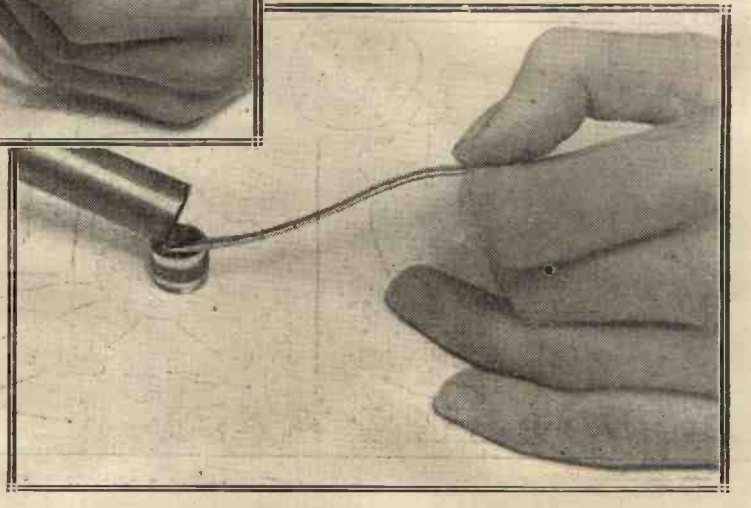
Carefully remove the crystal from its box with a pair of tweezers. Avoid touching it with your fingers, as the sensitivity is easily spoiled.

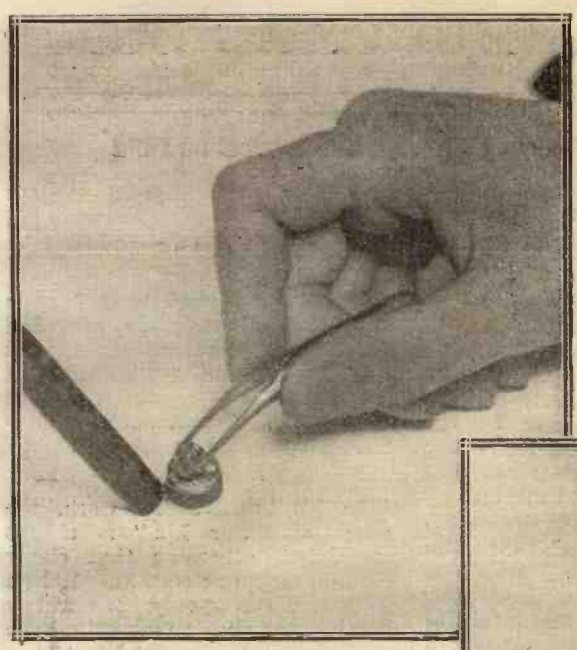


This form of spring cup grips the crystal without the use of fusible metal. In such cups it is advisable to wrap the crystal, except the surface to be exposed to the cat-whisker, in tinfoil, such as that found in cigarette or chocolate boxes. The same remark applies to the screw cup shown on the left.



If you wish to fix the crystal in a cup with "solder," do not use the ordinary tinman's solder (which has too high a melting-point), but the special substance known as "Wood's Metal." If there is already a crystal in the cup, heat a poker or soldering iron and hold it against the cup until the fusible metal melts. Remove the old crystal with a pin. If it is a new cup, melt the Wood's metal into the cup with the aid of the poker as shown.



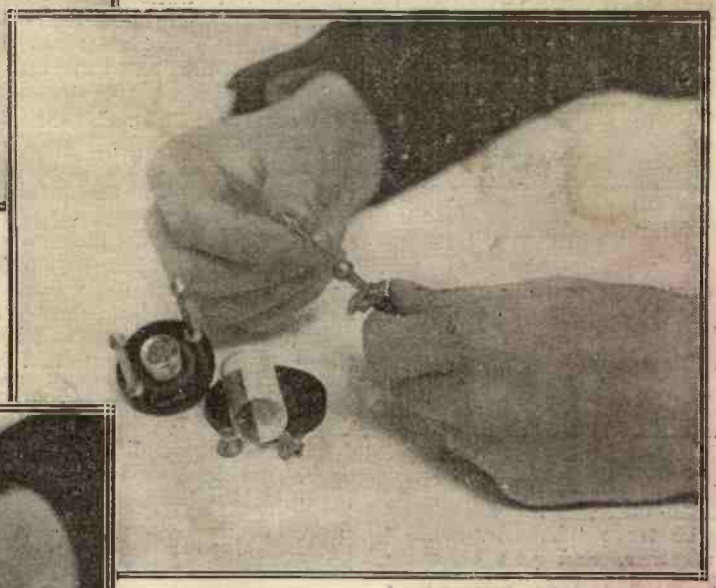


Nowadays catwhiskers are supplied in almost every crystal box. Most detectors hold the catwhisker in a kind of screw grip, so there is no trouble in fitting this part.

The next step is to let the metal cool down until it is solid. Now apply heat again until the metal just melts Press the new crystal into place with the tweezers, and remove the hot poker.

In this way you will avoid over-heating the crystal, and thus spoiling the sensitivity. Holding the cup in a wet cloth (keeping the cloth away from the surface of the crystal) will cool it down quickly.

It is now possible to obtain certain substances ("plastic metals") which will hold the crystal with only a slight warming. Some are excellent, but those which contain mercury should be avoided.



Some little attention is required in reassembly, so as to avoid touching the crystal surface. Be careful not to bend the catwhisker wire or to scratch it roughly on the surface of the crystal.

Our last photograph shows you how *not* to do it. The human skin has a thin oily coating, which will deposit itself on the crystal if touched. This greasy coating will render the best crystal insensitive, and is difficult to remove without injuring the crystal. A wash with pure alcohol will sometimes do it. Carbon di-sulphide has also been recommended. Do not use petrol as it leaves a slight greasy film.

Miss Violet Stevens.

Humorists of the Aether

By "CARRIER-WAVE"

"LONDON Station calling the British Isles. Our next item will be by Mr. Blank, who will entertain you."

A little chill always seems to descend upon one after that announcement, especially when you've gathered that select little party of relatives, including the "maiden-uncle," more fidgety than the three "bachelor-aunts" put together, and you offer up secret prayers that Mr. Blank really will "entertain" you.

Microphone Fright

But that is probably nothing compared to the feeling which inspires Mr. Blank himself, however famous an artist, when faced with "a round hole on a sponge," as one described it, and asked to make thousands of invisible people laugh, hundreds of miles away, and be unable to gauge his success.

Bereft of facial gesture, "make-up," "props," scenery, the close contact of the audience, and all the familiar atmosphere of the theatre, is it any wonder that many a would-be micro-comedian has literally fled the scene in dismay?

No one has recognised the magnitude of their task in this direction more than the B.B.C. itself, as well as the public, and both have waited patiently for the advent of a really "funny" man, capable of sending laughter-laden aether waves throughout the world. Gradually, however, a clever little band of entertainers have been found, the first to become a household word being "John Henry" and his "Sterner-half" Blossom.

John Henry

Their domestic differences have probably helped to cheer and unite innumerable households, for it's a funny thing, you know, but nothing stops a quarrel quicker than hearing or seeing two other people fighting like the proverbial Kilkenny Cats.

Like many other of the entertainers, he came to us via the medium of the war, for it was owing to his experiences after joining up in 1914, up and down the line, dodging bombs and bullets, that brought "John Henry" to the Front, in both senses of the word. So successful indeed were his songs and patter that he was withdrawn to form a Divisional Concert Party, and this afterwards performed in London at the big theatres; but when the slump came in things theatrical, "John Henry" dropped his stage name and adopted this one, now so familiar to us. He says himself "he has done most things for a living, trained as a reporter, he has written, travelled all over the world, speaks enough languages to quell even Blossom if he dare, has appeared before Royalty, and become the best-known comedian in London."

"The Londoners" Concert Party are well-known broadcasters.

"Our Liz"

In his broadcasting work, the name of "Our Liz" is always associated, otherwise that clever Shakespearean actress, Miss Helena Millais. Hearing only her Cockney studies, few people realise that she has made one of the finest Katherines in "The Taming of the Shrew," as well as other of the Bard's works, and in lighter work has played at the Palace, Alhambra, Queen's Hall, and every other big house of entertainment, and long established herself in the hearts of a wide public before the era of broadcasting.

"John Henry."

"Wireless Willie"

Of the value of "Wireless Willie," the name by which Mr. Willie Rouse has made himself famous "over the aether," there is little need to speak. He was an ideal chairman for the "Veterans' Varieties" and "Old Memories" programmes, and only to hear him pronounce the names of his artists is a cause for laughter in itself. He is widely known for his powers as an entertainer throughout the country, and also

Introducing "The Wireless Constructor" readers to some of the artists whose witticisms are such a welcome feature in the programmes

Mr. Louis Hertel.

for his concert parties, in which he is sure to include a Scottish member, thereby showing his wisdom. As a matter of fact and experience, it is the Scottish entertainer that is your true humorist, but it is his dry, pawky wit, without the "slapstick" or "grinning through a horse collar" variety that adds additional value, and consequently broadcasting suits the Scottish humorist right well, and both Hector Gordon and Syd Mac are excellent examples. Of

Mr. Willie Rouse.
("Wireless Willie.")

this Mr. Rouse is well aware, but with his own work at all stations "Wireless Willie" gets (dare I say a rous-ing—no, better not), well, a warm welcome not only from his unseen audience, as testified subsequently by letters, but the actual members in the studio, for they, too are assured of an evening's entertainment.

Jaye Kay

On the ever-welcome actor "Jaye Kay" has surely fallen the mantle of Dan Leno, for no other actor has, to my knowledge, succeeded in actually reproducing every shade and turn of that comedian's voice. To hear him "Buying a House" is to be carried back to the dear old Tivoli days, when Dan himself burlesqued that popular song, "Queen of My Heart," then being sung by Hayden Coffin in "Dorothy," with "I'll Give Him Beans To-night," while his "Minstrel Boy" was another gem that might well be included in Mr. Kay's repertoire.

In the Blood

The theatre may be said to be veritably in his blood, for he is a son of the late Edward Sanson, who was for so many years adviser to George Edwards at the old Gaiety, and Sir Augustus Harris at "The Lane." Though intended for a commercial life, Jaye Kay took to the stage like the proverbial duck to water, and he has toured every variety house worthy of the name in the kingdom. Though a masterpiece at "make-up," he has the faculty of being able to hold his audience by sheer force of wit.

Concert Parties

Concert parties make very good items for most broadcasting programmes, and the most popular is the body of ex-soldiers known as "The Roosters," as their choice again for "Armistice Night" testified. For their origin, perhaps I may be allowed to quote their own slogan:—

"At the foot of Olympus, which rises unmatched
'Midst the Thracian hills, the Roosters were hatched.'"

As a matter of fact, they "hatched out" at Salonica in 1917, when at Summerhill Camp reinforcements were wearily waiting to be sent up the line. Time hung heavy on the hands of the 60th London Division, and was aggravated rather than relieved by "fatigues" and "refresher class." Mails and "sing-songs" were the only events of interest, till at last Lieutenant Warren conceived the idea of forming a Divisional Concert Party and brought it to the notice of Camp Commander Captain Roose. So in March we find our Roosters, taking their name in gratitude to the C.C., making their wardrobe from "derelict" regimentals, getting curls for the "girls" (I wish you could see "Kitty," otherwise George Western) from the tails of the mules, and their dresses from dyed mosquito netting. With over three hundred performances throughout the seat of war, and a hundred in London, including Æolian Hall, not counting all their broadcasting concerts, we feel sure that the Roosters still regard their Christmas in Palestine, 1917-18, as their most triumphant, if trying, success. Here, despite the fact that they had to resume active soldiering, being detailed to guard the dumps at Shellal, they spent every spare moment rehearsing

An Ensemble of The Roosters Concert Party.

"Cinderella," or "The Army Boot," and, by the time they arrived with the victorious troops in Jerusalem, their show was ready. But after a ninety-six-mile trek in five days, during incessant rain and with short rations, you may imagine, as they say themselves, it was far from being Jerusalem the Golden. Christmas in a city skinned of food by the Turk resolved itself into a dinner of bully beef, stew and biscuits, with tea minus milk and sugar. Their opening night was before a famous regiment quartered in Abram's Vineyard, and under orders for active service that same night at any minute.

They dressed on piled-up cases of Lewis-gun ammunition, whilst the men were being served with "120 rounds" and "iron rations." Their audience sat on their equipment,

Mr. Norman Long.

ready, should orders come through, and the Roosters admit that they had their fight, too, to make the grim, silent men forget the grim panoply of war if only for an hour. Four items went without a smile, the fifth "hit home," and after that "we got them going" and finished to roars of laughter. Many and interesting are the Roosters' own reminiscences, and it is little wonder that their army items have more than the usual ring of truth in them.

The Londoners

Another capable concert party is that formed under Mr. Charles Harris, "The Londoners." As the name implies, its members are all London artists coming from the great concert halls and touring over the country and round the broadcasting stations. They are much in demand at the big seaside towns and booked up for lengthy periods. "The Moonstones" is another popular little band.

Here again all their work is written by Mr. Rickards himself,

Mr. Jaye Kay.

and he works in conjunction with Mr. Ernest Sewell, and they are well known at the Palladium, the Alhambra, Queen's Hall, and the other big concert halls. Over the ether they have proved exceedingly popular, and Mr. Rickards sprung a new joke on us last week in attaching the order of O.B.E. to a man because he Owed Bills Everywhere. There have been possibly worse reasons than that.

Norman Long

Mr. Norman Long is really one of the oldest of the radio entertainers, for he commenced as far back as the Marconi House concerts. It is always a pity that you can't see Mr. Long, as well as hear him, for his laughing eyes and cheery smile are valuable assets in themselves, and when he starts off, "Will any lady or gentleman in the audience kindly step up and select a card from this pack—

Miss Helena Millais.

perhaps that gentleman in Merton?—" there are many listeners-in who feel inclined to follow his advice and "take that No. 67 at the corner."

Mr. Long was one of the first to realise the needs of radio humour. With a wide concert hall experience, he "fell into line" almost immediately, but even he admits to that "little cold feeling down the spine" when he faces that "hole."

Louis Hertel

The work of Louis Hertel is another tribute to humour at its best. Widely known all over the country, Mr. Hertel is also one of the finest conjurers and prestidigitateurs in the kingdom, but he was quick also to see that the old-time brands of humour were useless for broadcasting purposes. His ability to produce rabbits from the

Mr. Jack Rickards.

air, or the cleverest of card tricks, were useless, so he revived his gift for character studies, and right well has he scored.

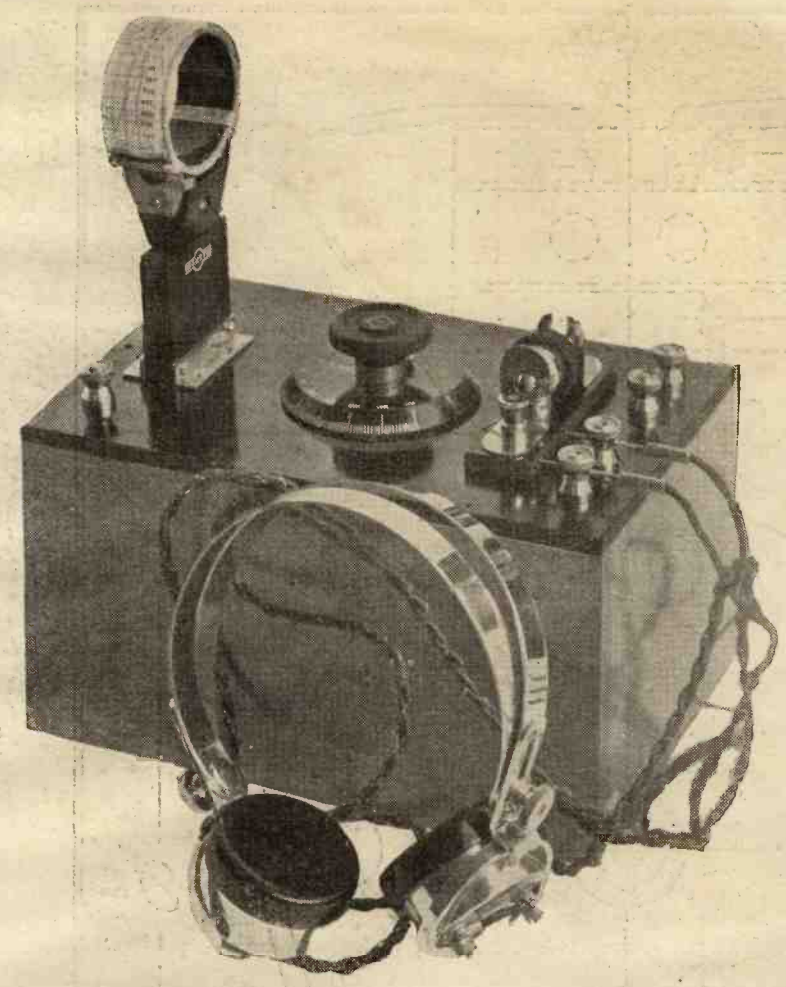
A Growing Band

These are but a few of the clever entertainers who have been recruited into radio service. An ever-growing band includes also Nelson Jackson, Foden Williams, the super-banjoists Olly Oakley and Will Van Allen, who held the Alhambra for months on end as "The Musical Tramp," Charles Coborn, with those "Two Lovely Black Eyes" in umpteen languages, to say nothing of "The Man Who Broke the Bank," whilst among the ladies are also Gladys Merridew, for those who like child imitations, Wish Wynne, and the cleverest star imitator on the stage, Ray Wallace. Of all the items in the programmes, humour is the most important, given a good entertainer, some music and a song, and we rather think the "talks" would invariably "go to the wall."

A Fool-Proof Crystal Set

By PERCY W. HARRIS, Editor

Have you ever wanted to possess a Crystal Set which would be fool-proof — no bothering about cat whisker adjustments? Have you ever been intrigued by advertisements of new crystals which you want to try without spoiling your present crystal? Would you like to change from one crystal to another in a moment? If so, this article will interest you.



The receiver uses a plug-in coil and tunes with a variable condenser.

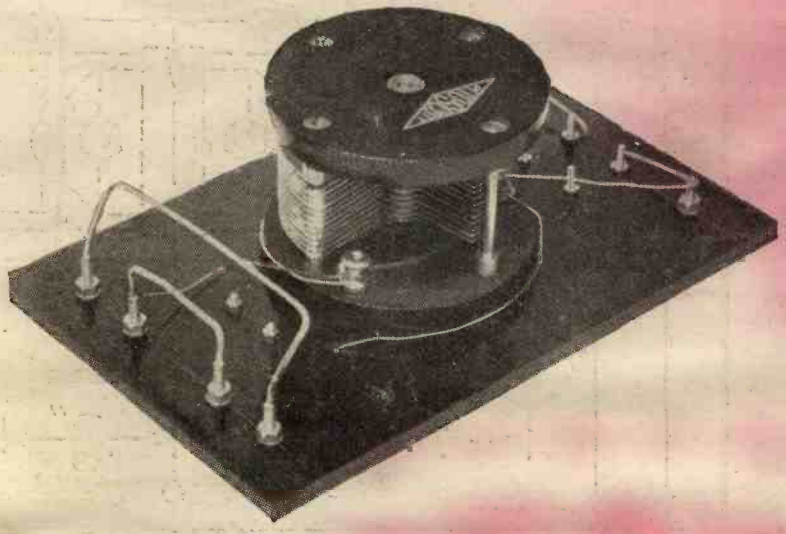
A FRIEND came to me the other day and said, "I have just heard of a new crystal detector, which seems wrong in theory, but works quite satisfactorily."

My interest was aroused at once, and the detector had to be investigated. Certainly when drawn out on paper it did not look as if it would work properly. It consisted of a cartridge-shaped container supported between two spring clips on an insulating base, terminals being attached to the two clips. The cartridge when examined was found to consist of two metal end-pieces, separated from one another by an ebonite ring. Each metal end-piece made contact with its own spring clip.

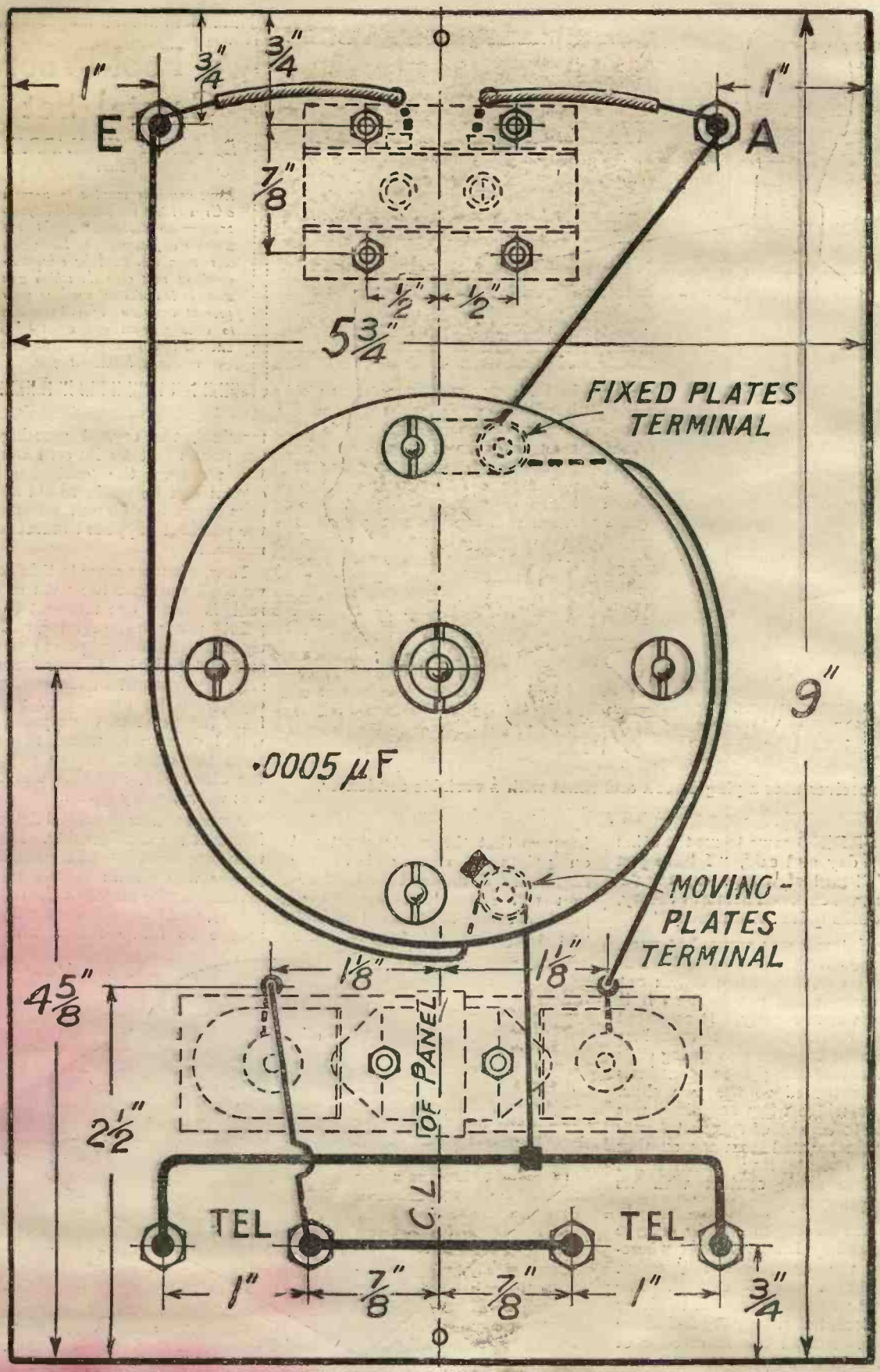
It was an easy matter to remove the cartridge from its clips, whereupon the end-pieces fell away, revealing a piece of crystal. The crystal was not connected to either end-piece, but simply lay inside the cavity. Round the inner edge of each of the two end-pieces were a number of sharp points, and it so happens that the crystal must rest on points at each end of the chamber. A moment's consideration will show that one set of points is connected to one terminal, and the other set to the other terminal, the crystal pressing on the points just by its own weight. By rotating the cartridge the crystal can be made to fall about, thus exposing different surfaces to the points it happens to meet at the moment.

Now, when we come to think of it, we shall see that the path of current is from one terminal to the points, through the crystal, and out through the other points to the second terminal. If now we consider the current in the particular crystal to be capable of passing from the point to the crystal, one would assume it would not pass from the crystal to the point at the other end, and this was what was worrying my friend.

Anything new in crystal detectors interests me considerably. I know there are hundreds of thousands of people who obtain their evening's amusement by means of the humble galena, and I know it is only human nature to fiddle round with cat



The back of panel arrangement is very simple.



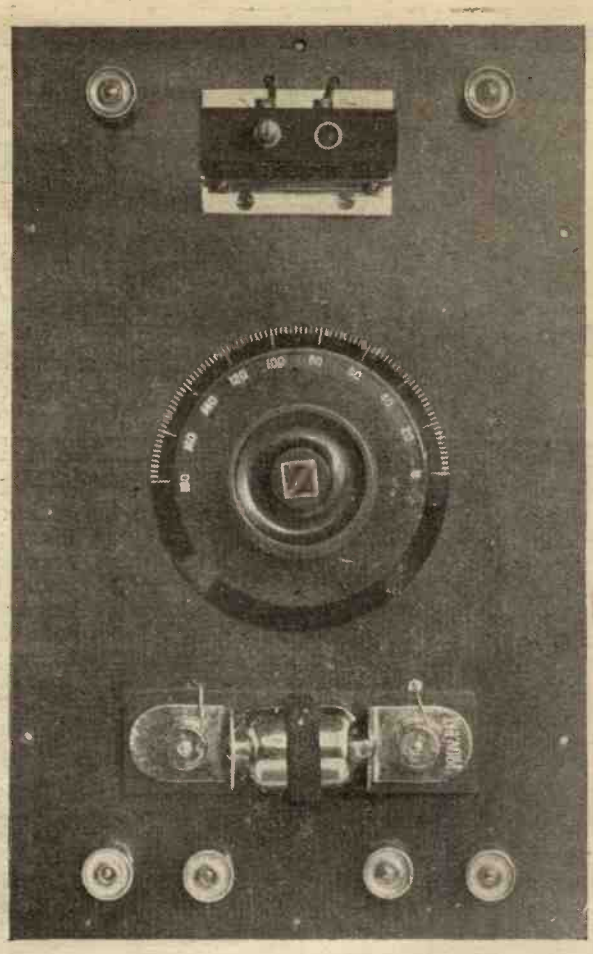
A full size back of panel wiring diagram and drilling chart of the receiver. Viewed from the back, the left hand upper terminal is "Earth" and the right "Aerial." The front terminals are for telephones. One or two pairs may be used as desired.

whiskers and contacts. Consequently I went straight home and built the complete receiver shown in the photograph, just for the purpose of trying the detector under practical working conditions. The circuit is quite conventional.

It is not necessary to wind any special coils; all you need to do is to obtain a socket, mount it on a panel, and then plug in one of the many available types of inductance coils sold for the broadcast band. A number 35 or 50 will do—a 35 for waves between Cardiff and Glasgow, and a 50 for those beyond. For Chelmsford a No. 150 will be needed. Tuning is effected by a variable condenser of good quality, and there are a couple of pairs of terminals for telephone headpiece connections.

It did not take me long to finish, and I thereupon began a fascinating little series of experiments. How many sensitive points should I find? Would they all be fairly good, or should I only find an occasional good spot by rotating the little cylinder? How would the different makes of crystal compare with one another? An aerial and the Savoy band were pressed into service, and a pair of 'phones connected up. Almost immediately I heard music.

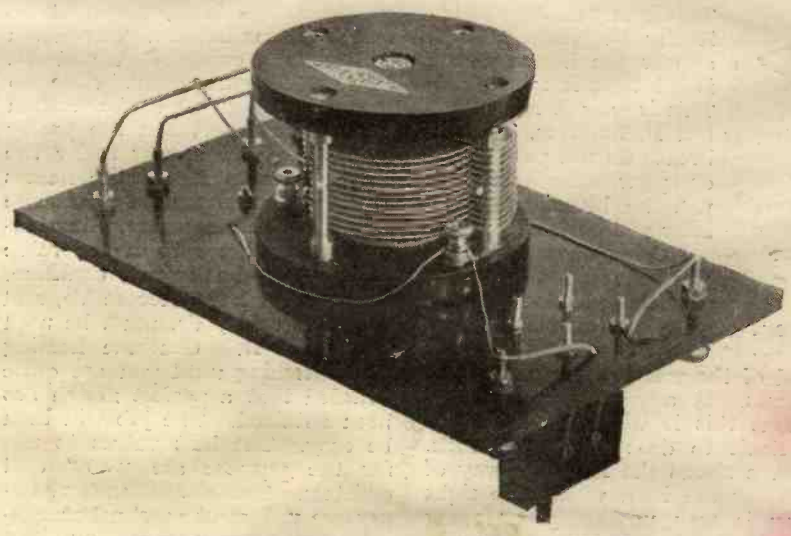
Yes, there were plenty of good places, although sometimes I had to rotate the cylinder a couple of times for finding another good point. The thing which interested me more than anything else was being able to change in a second from one crystal to another without damaging any of the specimens. It was the work of a moment to slip out the cartridge, open it (it really drops apart directly the spring pressure is removed), drop out one crystal and slip in another. Quite small pieces will do, or one can use a fairly large specimen. It is most interesting to open one of those intriguing little tin boxes, pick out a new crystal from its comfy bed of cotton wool (which it shares with a resplendent gold cat whisker), and drop it into the nickel-plated cartridge.



A plan view of the panel. The left hand upper terminal is for the aerial wire and the right for "earth." The front terminals are for telephones—one pair for each pair of 'phones.

To make the set you will need simply an ebonite panel 9 in. × 5¾ in. × ¼ in., a socket for a plug-in coil, a variable condenser of good quality (I have used one of the new Peto Scott square law condensers with ebonite end-plates. These are well finished, and are of considerable better quality than many square law condensers now sold), a "Gravity" crystal detector, six terminals, a suitable box, a pair of 4,000 ohm telephones, and some wire for wiring up. The Gravity crystal detector is fastened on a little ebonite base, and has two holes by which it can be secured to the panel. Two small holes are made at the side of this detector to bring up the leads from underneath the panel. The other components are quite easily mounted, and as I have given a full detailed drawing with measurements and also photographs, you will have no trouble in making it up.

Of course, the receiver will give just as loud signals with *any* of the ordinary crystal detectors if you adjust them well. The Gravity Detector described can also be fitted to other crystal receivers.



Another view of the underside of the panel.

ANOTHER INTERESTING CRYSTAL SET NEXT MONTH!

Soldering Simplified

By

"HOT WIRE"

An article in lighter vein which will strike a chord of sympathy in the breast of every home constructor.

FIRST of all I want you to forget all that you have read by other writers on the subject of soldering. There are lots of fellows who like to have photographs taken of themselves whilst they are *apparently* in the act of doing things with a soldering iron. I say apparently because the truth is that those photographs are, I am quite sure, simply fakes. In every case the iron is cold. Anybody can push a cold iron about, though it is most difficult to make satisfactory wireless joints with it. What I would like to see is pictures of these gentlemen *actually* engaged in soldering. If these were accompanied by gramophone records of what was said during the proceedings they might, I think, be distinctly entertaining. I propose to confine myself now to giving you practical hints by one who really does solder. You will see the difference between what I write and what the others write in a moment.

The first thing is to get your pronunciation of the word solder correct. Nothing gives a man away worse than to go into a shop and ask for a stick of "soulder" or "saulder," and my experience shows that nobody who talks like this ever makes a good job of a wireless set. The beginner should always speak of sawder; when he has acquired such skill that he is able to tackle simply any kind of job he may adopt the professional form of the word, which is sodder. Before we can begin our instruction it is first necessary that you should provide yourself with a soldering iron. A soldering iron is called a soldering iron because it is made of copper. In the same way we speak of tinning a joint because we do it chiefly with zinc. The purchase of a soldering iron demands no little care on the part of the beginner, for balance is just as important with it as in the case of a tennis racket, a billiard cue or a spilliken's prodder. If it does not feel right you will never be at your best with it. In the shop, therefore, do a good deal of brandishing, testing iron after iron until you find one that feels as handy as a toothbrush. Be sure that the bit is made of pure copper. This is best done by biting it (Fig. 1). Should a dent appear the bit so bitten is all that it should be. This is why it is called a bit. If, however, a tooth breaks do not purchase it or your disappointment will be bitter, and the biter will be bit.

Fig. 2

The wrong and . . . .

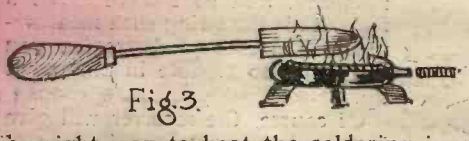


Fig. 3.

. . . the right way to heat the soldering iron.

Having chosen the iron and conveyed it home the next thing to do is to heat it. Great care is required here to select the right end of the weapon to place in the flames. If any mistake is made about this it will be found most difficult to do really good work. Fig. 2 shows the incorrect way of heating the iron, whilst the right way is seen in Fig. 3. Having mastered this very important point we will now go on to the proper way of holding the iron. This is made quite plain in Figs. 4 and 5. Many people do not know how to heat an iron to the right temperature. Other writers on the subject simply tell you vaguely to leave it in the gas ring until flames of a bluey green colour appear round it. This is all too vague. What the beginner wants to know is the exact colour of these flames. This can be determined by a simple little experiment.

Fig. 1.

Testing the bit.

A Testing Circuit

Wire up the circuit shown in Fig. 6. B1 is the common or garden accumulator, whilst B2 is a high-tension battery. The switch S has two contacts A and B. Place the arrangement close to the gas ring with the switch in position A. When the pretty flames begin to appear throw the switch over to B. If the flames of the gas are of precisely the same colour as the momentary illumination within the bulb of the valve all is well; but if not, continue. V1 will now have become Vo, and a second valve, V2, must be used to replace it. Continue heating and switching until you are quite satisfied that a perfect match has been obtained. The job will then be easy. The best valves to use for the purpose are "06" dull emitters. These are rather expensive if bought singly, but considerable discount is obtained

(Continued on p. 203.)

(*Continued from p.* 200.)

when they are purchased by the gross.

All about Flux

To help us to solder we require what is known as a flux. A Greek philosopher who lived many years ago announced that all things were in a state of flux. This is usually the condition of the wireless set after soldering has been accomplished. Anything really messy will do as a flux. I have obtained excellent results in emergencies with Zam-buk, margarine, dripping and hair oil. Anything in fact that splutters and makes a smell will do. Fluxite will be found useful, and it is most economical, for a couple of tins will suffice for making all the joints necessary in a 2- or 3-valve set. Other writers have told you to be sparing in the amount of flux you use. Nothing could be more misleading. Spare the flux and spoil the joint should be the solderer's motto. Lay the stuff on with a liberal hand and you will have no difficulty in getting your panels into that condition of sticky messiness which is the hall mark of good amateur work.

Starting Work

We will suppose now that you desire to solder a wire to the end of a terminal. The trouble is that one really requires three hands to do the job easily, one to hold the solder, one to hold the iron, and one to hold the wire. Unless you are one of those fortunate people born with an allowance of hands fifty per cent. above the normal, the best tip is to make use of the big toe and the next one of the left foot for holding the solder (Fig. 7). A little practice is required before a good foot grip can be obtained, but it is well worth while to cultivate a handiness, or rather footiness of this kind. Some constructors who are not blessed with prehensile toes hold the stick of solder in the teeth. This is a method which I do not recommend particularly in the case of beavers or those who cultivate moustaches of the Chu Chin Chow type.

More Tests

And now for it. Hold the wire firmly in the left hand and place its tip in contact with the end of the terminal. Get a blob of solder on the iron and apply it to the right spot. How long should the iron be held in place? There are two quite simple indications which should be duly marked by the beginner. Do not remove it until the ebonite of the panel has begun to melt a little. This tightens up the terminal automatically and much improves the resistance of the ebonite. The second indication is given by the wire itself. When you leap into the air with a scream, placing your fingers in your mouth, you may be quite sure that the joint is done to a turn. One of the dangers of holding the solder in the mouth is that it is apt to be swallowed when the fingers are thrust in. Should such an accident occur, gulp down a tin of fluxite immediately, and stand on your head before the fire until the heat melts the solder and causes it to run out. In such an emergency false teeth, if worn, should be removed. I knew a man once who neglected to do this and succeeded in soldering his top and bottom plates so firmly together that it took four dentists and a plumber to remove them.

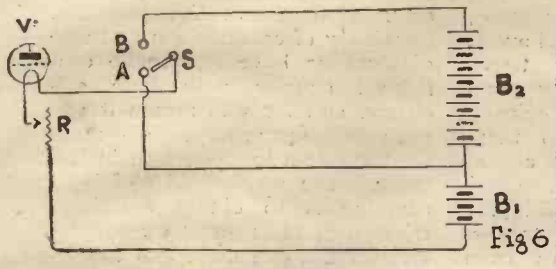


Fig 6

A wonderful testing circuit.

A Secret

The great secret in making sound joints is to use plenty of solder as well as plenty of flux. My own average is roughly half a stick per joint, but I have a friend who maintains that no really good joint can be made with less than three sticks. Personally I think that this is rather overdoing it, for my joints, a specimen of which is seen in the heading, are always neat and tidy-looking, and provide a firm enduring contact of low resistance, which stands up well to wear and tear. Take the soldering done in the photograph as your model, and your work will do you credit. It almost makes me weep when I see the skimpy niggardly soldering done by *some* members of the staff of this journal.

You may employ covered wire, bare wire, hard wire, soft wire, or square rod. My own preference is not for any of these. I wire my sets entirely with sticks of solder. Besides offering a large surface for the passage of high-frequency currents, this method has the great advantage that no tinning or anything of that kind is necessary. It is a little costly perhaps, but it *does* look neat.

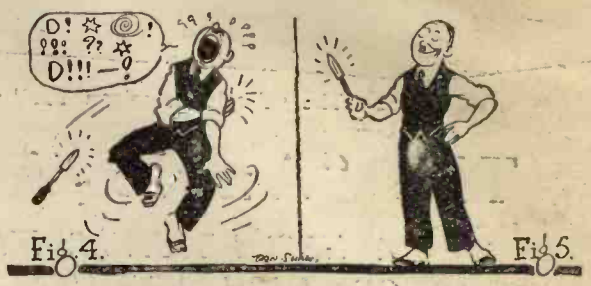


Fig 4. Fig 5.

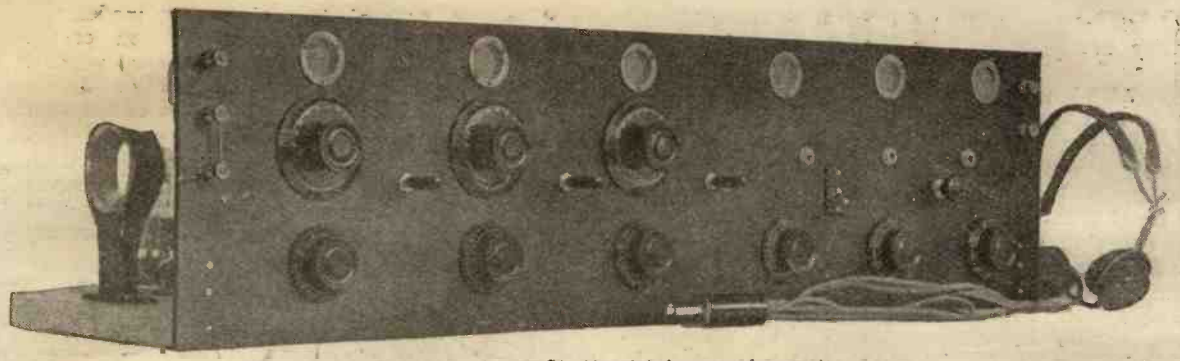
Incorrect and correct method of gripping hot iron.

A Few Hints

Let me conclude with a few hints. Do not pamper your soldering iron. You and I want irons to use and not to look at. A good coating of dirt is a protection to the delicate surface of the copper, and it also makes for nice big joints. If the iron is heated red-hot, it can be used for boring large holes in wood or in ebonite panels. When not actually in use for soldering it makes an excellent poker. It may also be used as a hammer, as a case opener or as a life preserver should burglars break in. Some people use a rest for the soldering iron, but this is an amateurish and finnicky gadget. The iron should always be laid upon the table cloth, when it is put down for a moment. After all, what is a hole more or less in a table cloth so long as one develops a good professional style of soldering?

Fig 7

The third hand method.



The "Anglo-American Six" withdrawn from its case.

The "Anglo-American Six"

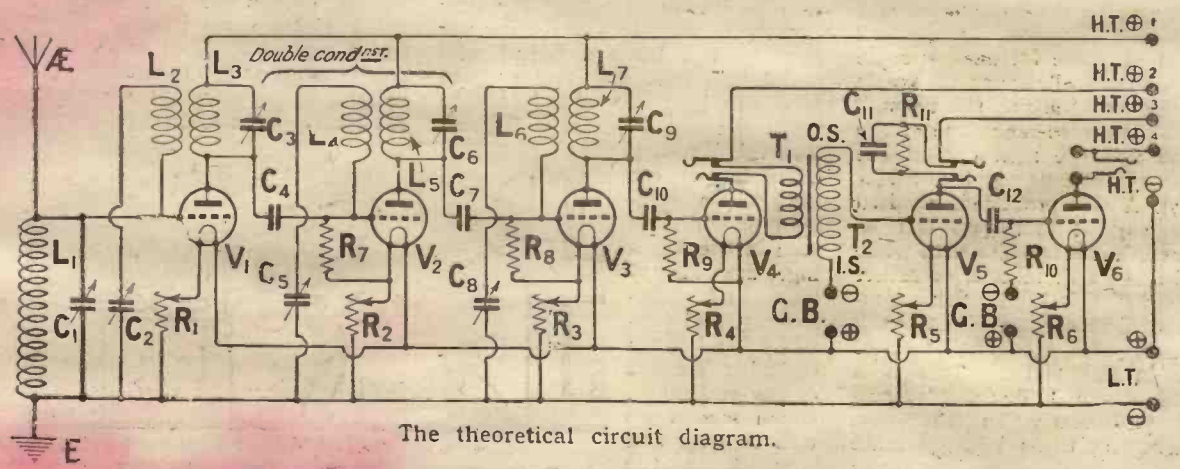
A NEW RECEIVER WITH THREE STAGES OF HIGH-FREQUENCY AMPLIFICATION

By PERCY W. HARRIS, Editor

NOTE.—Many months of study and experimenting preceded the production of this extremely sensitive six-valve instrument, which represents a practical solution of many problems which have previously puzzled the home constructor

I HAVE given the name "Anglo-American Six" to this instrument because, in its make-up, ideas from both sides of the Atlantic have been used. For example, the long, low vertical panel behind which the various components are arranged in the same order as the circuit diagram; the use of plugs and jacks for changing over from one circuit to another; the adoption of gauze-covered windows for viewing the valves; and the placing of the terminals on a terminal board behind the instrument are all ideas which, if they did not originate there, at least were first popularised on the other side of the Atlantic. The use of square law condensers, the simultaneous tuning of two circuits with a double condenser, the Cowper neutralised tuned anode method, high-frequency transformers fitted to valve legs, and certain other features are typically British ideas. Added to these reasons is one which will appeal to the more advanced experimenter. The set is eminently suitable for stretching out into those great distances which separate us from the numerous American broadcasting stations.

In point of fact, the "Anglo-American Six" is a combination of my previous "Transatlantic" design and the "Neutrodyne Receiver" described in the first issue of THE WIRELESS CONSTRUCTOR. Simplicity of construction and ease of handling have had to be considered equally with high efficiency, and for this reason it was not considered practicable to make the receiver a loose-coupled instrument. The great object of loose coupling is to obtain additional selectivity, but a loose-coupled receiver has one more dial to control, and in the present instrument selectivity is very high owing to the use of three stages of tuned high frequency amplification.



The theoretical circuit diagram.

IF IT'S POWER

Low frequency amplification gives power, but the temptation to gain power by adding L.F. Amplifying Panels to any receiver has its sting.

Rather build into your receiver at the offset a SUPER-SUCCESS (All Black) Transformer, which actually gives power amplification, than be misguided into adding another valve—the only alternative, having fitted inefficient transformers.

SUPER-SUCCESS (All Black) L.F. TRANSFORMER

AS USED in the TWIN VALVE RECEIVER described in the current issue.

The production of highly suitable power valves has placed a new responsibility on to inter-valve transformers. When power valves are employed the heavy current passed on to the primary will break down *any* ordinary transformer.

It cannot be too strongly emphasised that the new power valves require a transformer especially designed. Remember it is the SUPER-SUCCESS (All Black).

Price **21/-**

SUCCESS TUNER. Covers all Broadcasting and Continental Stations with one initial expense.
Price **21/-**

SUCCESS ANODE CAPACITY REACTANCE. A proved method of High Frequency Amplification combined with a vernier control of reaction.
Price **50/-**

SUCCESS ERTHAREL LEAD-IN SWITCH. Safeguards life and property. Switching *outside* the house. Operated from the inside.
Price **6/6**

SUCCESS VERNIER COIL HOLDER. Designed for low loss tuners. Quick and Micrometer action. As used in the T.A.T. Receiver described by Mr. John Scott Taggart in the December Issue of *Modern Wireless*.
Price **5/6**

REG. NO. 703507.

Successful reception of the short waves requires the simplest of arrangements—detector and one note magnifier which consists of one very important component—the low frequency transformer.

Choice of this instrument cannot be too deliberate. It need not be emphasised how, in so critical a receiver as one designed for the reception of K.D.K.A. on 68 metres, an ill-designed L.F. Transformer can mar your reception beyond skilful tuning.

The absolutely clear and undistorted reception of the SUPER-SUCCESS (All Black) has been brought about by extended experiments of trial and error.

Tested under every conceivable condition the SUPER-SUCCESS unconditionally gives you power amplification, and represents a new experience with which you should not delay your acquaintance.

SUCCESS
COMPONENTS

Obtainable from all Dealers.

Wholesale Distributors

LONDON.—BEARD & FITCH, Ltd., 34, Aylesbury Street, E.C.; CABLE & ELECTRICAL SUPPLIES CO., 234, Pentonville Road, N.
MANCHESTER.—BEARD & FITCH, Ltd., 1, Dean Street, Piccadilly.
BIRMINGHAM.—COOKE & WHITFIELD WIRELESS Ltd., 24 St. Paul's Sq.
BRISTOL.—FRED BURRIS & SONS, 7/15, Redcliffe Street, WHOLESALE FITTINGS CO., Ltd., 14, North St., Stokes Cross.

Full list of wholesale distributors appears in the Manufacturers' Directory, November BROADCASTER & Wireless Retailer.

Advertisement of Beard & Fitch, Ltd., London, E.C.1. *Barclays 313*

Plugs and Jacks

The plug and jack method of switching has several important advantages, not the least of these being the elimination of complicated wiring on the low-frequency side. In such a receiver as this it is highly desirable to be able to bring into, or cut out of, circuit the first or the second of the note magnifying stages and to be able to switch on the loud-speaker rapidly. Furthermore, to obtain high efficiency it is desirable to have different voltages upon the detector, first and second note magnifying valves. It is quite a simple matter to arrange switches which will place the telephones in the plate circuit of the detector, first, or second note magnifying valve, but most of these arrangements have the disadvantage of changing over the voltage normally used on the last valve to the plate of the valve to which the telephones are switched.

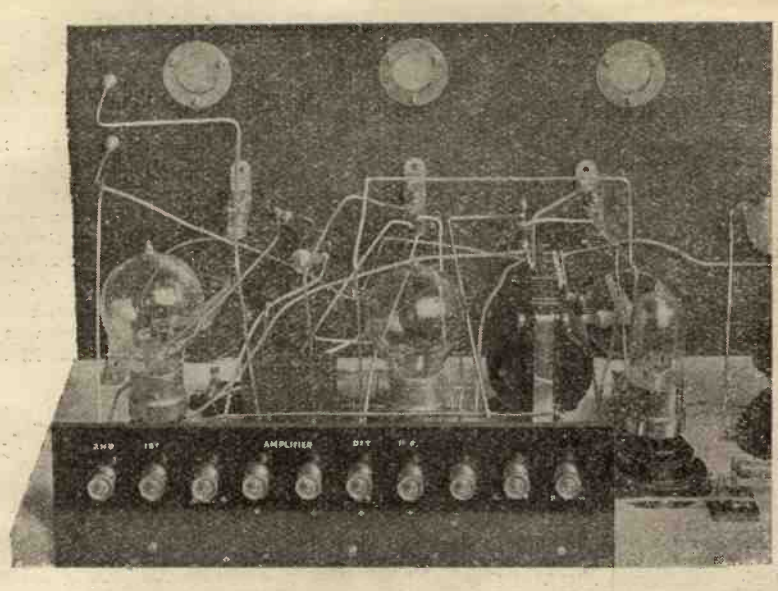
A Practical Point

In practice, this does not upset matters to any great extent, save when the set is adjusted on the edge of reaction, and it is often useful to put up with this slight disadvantage in order to obtain simplicity. The plug and jack method, however, does not disturb the voltage normally applied to a particular valve. Thus in the present receiver plugging the telephones into the plate circuit of the detector valve simply substitutes the telephones for the primary of the intervalve transformer. On plugging them into the first note magnifying stage, the anode resistance is removed from the plate circuit, and the telephones are substituted. In the last jack, the telephones are simply inserted in the plate circuit of the last valve.

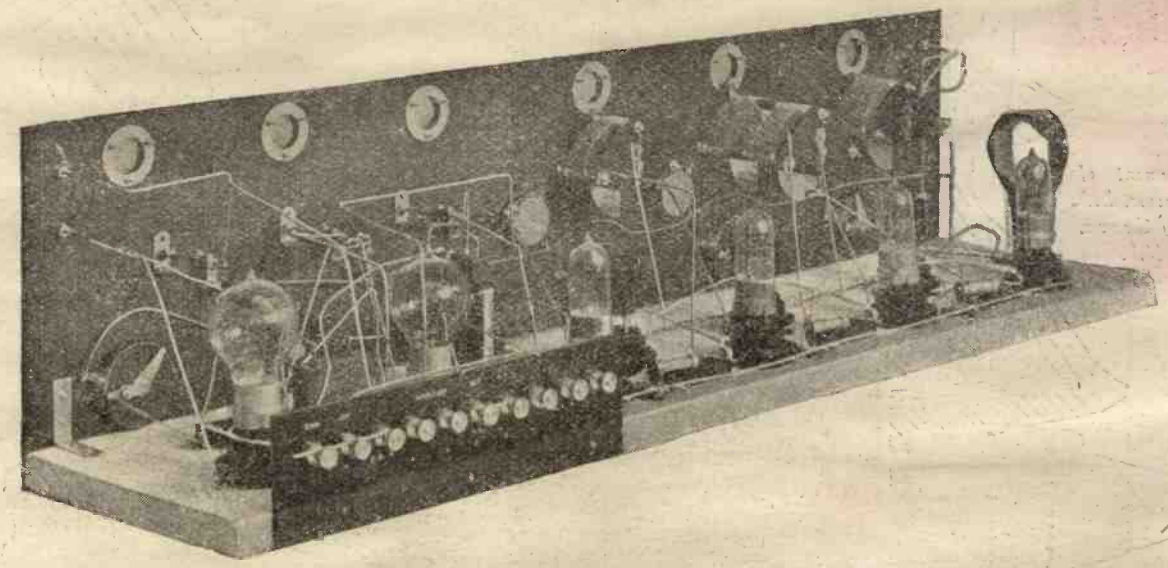
Stability

An efficiently built receiver (not provided with some stabilising device), using one stage of tuned high frequency, will be very prone to self-oscillation. This self-oscillation can be kept under control either by introducing losses into the circuit or by neutralising the valve capacity. The former is the simpler method, but the latter the most efficient. Two stages of high frequency require much greater care in design. Here, again, we have the two methods of stabilising. The simple way of connecting the grids of the high-frequency valves to the slider of the potentiometer, by which a positive bias can be placed upon the grids, has much to recommend it, and if the set is well designed, comparatively small losses need be introduced. With three stages the losses have to be heavier before the set can be made stable, so that the additional amplification obtainable by the use of three tuned stages is to some extent discounted by the losses involved. For this reason I did

(*Continued on page* 211)



The terminal strip behind the instrument.



Viewed from the rear, the set is seen to be simple in its wiring. It works excellently with either bright or dull emitter valves.

Cossor in their new

Watch your Dealer test a Cossor Valve —no need for him to open the Box

ONE of the principal difficulties that has to be faced by every Valve Manufacturer is to ensure that his Valves reach the user in the same good condition in which they leave the factory.

Many prominent Radio authorities and journals have consistently advocated some form of sealing which would prevent any Valve being used even for demonstration purposes—before being sold. It has remained for A. C. Cossor, Ltd., to work out a patented packing scheme which is of the utmost benefit to the trade and user alike.

The idea is simplicity itself. The Valve is securely packed in a thick layer of cotton wool, and sealed in its carton. To each of its filament legs has been attached a copper wire brought through the packing and connected to a couple of brass studs on the exterior of the carton. It will be obvious

TYPES and PRICES.

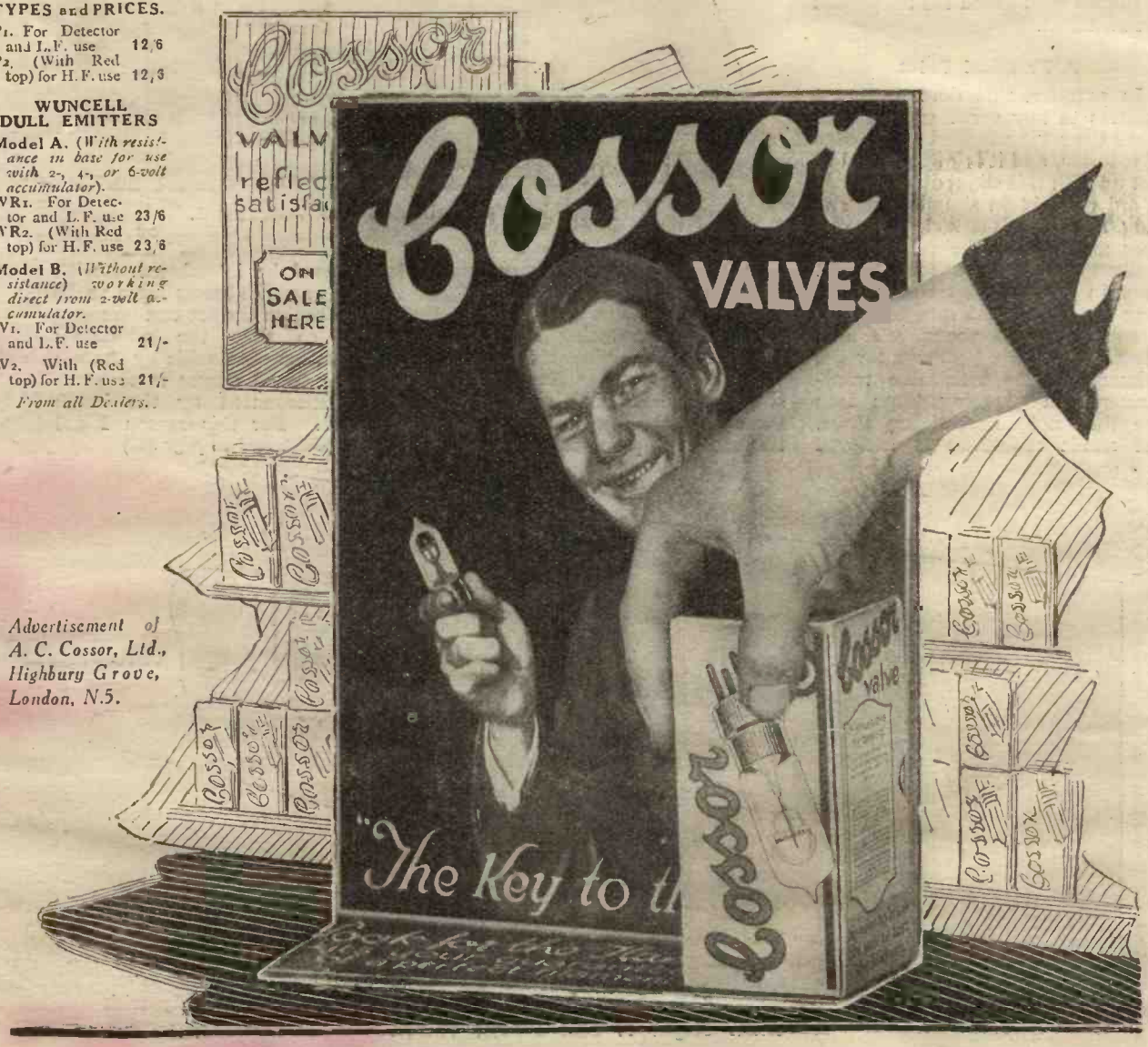
P1. For Detector and L.F. use 12/6
P2. (With Red top) for H.F. use 12/6

WUNCELL DULL EMITTERS

Model A. (*With resistance in base for use with 2-, 4-, or 6-volt accumulator*).
WR1. For Detector and L.F. use 23/6
WR2. (With Red top) for H.F. use 23/6

Model B. (*Without resistance*) *working direct from 2-volt accumulator.*
W1. For Detector and L.F. use 21/-
W2. With (Red top) for H.F. use 21/-

From all Dealers.



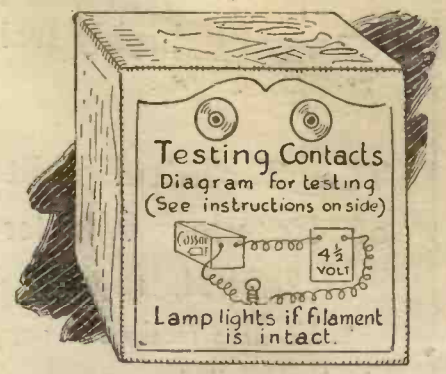
Advertisement of A. C. Cossor, Ltd., Highbury Grove, London, N.5.

Valves sealed cartons

that if these two studs are placed in circuit with a flash lamp and battery the current will pass through the filament and—completing the circuit—cause the flash lamp to light. If, on the other hand, the filament is broken, the current cannot pass, and the lamp will not light.

This idea is incorporated in an electrical Showcard supplied to all Dealers. All that he has to do is to pick up the Cossor *sealed* Carton containing the Valve, and place its studs in contact with two metal strips on the Showcard. If the Valve is in order the miniature lamp behind the showcard lights up—*he need not break the seal at all.*

If you want to be sure of getting a Valve with a full life, therefore, be sure you choose a Cossor—the only one that is guaranteed a safe passage from factory to user.



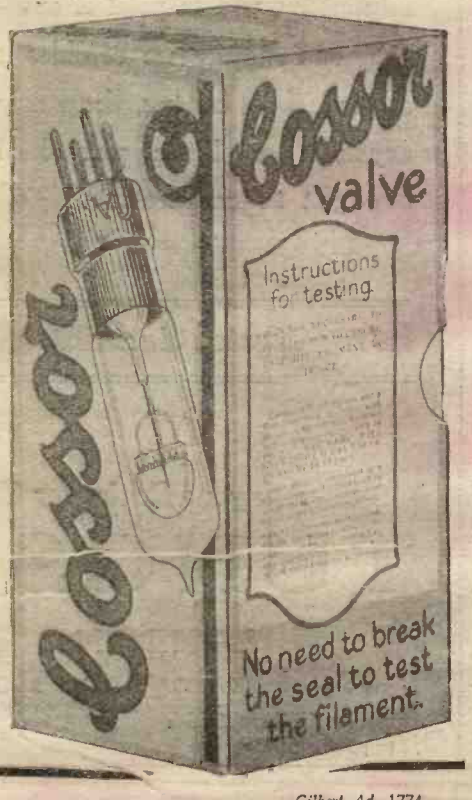
Above: The end of the Carton showing the metal contacts and circuit diagram of the Showcard. Below: The new Cossor box—every Cossor Valve irrespective of type is being packed in this method.

Every Purchaser gets an unused Cossor Valve—

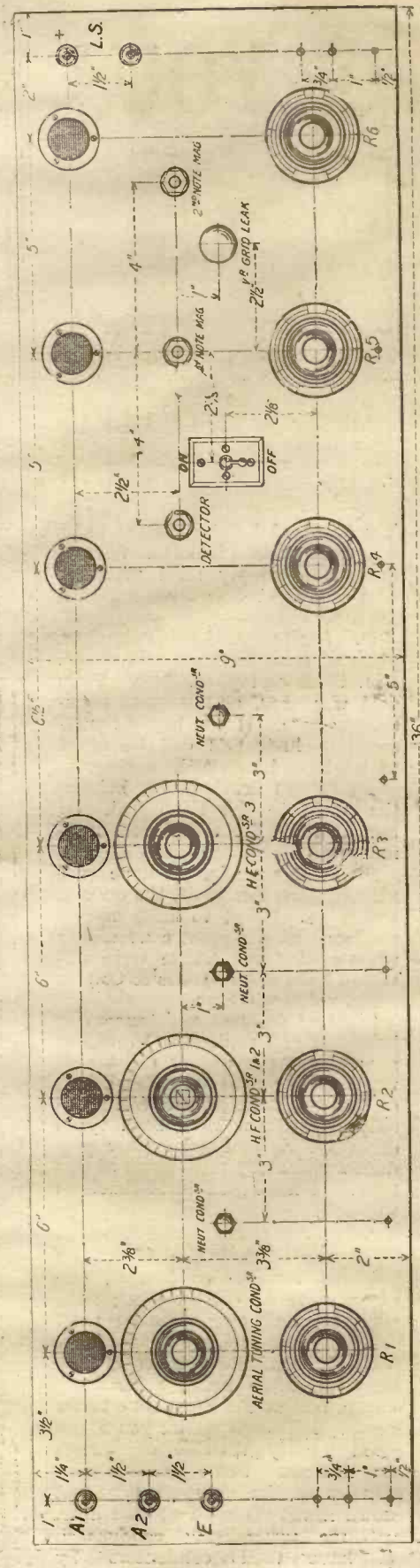
Seven Features you cannot get with any other Valve

1. An arched filament which entirely supports its own weight and which does not require springs or other forms of tension to prevent it from sagging. This makes for long life for the Valve.
2. A hood-shaped Grid—scientifically built up on a stout metal Grid band—with every turn of its wire anchored in three distinct positions. This guarantees complete freedom from microphonic noises.
3. A hood-shaped Anode completely enclosing the Grid and filament and thereby making use of practically the whole of the electron stream. This ensures greater sensitiveness.
4. A special type of Valve—known as the Cossor P.2 (the Valve with the red top)—which has been specially designed for high-frequency amplification. This means that Stations—hitherto out of your reach—can now be picked up with certainty.
5. A unique method of testing Cossor Valves by which every Valve is given a complete and costly series of tests before being issued. This ensures that Valves which, superficially, might look correct must conform to a definite scientific standard or be rejected.
6. And now a Dull Emitter which glows at a temperature which is practically invisible during daylight. The Wuncell is available with characteristics to match exactly the P.1 and the P.2. It operates at 1·8 volts and requires so little current that a small portable accumulator will last the average 3 valve Loud Speaker Set a fortnight on a charge at a cost of a few pence.
7. Finally, the new patent Cossor packing system—a method which will revolutionise the industry—is a genuine effort on the part of the manufacturers to strike out of the rut in the honest endeavour to see that Cossor Valves arrive at their ultimate destination in an absolutely new and unused condition.

¶ Interesting and useful literature on the Cossor Valve will be sent post free to all who apply. In any case before you purchase a Dull Emitter be sure you read our large Folder containing a full description of the many exclusive features of the Wuncell. A pos card brings it free.



Gilbert Ad. 1774.



Layout of panel and drilling diagram to scale. A complete wiring diagram and further constructional details will appear in the next issue. A full size blue print of this panel can be obtained (No. C1006A), price 1/6 post free.

(*Continued from page* 207).

not adopt the method of simply adding a further high-frequency valve to my "Transatlantic" design, as some readers have asked me to do.

Experience with the Neutrodyne Receiver, described in the first issue of THE WIRELESS CONSTRUCTOR, has shown that the method I introduced there of using the windings of the ordinary plug-in transformer, one for the anode winding and the other for the neutralising winding, is highly efficient and practical. The present set is therefore made up with two stages of high frequency simultaneously tuned, the coupling being the tuned anode method, with one of the windings of a high-frequency transformer used in conjunction with a neutralising condenser, to give a neutrodyne effect. The third stage of high frequency is separately tuned. The aerial is directly coupled, there being only one tuning condenser for this part of the circuit, and as the set can be made to oscillate or not as we desire, without magnetic reaction, it has not been necessary to introduce the conventional reaction coil. This, I may say, simplifies the wiring considerably.

Simple Lay-out

The actual building of the receiver did not take very long. Designing the layout and general disposition of the parts, however, took much more time than many readers will credit, for the aim throughout was to obtain shortness of wiring, simplicity, ease of construction, and, lastly, a good appearance. The wiring of the high-frequency side has been tried out in a number of different ways, and the final arrangement proved to be the best of many.

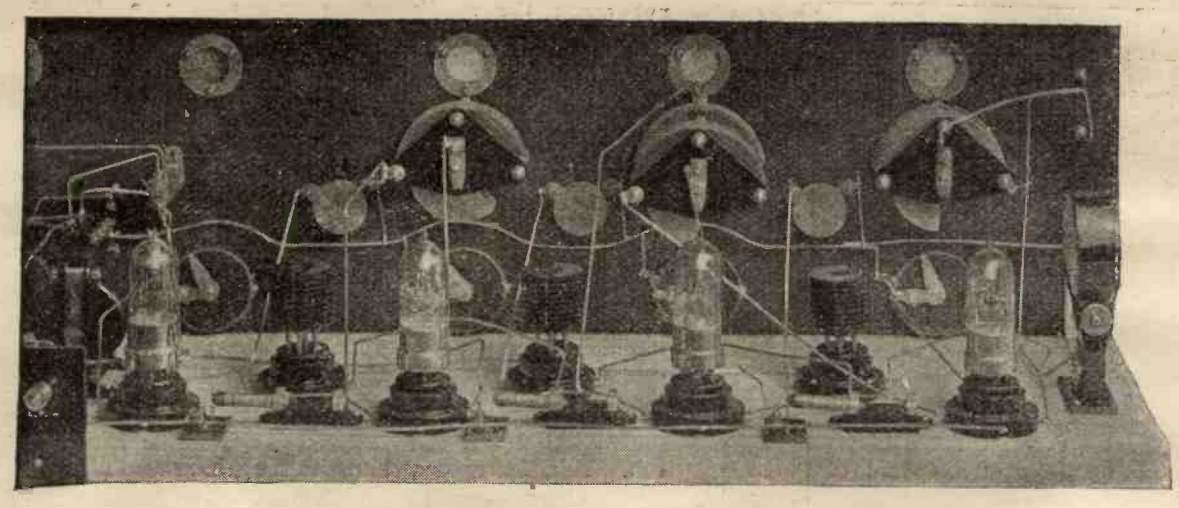
Terminals

Looking at the front of the panel, three terminals will be seen on the left, the lower two being joined by a strip. These terminals are used for the aerial and earth connections, and with them either series or parallel connections of the aerial tuning condenser can be had. The six filament resistances (dual pattern for either bright or dull emitter) are seen along the bottom of the panel. The three condenser dials are respectively for aerial tuning, the double condenser controlling the first two high frequency stages, and the condenser controlling the third stage. The values of these are respectively ·0005 μF. for the aerial tuning condenser, ·0003 μF for each half of the double condenser and ·0003 μF for the third H.F. tuning. Immediately adjacent to the three dials are the three knobs of the neutralising condensers, while on the right-hand half of the panel can be seen the three jacks for placing the telephones in the detector, first note magnifying or second note magnifying circuit. Two other controls will also be seen an "on-and-off" switch for all filaments, and a variable grid leak in the last note magnifying stage. The first note magnifier is transformer coupled, and the second resistance coupled, as this combination has been found to give both purity and strength.

Terminals Behind

To avoid trailing leads and general untidiness, the battery terminals are all connected to one terminal board at the back of the instrument. In the photograph accompanying this article, the set is seen withdrawn from its polished mahogany cabinet. When in place the terminals project through the back of the cabinet in the space specially cut out for them.

The instrument is highly sensitive, giving results which are better than those I have ever previously obtained. Its chief charm is its appetite for distance. It does not, as some readers might imagine, bring in the distant stations with huge volume. Any fairly experienced reader knows that many efficient three-valve sets will bring in, say, Aberdeen in London at loud-speaker strength. To get this strength, however, in most cases, reaction has to be forced almost to the limit, giving a distorted effect, which is not at all desirable or pleasant. The "Anglo-



The high frequency end of the receiver.

American Six" brings in the distant stations with crystal clarity and without any "forcing." Madrid, for example, when heard on my indoor aerial at Wimbledon comes in (using the three high-frequency stages and the detector only without note magnifiers) at the same strength and purity as does London on a crystal set on the outdoor aerial. This may not convey a great impression to the beginner, but the man who is used to handling wireless sets will know that this is a highly desirable state of affairs. The note magnifying stages, of course, are only used for loud speaker work; for telephone reception there is no need to use them.

The technique of handling this receiver is somewhat different from that of other instruments. Let me say at once that I do not recommend the set to the beginner without previous experience. To the man who is already experienced in handling such a receiver as my "Transatlantic," two or three nights' work on the new receiver will be ample to familiarise him with it. There is not space in this article to deal with the many interesting points in handling, and as I am very anxious to give readers a very full report and practical instructions, such details must be held over until next month, when a special article will be devoted to the subject.

Components Needed

We need to build this set:—

One ebonite panel, 36 in by 9 in. by ¼ in. (Use one of the "guaranteed" ebonites here. By "guaranteed" ebonite I mean one which is guaranteed by the makers to be free from surface leakage. Several firms now supply such material. In the present case I have used a Pilot panel.)

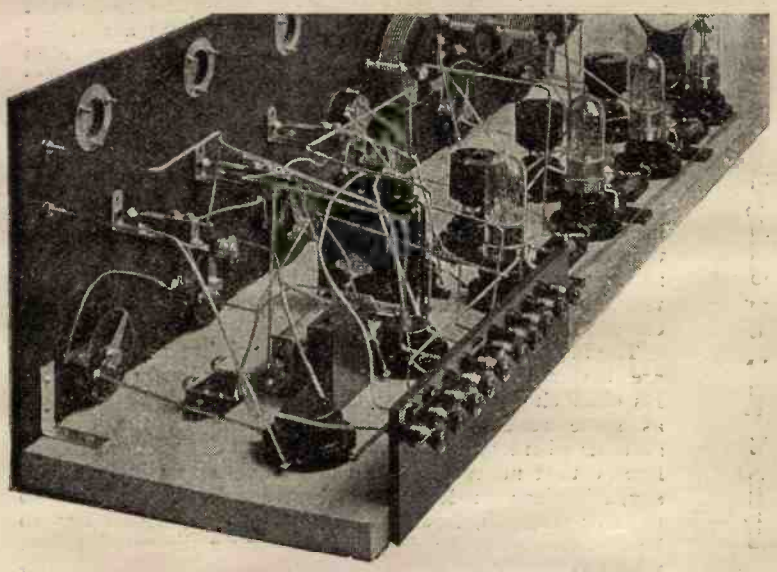
One baseboard. This is simply a piece of suitable wood 9 in. wide, 1 in. thick and 36 in. long. Plain deal was used, and is quite satisfactory here. If you buy a ready-made cabinet, this will be fitted with a loose baseboard.

Two brass brackets for holding the panel to the baseboard. (I bought these from the local ironmongers.)

Fifteen terminals. (I have used nickel-plated terminals, the ends of which are drilled to take square sectioned wire, a great convenience when soldering. These were obtained from Burne-Jones & Co.)

Six valve windows.

Six dual filament resistances (for bright or dull emitters). I strongly recommend the use of resistances which can be used for either bright or dull emitters, as you will probably experiment with both types of valves. Several makers now produce satisfactory resistances of this type. (I have used McMichaels in this set.)



The note magnifying end of the instrument.

Variable Condensers

Three variable condensers, one of ·0005 mfd., one of ·0003 mfd. (double), and one of ·0003 mfd. (single) (Bowyer-Lowe square law). Variable condensers differ greatly in price, some being exceedingly cheap, and at the same time badly made. I strongly advise you to get good quality variable condensers for this set. Some variable condensers of the cheapest type cut down signal strength considerably.

Three neutralising condensers. (I have used condensers by

Gambrell Bros., Ltd., Burne-Jones, Ltd., and Bowyer Lowe, Ltd., in this set with equally-good results! (Those shown in the photos are Gambrell's).

Two double-circuit jacks for panel mounting (Elwell).

One single circuit jack for panel mounting (Elwell).

Plugs for same (Elwell). You will use one of these plugs for your telephones and the other for the loud speaker.

One on-and-off switch (Connecticut).

One variable grid leak (Bretwood).

Valve Sockets

Nine valve sockets for board mounting. I have used the Burndept "Anti-phonic" throughout. These sockets although more expensive than the conventional type are very useful when dull emitter valves are used, as they eliminate those annoying "ponging" sounds which are characteristic of some dull emitter valves. Furthermore they have low capacity and certainly add to the life of a valve by saving sudden jars. For uniformity I have used these throughout, even for the plug-in transformers, although they are not really necessary for the last. There will be no loss of efficiency if less expensive anti-capacity sockets are used, provided, of course, they are of good quality. Whatever type of valve socket is used, be sure it is of the low capacity type, for the first three valves at least. If you intend to use bright emitters throughout there is no point in spending extra money to obtain the anti-microphonic holder.

Three fixed condensers ·0003 mfd.

Three grid leaks 2 megohms.

One fixed condenser ·001mfd.

One fixed condenser ·0001mfd.

(Any good make can be used. I have used both Dubilier and Paragon.)

Mr. E. Le Breton Martin who often broadcasts during the children's hour.

One fixed condenser ·25mfd. (T.C.C.)

Clips for grid leak.

One socket for board mounting for plug-in coil.

One good intervalve transformer. (That shown is the Igranic new pattern 5 to 1 ratio.)

One anode resistance 100,000 ohms (Dubilier).

One ebonite strip measuring 11 in. by 3 in. by ¼ in.

Square wire for wiring up.

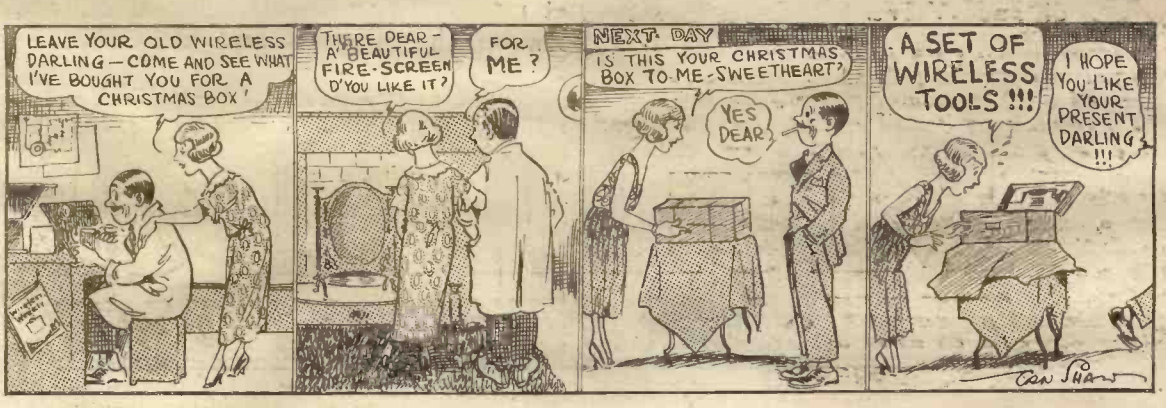
Suitable cabinet. (I have used one made by The Carrington Mfg. Co.).

Whatever you do (unless you are thoroughly experienced in the matter of the design of sets), do not attempt to make the set smaller or fit it into a size of panel you have already and which is different from that shown. I know it's a great temptation to see what you can do and how you can pack the parts into a panel of different shape or a cabinet of different size. It may seem to you on examination of the photograph that the parts are unduly spread out. This spacing is intentional and deliberate. There would have been no difficulty in making the set on a panel at least a foot shorter had I so desired. The present size was chosen after much experimenting in the spacing of parts to avoid interaction.

Plug-in Transformers

You will also need three plug-in transformers of each wave-length range. As explained these are not used as transformers. One winding is used for a neutralising coil and the other for a tuned anode coil. As these are not used in the ordinary way the wave-length is not that stated on the instrument, the transformers normally marked 300 to 600 metres actually giving in the neutrodyne circuit a wave-length from about 350 to well over 700 metres. To get the lowest B.B.C. wave-lengths, transformers of the 150 to 300 metre range must be used. To avoid the expense of two transformers for the broadcast band I have arranged with the leading makers of plug-in transformers to manufacture special sets for this instrument. These will be specially wound so as to cover the broadcast band adequately. They will be on sale and advertised by the time the next issue of THE WIRELESS CONSTRUCTOR appears. This set works excellently on the ordinary plug-in transformers, so that those readers who already have matched pairs need only buy one more of each wave-length range without troubling to see whether it matches or not, as the third high frequency stage is not tuned with the same condenser as the other two.

Next month a fully detailed wiring diagram and full instructions on handling the receiver will be given. Meanwhile the photographs and circuit diagram will provide the more experienced experimenter with sufficient data to build the set.



Tit for Tat.

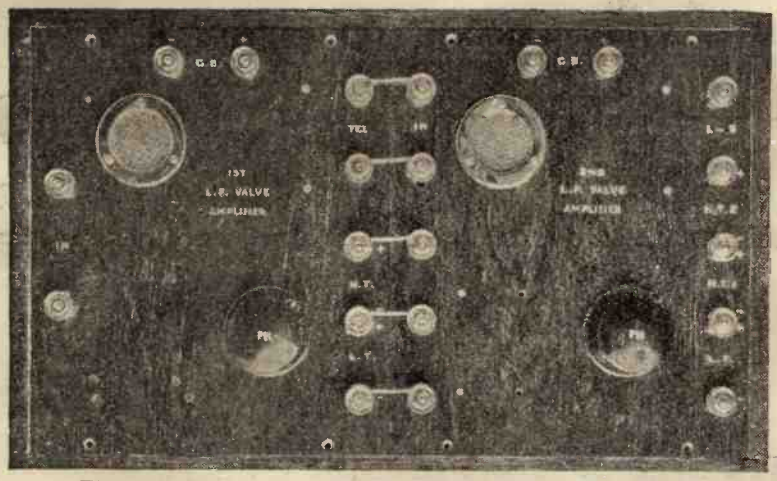


Fig. 1.—The valves are contained within the cabinet out of harm's way.

A Loud-Speaker Amplifier for Your Crystal Set

By E. REDPATH

THERE are, no doubt, many readers already in possession of serviceable crystal or single-valve receiving sets who would like to obtain good loud-speaker reception from their local station, particularly in view of the forthcoming festive season. Others, with a preference for telephone reception, may wish to obtain increased signal strength to permit the use of several pairs of telephones.

At a distance of six to eight miles from a main transmitting station, the addition of one valve as a low-frequency amplifier to an efficient crystal receiver will, in ordinary circumstances, enable a loud-speaker to be operated in a manner quite satisfactory for home use. At greater distances, say, up to 25 miles, two amplifying valves will be necessary for really satisfactory results.

Sensitivity

A good deal depends, however, upon the sensitivity of the crystal receiver and the general efficiency of the aerial with which it is used. Further, opinions as to what really constitutes "loud-speaker reception" differ considerably, so that, by designing a two-valve amplifier in separate units, readers who are doubtful as to their minimum requirements will be able to construct and try the first unit, subsequently adding the second if considered necessary.

General Description

The appearance of the complete two-stage amplifier is shown in the photograph, Fig. 1. With a view to neatness and general compactness, the valves are fitted behind the respective panels, the glow from each lighted filament being visible through the respective gauze windows.

Diagonally opposite the valve window on each panel is the knob of the filament rheostat which, being of the "dual" type, permits either bright or dull-emitter valves to be used as desired.

The two terminals on the left-hand side of the amplifier are the input terminals, to be connected to the telephone terminals of the crystal or valve receiving set. The three vertical rows of terminals, five in each row, are for the telephones or loud-speaker, high-tension and filament-lighting batteries, as indicated in a subsequent drawing. The two terminals at the top centre of each panel are for grid batteries, so that by applying suitable negative potential to the grid of each valve distortion in this amplifier may be avoided and a considerable saving effected in high-tension current.

If one panel only is in use, the telephone or loud-speaker and battery connections are made, of course, to the five terminals on the right. By the provision of five corresponding terminals on the input or left-hand side of the second panel, with suitable connecting links or pieces of stout wire, the battery connections of the first panel are brought on to the second, so that, with the two-stage amplifier complete, all connections, except the input and those of the grid batteries, are made on the extreme right.

The First-stage Amplifier

The photographs, Fig. 1 and 3, show a plan and back view respectively of the double amplifier, complete with valves. The theoretical-circuit diagram is shown in Fig. 9, and the action is as follows. The low-frequency

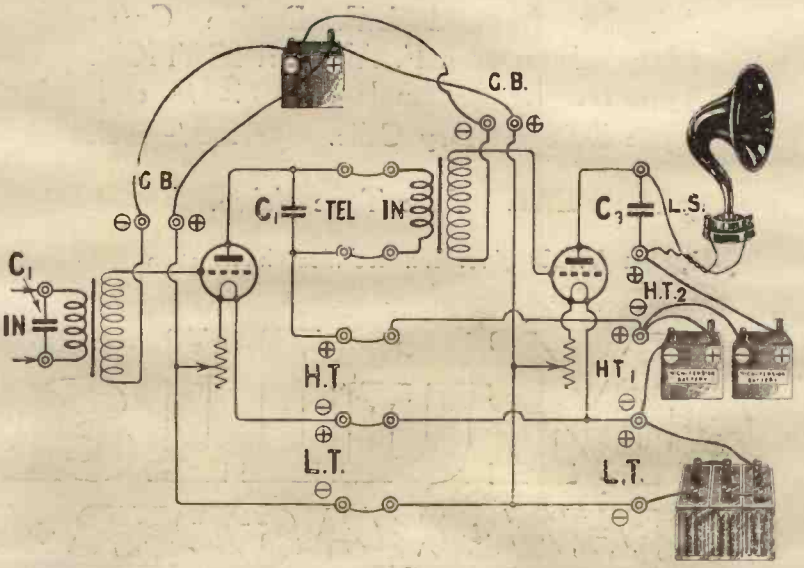


Fig. 2.—Combined circuit and pictorial diagram showing how the two panels are wired to the external components.

As a sequel to the theoretical article which appeared in our last issue, Mr. Redpath now gives full practical details for the construction of an amplifier which may be added to any existing crystal or valve receiver

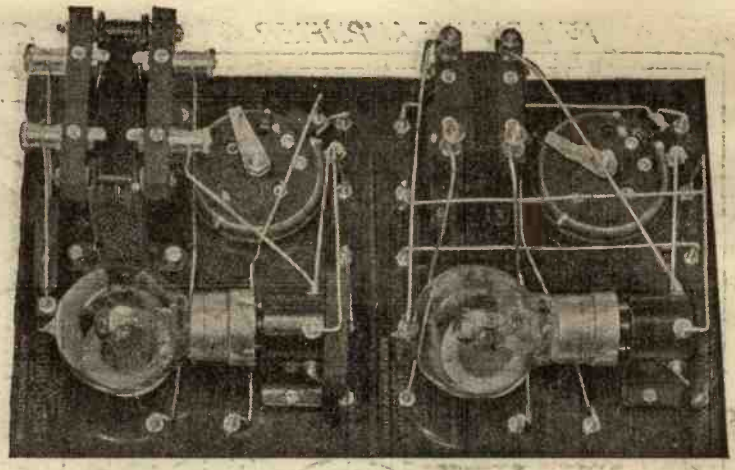


Fig. 3.—The two panels viewed from the rear.

currents which actuated the telephone receivers when connected to the original crystal or valve receiver are now made to traverse the primary winding T1 of the step-up iron-core transformer T1 T2, the primary winding being shunted by a fixed condenser C1, capacity ·002 μF. If the original receiving set is already fitted with a telephone condenser of approximately this capacity, the condenser C1 may be omitted.

Currents induced in the transformer secondary T2 are applied to the grid and negative filament of the valve, this latter connection being made via the grid-bias battery GB.

Accumulators

The filament-lighting circuit includes a 4 or 6 volt accumulator (a 4 volt for the ·06 dull emitters or a 6 volt for general purpose valves) connected to terminals L.T+ and L.T−, the filament rheostat R and the valve filament itself. The anode, or output circuit of the valve, includes the telephone receivers (shown dotted in this instance) shunted by a fixed condenser C2, capacity ·002 μF, and the high-tension battery connected to terminals H.T+ and H.T−. The telephone receivers therefore are now actuated by the amplified currents flowing in the anode circuit of the valve.

Grid Bias

The value of the grid battery depends upon the type of valve and the high-tension voltage employed. With an ordinary hard-receiving valve and a high-tension voltage of 80 to 100 volts, an ordinary flashlamp dry cell battery, with "tappings" at 1½, 3 and 4½ volts, will usually be found quite satisfactory. Use the voltage that gives the best results.

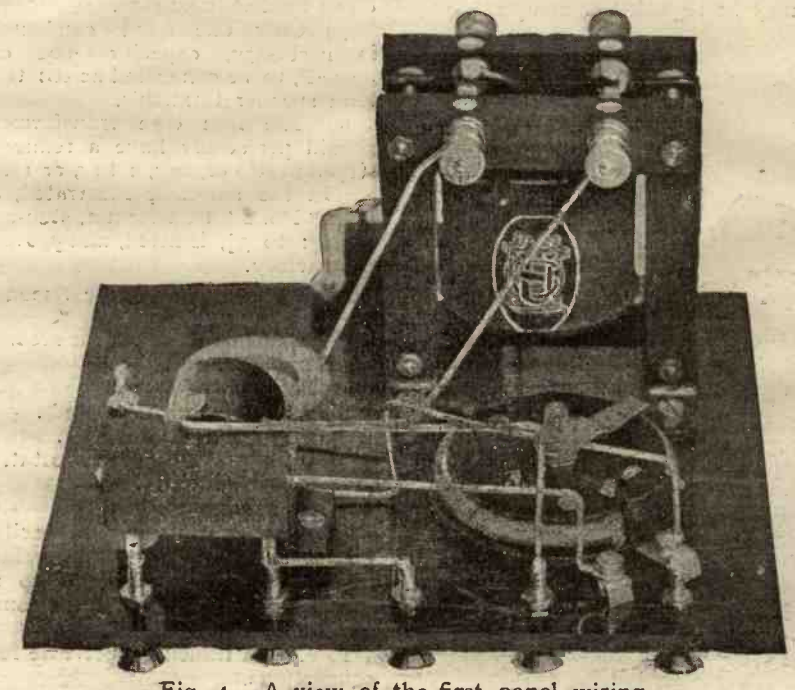


Fig. 4.—A view of the first panel wiring.

List of Components

The following components are required:—

1 Panel, 7 in. × 6 in. × ⅜ in. thick. (Radion panel was used.)
9 Terminals (nickel plated).
1 Burndept "Dual" or similar rheostat.
1 U.S. "Super" transformer or other suitable first stage transformer.
1 Valve window.
1 Aermonic valve holder.
2 Dubilier condensers (·002 μF).
16 S.W.G. tinned copper wire for connections.

Constructional Details

The ebonite panel is first to be marked out and drilled in accordance with Fig. 5, a full-sized blue print of which may be obtained from Radio Press Sales Department, price 1s. 6d., post free.

In order to drill the 1 in. diameter hole required for the valve window, a ⅜ in. or ¼ in. hole should first be drilled, after which an ordinary 1 in. centre bit, used from both sides of the panel, will enable a 1 in. disc of ebonite to be removed, leaving a clean hole.

Figs. 4 and 6 shew how the various components are to be fitted in place. All the items may be secured with the exception of the two condensers, which are held in position by soldering after the wiring is completed.

The actual wiring is a fairly simple operation, and should be carried out in accordance with the complete wiring diagram (Fig. 7) (Blueprint No. C 1005 B). Before

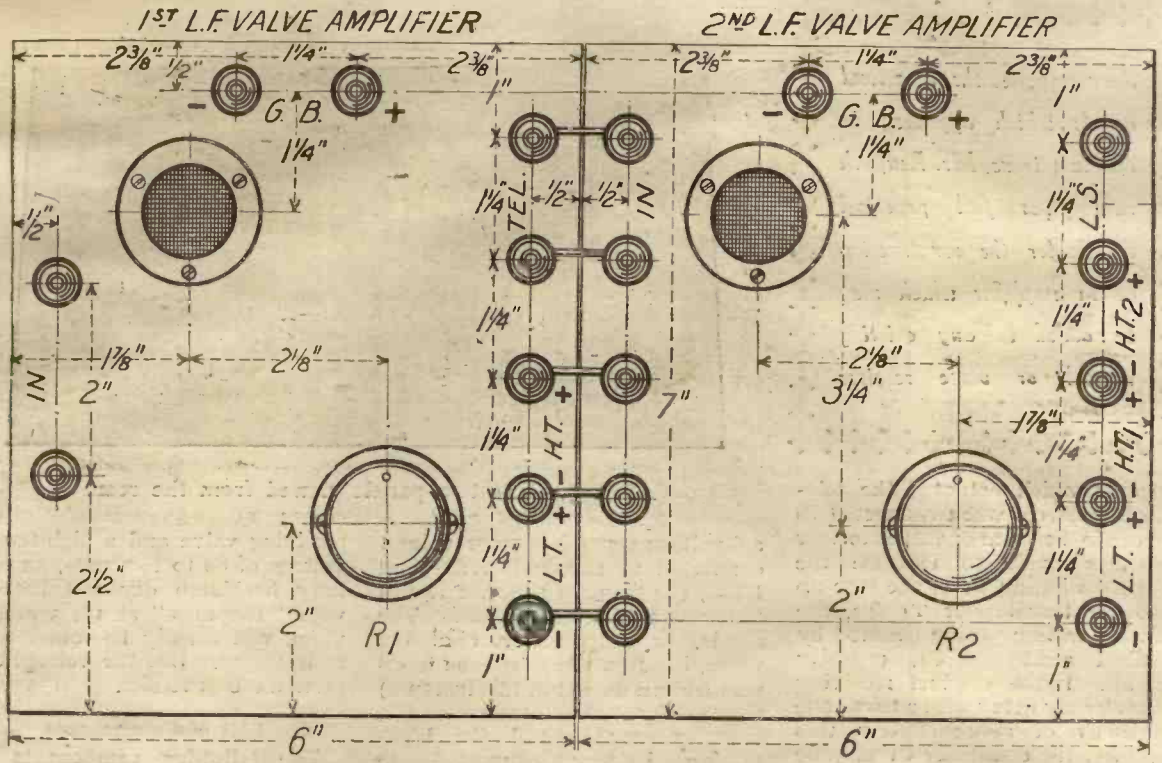


Fig. 5.—Complete scale drawing of the two panels. A blue print (full size) No. C1005A is obtainable, price 1/6 post free.

commencing the wiring, clean the tip of each terminal, and all other points to which wires are to be soldered, by means of a small smooth file, and, after applying a little fluxite, tin each point, leaving a small bead of solder, which will subsequently make a neat joint with the No. 16 S.W.G. tinned copper wire.

At this stage the first amplifier may be connected up and tested. If it should be found that the resulting volume of sound from the loud speaker is satisfactory, a simple containing box, 7 in. by 6 in. by 4½ in. deep, may be constructed, or purchased, the panel may be fitted and secured by small brass screws, and the amplifier may be regarded as complete.

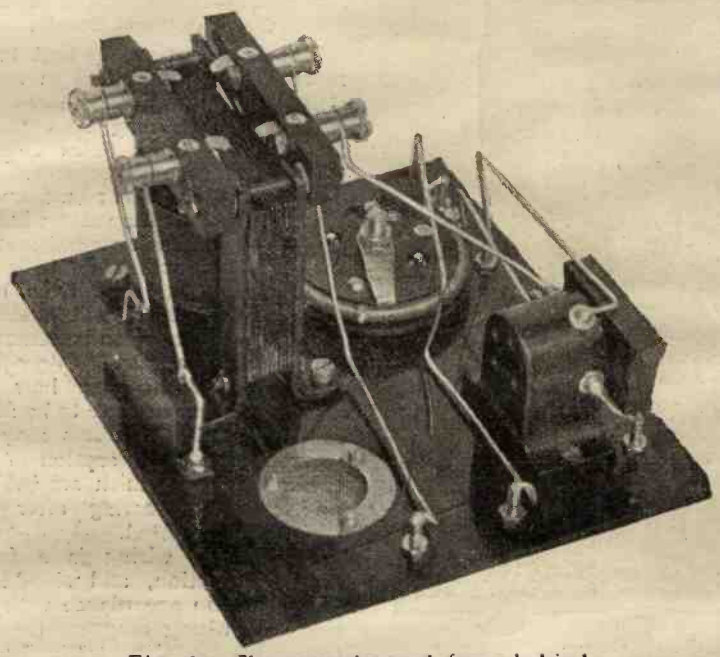


Fig. 6.—The second panel from behind.

The Second Stage Amplifier

The photographs, Figs. 1, 3, and 8, shew a plan and back views of the second amplifying panel. The essential differences between the second and first panel are as follows:—

(*a*) Three additional terminals are required to form a row of five down the left-hand side.

(*b*) Only one fixed condenser is necessary, capacity ·002 or ·003 μF, to be connected across the loud speaker terminals.

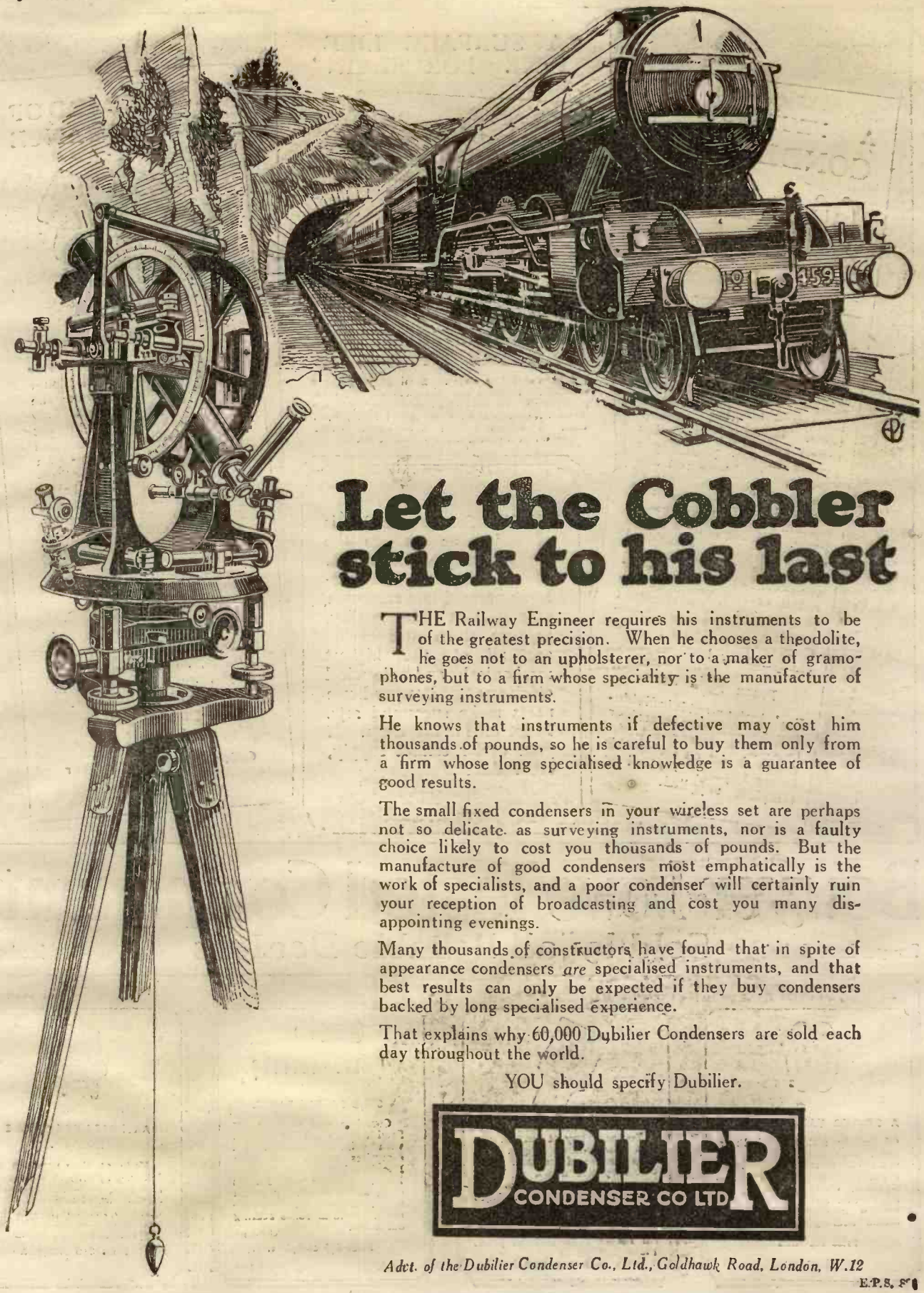
(*c*) The iron core transformer should preferably have a reduced step-up ratio of, say, 1 to 3 or 1 to 4. In the amplifier illustrated, a U.S. "No. 2" transformer, step-up ratio 1 to 3½, is fitted, and proves satisfactory.

Components Required for Second Stage Amplifier

The items required for the second panel are as follows:—

1 Panel as before.
12 Terminals (nickel-plated).
1 Aermonic valve-holder.
1 Burndept "dual" rheostat.
1 Valve window.
1 Transformer.
1 Dubilier condenser (capacity ·002 or ·003 μF.). The best value for this condenser depends to a considerable extent upon the loud speaker to be used.
16 S.W.G. tinned copper wire for connections.

(*Continued on page 221.*)



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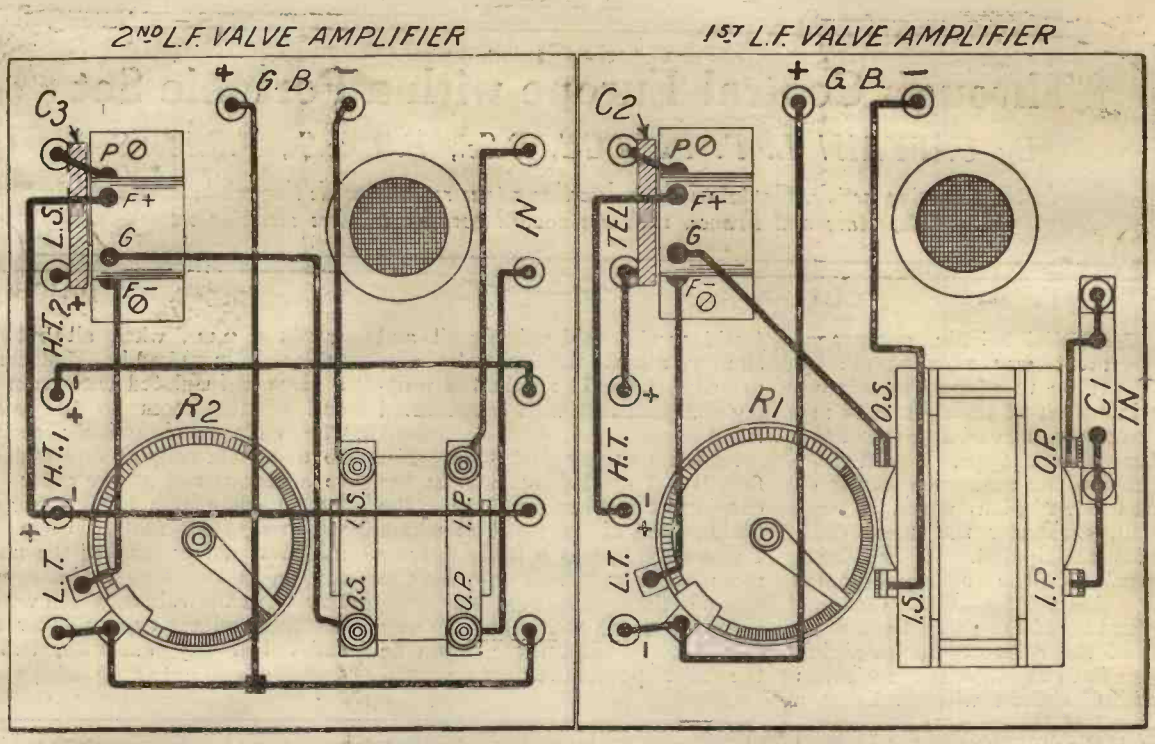

Fig. 7.—Practical wiring diagram. Full-sized blue print, C100 5B, price 1/6 post free.

(*Continued from page 218.*)

Drill the panel in accordance with Fig. 5, remembering to provide 5 holes down the left-hand side instead of only 2; fit the components and terminals in place and wire up in accordance with the back of panel wiring diagram, Fig. 7.

Readers who decide to construct both panels for use as a two-valve amplifier, will require a containing box or cabinet measuring 12 in. by 7 in. by 4½ in. deep. The cabinet illustrated in Fig. 1 was made by Baker & Russell.

The Complete Two-Stage Amplifier

With both panels completed and fitted side by side in the containing box, corresponding terminals in the two centre rows are to be connected together by means of short pieces of No. 16 gauge wire, connections are to be made to the existing receiving set and to the loud-speaker and batteries as indicated pictorially in Fig. 2, which

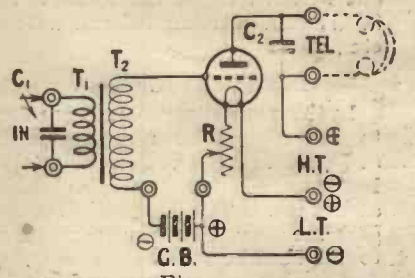

Fig. 9.

is a complete circuit diagram of the two-valve amplifier.

With from 100 to 120 volts on the anode of the second valve, a negative grid bias of from 4½ to 6 volts will usually be found satisfactory.

By the provision of a special terminal (H.T.2+), any additional voltage may be applied to the anode of the second valve, so that one of the small-power valves may be employed with suitable anode voltage and negative grid potential in order to obtain a greater volume of sound from the loud-speaker than would be the case with the ordinary type of receiving valve.

With the completed amplifier connected to a crystal receiving set, some 15 miles from the broadcasting station, extremely clear loud speaking was obtained of sufficient volume to be easily audible all over the house.

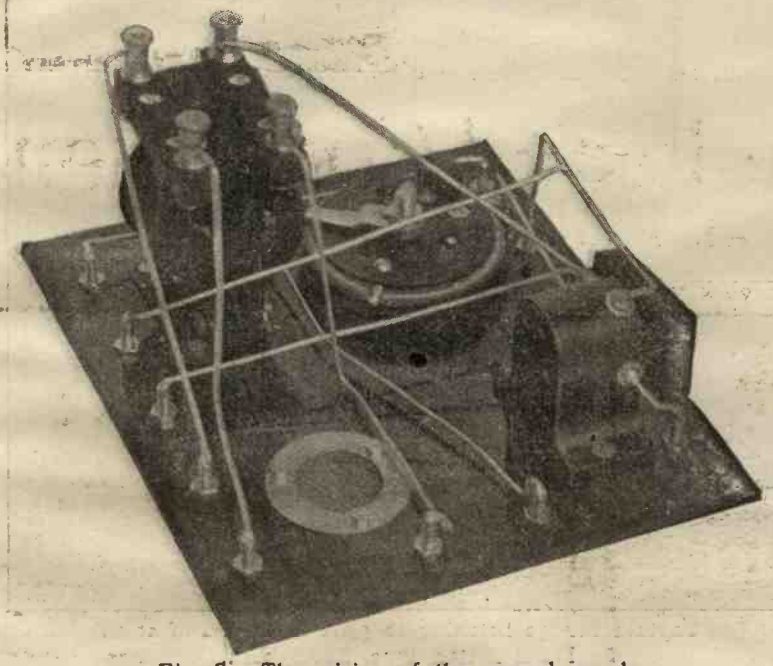

Fig. 8.—The wiring of the second panel.

Through Central Europe with a Portable Set

By CAPTAIN L. F. PLUGGE, B.Sc., F.R.Ae.S., F.R.Met.S.

In the following article, Captain Plugge describes a tour recently made through Switzerland, Austria, Italy and France, with a standard portable wireless receiving set

ALTHOUGH little encouragement was afforded me by those to whom I mentioned my intention of taking one of my instruments, a two-valve set of the reflex circuit type, I did not, thanks to the numerous letters of introduction with which I was armed, encounter the many difficulties anticipated. I had been warned of the stringent rules laid down by the Customs Authorities of the various countries and of the difficulty in obtaining a permit to install or use a wireless receiving station without being a national of the country concerned, even if the station were to be a fixed station. What would it be for a portable one? I was told of the laws forbidding the use of foreign material, the licences to be got out in such cases, the forms to be filled in, the questions to be answered, etc., etc.

Diplomatic Kindness

In this respect my thanks are due to the diplomatic representatives in London of the various countries I traversed for their valuable assistance. The credentials they gave me proved an "open sesame" to the hard hearts of the *gendarme*, *douaniere*, *zollbeamter* and *douanier* alike, who, "ne connaissant que leur consigne," are the most difficult people to move. I was told that a considerable sum of money would have to be left as a guarantee at Dieppe and a declaration made that the instrument would be taken direct to Switzerland without being used. Looking back at the "hold-ups" I experienced at the different frontier towns, I am inclined to advise all travellers who do not like their luggage examined to travel with a portable wireless set. This probably needs some explanation. The fact was that declaration of the wireless gear caused so much commotion and evinced so much interest to all concerned, that after its examination there was no other question about the rest of my numerous bags. These were immediately chalked without a murmur. Escorted by the heavily laden *facchine*, who told volubly all and sundry about the case he was carrying, I would regain the waiting compartment with a contented mind.

Zurich was my first stop. The first test I carried out was in the evening of my arrival there. The dining-room of the hotel at which I was staying was a fairly narrow room, some 40 ft. in length, on the ground floor. Heating was provided by steam radiators. To any wireless enthusiast these would be the first points to notice. Towards 9 p.m., when all but two tables of diners had left, I stretched a piece of insulated wire from one end of the room to the other. The ends were quickly secured to a curtain-ring at one end and to a picture-rail at the other. To fix an earth clip to the radiator was only the matter of a few minutes. After making the necessary connections to the instrument I fitted in the valves, which were of the dull-emitter type, fed by four small bell dry batteries, two in

(*Continued on page 226.*)

Captain Plugge listening to 5XX in his room at the Hotel Britannique, Bordighera.

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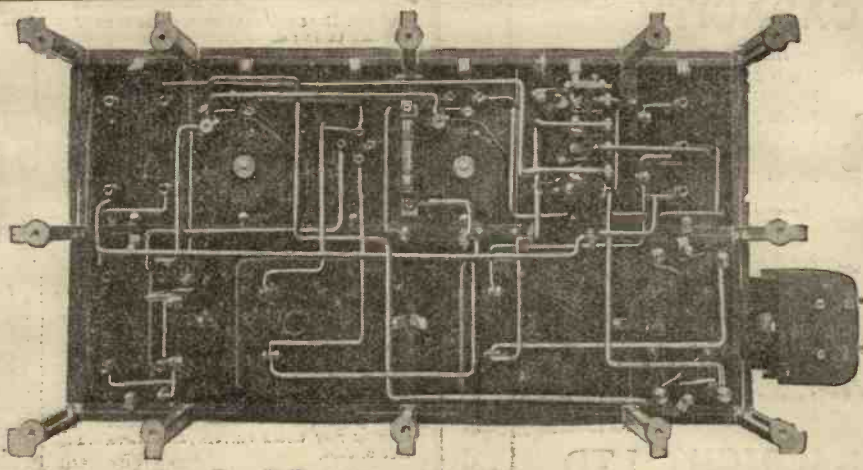

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CP. 7597	1	1 PB. Polar Condenser ·0003 mfd.	18 0
CP. 7596	1	1 PB. „ „ ·0005 mfd.	18 0
CP. 7580	1	½ PB. Single Valve Holder panel	3 8
	2	½ PB. Valve and Bobbin Rheostat panels	18 0
CP. 7847	1	½ PB. Intervalve Transformer	1 6 0
	2	Fixed condensers ·0003	7 8
CP. 7660	1	Fixed condenser ·002	4 4
A. 488	1	2 megohm grid leak	2 6
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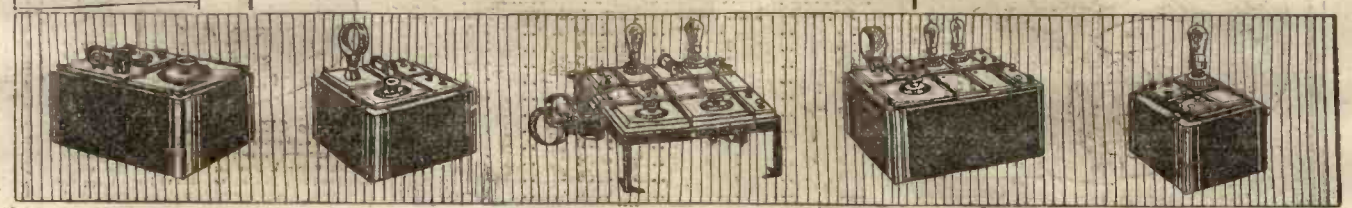

RADIO COMMUNICATION COMPANY, LIMITED.

(*Continued from page 222.*)

series, and two in parallel. The dull glow of the valves warmed my heart for I had feared that they might have been damaged. However, the valves appeared none the worse for their five hundred miles trip and rough handling. I carried two spare valves with me, but this proved to be an unnecessary precaution. No more than fifty seconds were taken to tune in 5 XX. It was a Sunday evening and a copy of the *Radio Times*, which, of course, formed part of my equipment, informed me that I was listening to the "De Groot's" orchestra at the Piccadilly Hotel. The thrill was great and the news spread like wildfire through the hotel. Even the hotel doctor was sent for, and the two pairs of headphones that I had taken with me never crowned so many heads in so short a time. Mr. Rex Palmer gave out the news in excellent style, and the distance I had taken twenty-four hours to cover seemed to vanish. Closing my eyes, I was back in my bachelor flat in St. James's—the same voice, the same millibars, the same list of news agencies that I was listening to only two evenings before. My readers with a more technical mind might want to hear some details of the reception. To them I would say the aerial was made of 100 ft. of electron wire, the earth 5 ft. of the same wire to the radiator. The valves were of the D.E.R. type, L.T. current being supplied by dry cells. The H.T. used was 30 volts. Reception strength was equal to normal crystal reception of London at ten miles from 2L.O.

No Interference

No interference was heard, and the amount of usual oscillation to which one unfortunately has to get accustomed in England when tuning in a distant station was conspicuous by its absence.

My stay in Zurich was in August and the Zurich station which is now working with 500 watts on a 650 metres wavelength had not yet been opened, and very few experimenters were about. Those who may endeavour to repeat the experiment now may no longer find the silence to which I refer.

A general view of Innsbruck, showing the peaks which screen the city.

A pass on the famous Dolomite road.

Next Innsbruck in the Austrian Tyrol was reached. Many of my readers, I am sure, know that delightful town on the River Inn surrounded by high and snowy peaks. I had not seen it for the last two years, but there seemed to be no change. It was just as if the town had slept during my two years' absence and awakened again on the morning of my arrival. The rooms at the "Tyrolerhof," where I stayed, were provided with a kind of running balcony—very suitable for fitting an aerial wire I thought. So climbing along the rail at the risk of being accused of trying to enter the next bedroom, the faithful piece of electron wire was strung up. This time it was found possible to stretch out some fifty feet. A radiator in my bedroom again proved to be an excellent earth. The Savoy Bands came through splendidly and in good strength under these

(*Continued on page 229.*)

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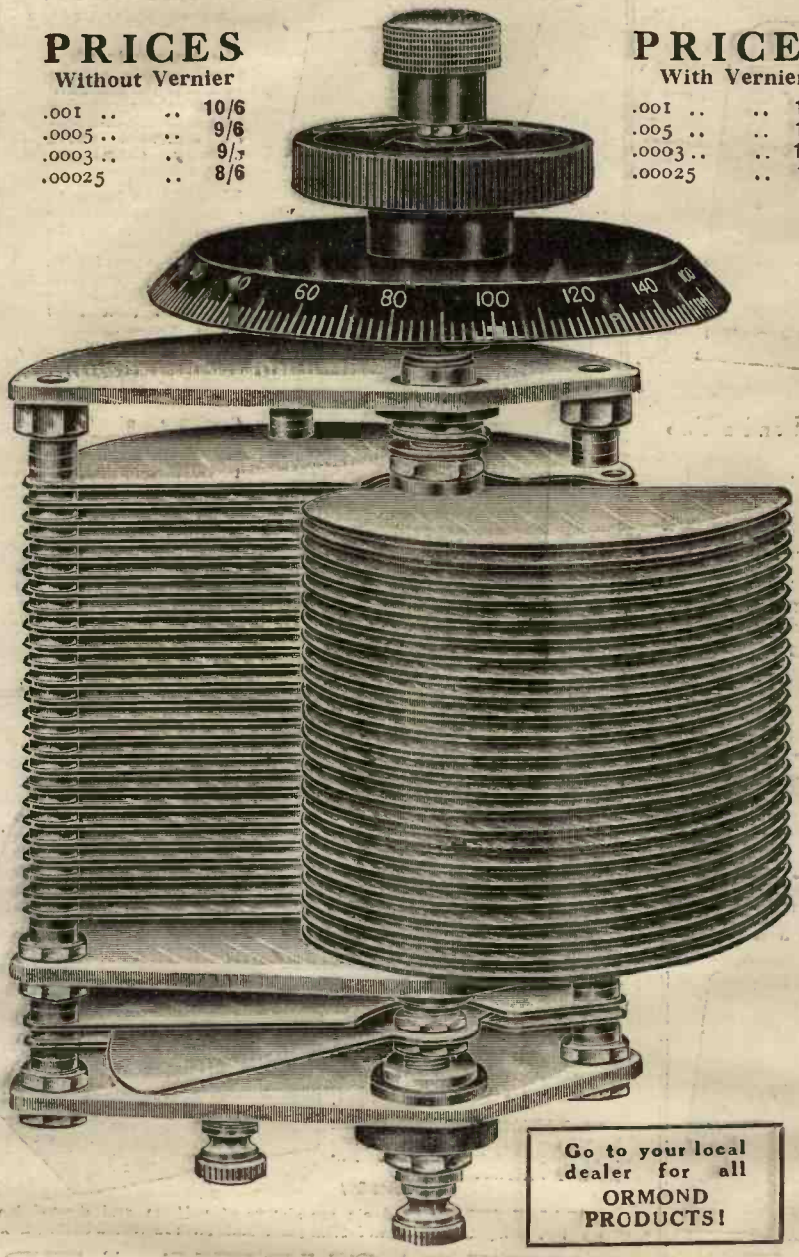

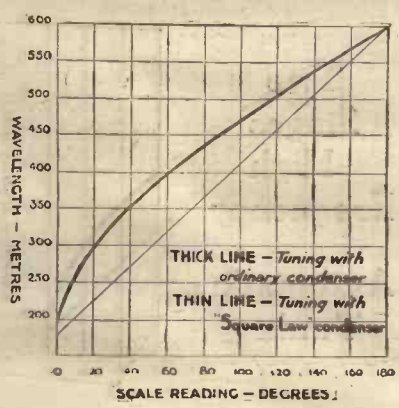

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(*Continued from page* 226.)

conditions, the set being on the point of oscillation.

Innsbruck

At Innsbruck, thanks to the courtesy of the Managing Director of "Tyrolia," a large firm of booksellers in the Maria Theresienstrasse, I was able to spend a couple of evenings experimenting on the sixty metres aerial erected by them over their store. German and Austrian dull-emitter valves which were on sale there worked well on my set and were very cheap compared with ours. The German valves were seven shillings each, and the Austrian, made in Vienna, eight shillings. Their specification was similar to our British type—2 volts and ·25 amp. The British set was much admired. With it I tuned in London and the various German, French and Austrian stations much more easily and with better results than with the best three-valve Austrian set available, with which comparative tests were carried out. Chelmsford came in just like Radiola does in London. I did not anticipate these results because of the special geographical situation which Innsbruck occupies. It is situated in a deep valley and the mountains surrounding it are very near and steep. They seem like huge cliffs rising to more than 2,000 and 3,000 ft.

The Dolomite Road

From Innsbruck I proceeded to Bolzano by train and thence by car along the beautiful Dolomite Road, with its ever-changing scenery that one could go on describing for ever, finally reaching Cortina d'Ampezzo. My rooms were booked at "Tre Croci," a palatial hotel some four miles out of the village and a steady half-hour climb by car. There, 8,000 ft. above sea level, surrounded by the warm red columns of the fantastic Dolomite heights, I wondered as I gazed at them what effect they would have on the ether waves. Anticipating more difficult reception, as distance from London was increasing, I succeeded, with the help of my chauffeur, to fix a standard British Post-office 100 ft. aerial between two distant balconies. It was made this time of some lighting flex purchased at Innsbruck. It is not possible to report such good reception from "Tre Croci." Nothing at all was audible except howling and atmospherics until darkness set in. A thunderstorm was raging at the time. The carrier wave from 5XX was heterodyned at that stage, but only unreadable speech and distorted music came through. After a couple of hours of this standing to attention, "God Save the King" was clearly heard! I was only able to stay two days at "Tre Croci," and consequently had no time to make another night attempt which probably would have been more successful.

A day's motor drive through the beautiful valley of the Piave, where our troops fought during the Austrian advance, brought me to the Venice Lagoon. Knowing the severity of the Venetian authorities in regard to wireless apparatus (I had been told stories of wireless sets being thrown overboard), it was not without apprehension that I felt the motor-boat which had been waiting for me at "St. Juliana" approaching the Venice marine customs. Boldly pointing to my five pieces of luggage, I said "Niente a dichiarare." I must have an honest face, for no more was said but the usual "Molto bene" with a salute. Wishing to stand by my word, I did not open the wireless case while in the City of Gondolas—temptation was great, however. Wireless did not appear to be entirely debarred at Venice, for as I was paddled the following day down the Grand Canal I noticed several "Palazzi" with aerials that might have made many of us envious. The municipal authorities evidently did not object to wires crossing thoroughfares, nor did they appear to limit Venetians to 100 ft. of the precious thread. Several of the aerials I noticed consisted of a single wire stretched across the Grand Canal from one building to another, in some cases askew, covering a span of more than 300 ft. I heard that local objection to radio arose owing to some discontented inhabitants carrying a receiving set in their gondola. Complete with loud speaker, they would make a practice of pouring out Radiola dance music accompanied by intermittent howling and crackling in the vicinity of the "Serenata." I think that all lovers of Venice and its old and quaint customs will be heart and soul with the Venice authorities in objecting to that.

No Aerials at Lido

At the "Excelsior," on the Lido, everyone seemed too gay, bathing all day and dancing all night, to have time to worry about wireless. I saw no aerials at this famous Adriatic resort.

Leaving Venice, I proceeded to Milan. This great centre of Northern Italy seemed behind the times. Milan is, however, shortly to have a broadcasting station, but everything about it was kept so dark that I was not able to get any reliable information on the matter. We may then look forward this winter to some of the performances at the "Scala," which this station, I understand, will be broadcasting. This will prove an interesting experiment, as the "Scala" of Milan, apart from being the largest opera house in the world, is especially wonderful for the acoustic properties of the auditorium. Standing in the spot occupied by the "Chef d'orchestre," one may clap one's hands ever so slightly and then hear the sound run round the loges echoing some seven to ten times as plainly as a bell.

Maria Theresienstrasse, Innsbruck. The publishing firm, "Tyrolia," referred to in this article, may be seen on the right.

(*Continued on page* 233.)

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25 .. 3/9	150 ..	6/-	
35 .. 3/9	200 ..	7/-	
50 .. 3/9	250 ..	7/6	
75 .. 4/-	300 ..	8/-	
100 .. 5/6	400 ..	9/6	

Set of 4 for B.B.C. wave lengths .. 14/11

FOR NEUTRODYNE CIRCUITS.

"Colvern" Ind. Vernier. The low maximum of any vernier is adversely affected by capacity effects and any vernier which is employed to give fine tuning MUST NOT be in association with the main tuning condenser.
PRICE 2/6. .. Post 3d.

MYERS VALVES

UNIVERSAL 12/6 D.E. 21/-

"RAYMOND" FIXED CONDENSERS.

Ebonite Base, Terminal Fittings. Post Free.

·001, ·0001 to ·0005,	1/2
·002 to ·004	1/3
·006	1/6
·01 and ·02	1/9
·05	3/3

MANSBRIDGE TYPE CONDENSERS:

Best quality obtainable. Accurate, permanent, noiseless, unaffected by atmosphere, beautifully cased, double insulators, two extra fixing lugs, made entirely of finest materials, pass all tests, guaranteed.

1 mfd.	3/6
2 mfd.	3/11

Post 3d. each.

NEWEY SNAP TERMINALS.

Complete Set .. 2/6

DIAMOND WEAVE BASKET COILS (5) EXTRA AIR SPACE (DUPLEX WAXLESS)

Equal to Honeycomb. 25, 35, 75, 100 (wavelengths marked).
Set of 5, 3/9

"POLAR" MICROMETER CONDENSER, 5/6

Boxes, ALL SIZES, stocked.

West End Stockist—Polar, Edison Bell, Ferranti, Silvertown, Dubilier, Lissen, Energo, Unidyne, Eureka, G.R.C., Sterling parts, etc.

Tape Aerial, 100 ft.	3/-
Sausage Aerial ..	2/6
Bus Bar, ¼ square, 15 feet	1/-
Bus Bar, 18 square, 15 feet	10d.
16 D.C.C. Wire per lb.	3/-
100 ft. 7/22 and 6 Insulators	3/6

PARTS FOR 7 CIRCUIT CRYSTAL SET (Percy Harris).

·0003 Sq. Law Condenser, Panel, 10 x 8, Burndept Detector, Terminals, Slix, Cardboard Tube, 3 x 7 in., 16 D.C.C., and square tinned, Radio Press Transfers.
22/6 the Lot. Post free.

CHELMSFORD 5XX.

Post Price.

D.C.C. Coil	1/3
With adapter	2/3
D.C.C. Extra Air Space	2/11

PARTS FOR ST. 100

(Less Box & Ebonite)
Absolutely Inclusive
£6 6s. 0d. to £10.

N and K

No. 3 LATEST MODEL 17/6 17/6

New 3-pole Laminated Magnets, which ensure an even magnetic pull and still greater volume. Windings well insulated. Large size earpieces and leather headbands of standard "N & K" comfortable design. Technically, "N & K" Headphones represent the last word in Wireless Reception.
IMPOSSIBLE TO EQUAL FOR CRYSTAL SETS.

Lead-in tubes: 6d., 7d., 8d.	
Valve Pins and Nuts 2 a 1d.	
Stop Pins and Nuts 2 a 1d.	
Nickel Terminals	2d.
Nickel Contact Studs 2 for	1½d.
Nickel Switch Arm (one-hole fixing)	1/-
Loading Coil and plug	8d.
Gamages Permanite	1/-
Condenser Brushes	6d.
2-meg. Leaks ..	10d.
Cheap Fixed	6d.

RAYMOND FIXED CONDENSERS.

·001, ·0001 to ·0005	10d.
·002, ·003, ·004 ..	1/-
·006, 1/3; ·01 1/9; ·02	1/9

D.C.C. Wire, per ¼lb.—
13 g. .. 9d. 20 g... 9d.
22 g. .. 10d. 24 g... 1/-
26 g. .. 1/1 28 g... 1/3
30 g. .. 1/6 Etc., etc.

Terminals complete—	
Brass Pillar ...	1d. 1½d.
W.O. or 'Phone	1d. 1½d.
Fancy Patterns	1d. 1½d
Extra large ..	2d. 3d.
Valve Sockets 2 for	1½d
Machine cut Screws Stocked (Best).	
Pulleys	4½d.
4 Taps and Wrench	2/11
Screwdrivers ..	6d.

LARGE NUMBER OF BARGAINS TO CALLERS ONLY

ACCUMULATORS

2 v. 40 amps. ..	9/6
4 v. 40 amps. ..	16/6
4 v. 60 amps. ..	18/6
4 v. 80 amps. ..	23/8
6 v. 60 amps. ..	27/6
6 v. 80 amps. ..	33/-
6 v. 105 amps. ..	38/6

Hart's Stocked. All High Quality.

Neutron Crystal ..	1/6
Uralium	1/-
Midite	6d.
Enclosed Detectors	9d.
Large, Brass, on base	1/3
Ditto., Nickel, on base	1/6
MicMet Type ..	2/8
Variometers (special)	1/6
Ditto., with clips, etc.	2/3
Ebonite D.C.C. and Dial	3/9
Also at 3/11, 4/3, 4/6 up.	

H.T. BATTERIES

66 N. & K.	7/11
60 v.	7/6
30 v.	4/6
60 B.B.C.	9/6
36 B.B.C.	5/6
9v. B.B.C.	2/6
1·5 (D.E.)	1/9
Ditto	2/- to 3/-

"DE LUXE" SUPER LOUD SPEAKER

2,000 ohms 24/-
A "REAL" BARGAIN

PHILLIPS' ·04 TYPE VALVE 15/11

MANSBRIDGE TYPE FIXED CONDENSERS

1 MFD.	3/6
2 MFD.	3/11

Legless Valve Holder	1/-
Solid Rod Ditto. ..	1/-
Under Panel Ditto.	1/6
Ebonite Dials .. 8d.,	1/-
Valve Templates 2d.	4d.
Electron Aerial ..	1/3½
Adhesive Tape Roll	2½d.
Copper Foil per foot	2½d.
1 in. Fibre Strip 3 ft.	2d.
Insulated Hooks 4 for	3d.
Ditto Staples 5 a	1d.

Microstat	2/6
Switch Arms 8d. to	1/-
Flex (Red and Black) per yd.	3d.
Shellac	5d.
Loading Coil and Plug	8d.
Contact Studs 4 for	1½d.
Nickel ditto 2 for	1½d.
Nickel Switch arm	1/-
Sorbo ear caps pair	1/4
Tumbler Switches	1/4

D.P.D.T. SWITCHES.	
Min Panel	1/-
On China Base ..	1/7½
On Ebonite Base 1/11	2/6
S.P.D.T. SWITCHES.	
Miniature Panel ..	10½d.
On China Base ..	1/1
On Ebonite 1/3 to	1/9
Murray Valve Holder	1/3
Spring Washers 4 a	1d.
Coil Plug on Base	10d.

"ORMOND" L.F. 13/11

A Wonderful Transformer

DUTCH ·06 VALVES 12/6

PHILLIPS 12/6

4 ELECTRODE VALVE P.W. "UNIDYNE"

FIBRE STRIP (For Coils)

3 ft. long, 1 in. wide, 2d.

1st D.C.C. USUALLY IN STOCK

Twin Flex 4 yds.	6d.
Twin Silk Small 6 yds.	6d.
D.C.C. Bell Wire 10 yds.	5d.
Knobs, 2 B.A. 2d. 3d.	4d.
Small Knobs 6 B.A.	3d.
Small Knobs 4 B.A.	3d.
Wander Plugs pair	3d.
Egg Insulators each	1d.
Tape Aerial 100 ft.	2/-
Valve Windows 4d. to	9d.
Mica	2d.

"METAL" (FRENCH) '06 VALVES, 15/11

'Phone Cords 6 ft.	1/-, 1/3
Nugraving	
Empire Tape 2 yds.	1d.
Allen Var. Grid Leak	1/3
Best Sleeving 3 yds.	10d.
Rubber Lead-in 10 yds.	1/-
Thick ditto., 1d., 2d., &	3d.
Aerial, 7/22 100 ft.	1/10½
Ditto, Extra Heavy 100 ft.	2/3
Anti Cap. Handles	8d.
Tumbler Switches	1/-

BREAST DRILLS 0 to ¼ chuck

Cut Bevel and Gear	4/9
De Luxe Crystal Set	7/11
4 Whiskers, 1 Gold	2d.
Coil Plugs (ebonite)	4½d.
Ditto	6d. 8d.
Shaped ..	8½d. 1/-
5 ohm Rheostat ..	1/3
Various 1/3, 1/6, 1/9,	1/11
With Dial	1/11
Ormond	1/9
'Phone Connector	1d.
Nuts 2, 4, 6 B.A. doz.	2d.
Washers .. 12 a	1d.

BROWNIE "IMPROVED" WIRELESS SET - 7/6

RAYMOND CRYSTAL SETS 7/11 9/11 12/11

BUS-BAR

1/16 sq. - 15 feet 6d.
18 sq. - 15 feet 5d.

BUY RAYMOND GOODS

BOXES

7 × 5 9 × 4 12 × 9
8 × 6 10 × 8 12 × 12

2 B.A. rod per ft.	2½d.
4 B.A. Rod per ft.	2d.
Basket Holders ..	8½d.
Also at 10d., 1/-, 1/3,	1/6
2-way Coil Stands	1/11
3-way ditto	3/11
2-way with ex handles	2/11
3-way ditto	4/9
4-5 Batteries	4½d. 5d.
Brass Coil Former	2/11
Twist Drills	1/4

5 Waxless Coils 200/2000	1/5
5 equal 25 to 100 ..	1/11
5 ditto., Extra Air Space ..	2/8
6 waxed 200/3600	1/8
7 waxed 150/3600	1/11
Chelmsford D.C.C. 1/-, 1/3,	2/6
With adapter, 9d.	extra.

Switch Arm 12 Studs, 12 Nuts, 12 Washers. Lot 10½d.

EBONITE STOCK SIZES 3/16 in.

6×6 ..	1/4
7×5 ..	1/4
8×6 ..	1/10
9×6 ..	2/-
10×8 ..	3/-
12×6 ..	3/-
12×9 ..	4/3
12×12	5/6
14×10	5/6

WE STOCK Cut to size ¼-in. ½d. sq. in. EBONITE.

RIGHT OPPOSITE DALY'S GALLERY DOOR

K. RAYMOND
27, LISLE STREET, LEICESTER SQUARE, W.C.2

No responsibility accepted on post orders unless cheques and postal orders are crossed and made payable to the firm. Moneys sent must be registered

HOURS OF BUSINESS:
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SUNDAY . 10 to 1

'Phone: GERRARD 4637.

HULLO EVERYBODY!!

All these Goods sent by Post. Foreign Packing and Post extra.

"DE LUXE" MODEL

AS SHOWN, WITH DIAL, KNOB AND BUSH.

·001	7/3
·0005	5/11
·0003	5/4
·0002	4/11

POST 6d. SET.

UNSURPASSED FOR FINE TUNING.

John Blair, Esq., Rexall Pharmacy, Millom, says:—
Your Condensers are a REVELATION to me as a Dealer. Sept., 1924.
C. Walton, Esq., Andover:—
Tested your Condensers on Megger and got "INFINITY."

NEW MODEL

With knob and dial.

WITH VERNIER.

·001	9/3
.0005	7/3
0003	6/9

With EBONITE DIAL and Two Knobs. Post 6d. Set.

TWIN CONDENSER

SQUARE LAW

·00025	12/6
·0003	12/6
·0005	18/11

TWIN (ORDINARY)
Equal units of ·00025 or ·0003 9/6
Complete with Knob and Dial.

NEW MODEL SQUARE LAW

	AL'MN ENDS	EBONITE ENDS
·0003	10/-	11/6
·0005	10/11	12/6

With Knob and Dial. Post Free.

JACKSON BROS.

"J.B." VARIABLE CONDENSERS.

SQUARE LAW

·001 –9/6 ·00025–6/9
·00075–9/– ·0002 –5/6
·0005 –8/– ·0001 –5/3
·0003 –6/9 Vernier 4/6

"J.B." ordinary type

Standard	Super	Micro-denser
·001	8/6 – 9/6 –	11/6
·00075	8/– – 9/– –	11/–
·0005	7/– – 8/– –	10/–
·0003	5/9 – 6/9 –	8/9
·00025	5/9 – 6/9 –	8/9
·0002	5/– – 5/6 –	8/–
·0001	4/9 – 5/3 –	7/9
Vernier	4/– – 4/6 –	

Complete with Knob and Dial

STERLING SQUARE LAW with Vernier.

·001	30/–
·0005	25/6
·00025	23/6

POLAR

·001 var. Condenser	10/6
·005 " "	10/6
·0003 " "	10/6
Micrometer Condenser	5/6
Cam Vernier 2-way Coil Holder	11/-
Polar 2-way, with Vernier	11/–
Polar 3-way, with Vernier	17/–
Polar-Junior, 2-way Cam Vernier	6/–
Polar Junior, 3-way Cam Vernier	9/6

GOSWELL ENGINEERING

Patent Valve Holder	1/6
Goswell 2-way coil holder	5/6
Goswell 2-way Vernier Coil Holder	9/-
Goswell 3-way Coil Holder	7/6
Goswell 2-way Panel Mounting	3/-
Goswell 3-way Panel Mounting	5/-
Goswell 3-way Cam Vernier	12/6

LISSEN

Variable Grid Leak	2/6
Anode Resistance	2/6
Lissen Minor	3/6
Lissenstat	7/6
Do. Universal	10/6
2-way Switch	2/9
Series Parallel	3/9
T1 Transformers	30/-
T2, 25/-; T3, 16/6; Coils: 25, 4/10, 30, 35, 40 4/10, 50 5/-, 60 5/4, 75 5/4, 100 6/9.	
5 point switch	4/–
Lissen choke	10/–
Aux. Res.	1/3

HEADPHONES

We can recommend these as being excellent Headphones, with a great reputation.

G.R.C., 4,000 ohms resistance, each	£1 0 0
B.T.H., 4,000 ohms resistance, each	£1 5 0
Brandes Matched Tone, 4,000 ohms resistance, each	£1 5 0
Brown Type A, 4,000 ohms resistance, each	£3 2 0
Sterling, 4,000 ohms resistance, each	£1 5 0
Gecophone, 4,000 ohms resistance, each	£1 5 0

ACCUMULATORS

MADE BY WELL-KNOWN FIRM FOR ME.
POST PRICES.

2 v. 40 amps	10/6
4 v. 40 amps	17/6
4 v. 60 amps	20/6
4 v. 80 amps	24/6
6 v. 60 amps	29/–
6 v. 80 amps	34/6
6 v. 105 amps	40/6

EBONITE

Post Prices.	3/16th in.	¼ in.
6 x 6	1/6	2/–
7 x 5	1/6	2/–
8 x 6	2/–	3/–
9 x 6	2/2	3/3
10 x 8	3/–	4/2
12 x 6	3/3	4/2
12 x 9	4/3	5/6
12 x 12	5/6	7/6
14 x 10	5/6	7/6

Cut to Size, 3/16 in. at ½d. square inch.

DUBILIER

·001, ·002, ·003, ·004, ·005, ·006, Fixed	3/–
·0001, 0002, ·0003, ·0004, ·0005	2/6
Type 577, ·01	7/6
Grid Leaks, each	2/6
Anode Resistance 50,000, 70,000, 80,000 100,000, on stand complete	5/6

IGRANIC

Coils: 25, 5/–; 35, 5/–; 50, 5/2; 75, 5/6; 100, 7/–; 150, 7/10; 200, 8/8; 250, 9/–; 300, 9/5; 400, 10/3; 500, 10/6
Fil. Rheostat 4/6
Potentiometer 7/–
30-ohm Rheostat 7/–

WATES MICROSTAT

For D.E. or R. Valves 2/9
Post Free.

Formo, open 12/6

47 Bucks "Powquip" 12/6

Manchester "Powquip," 15/6

Ormond, 14/6

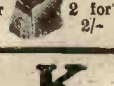
Shrouded 'Powquip,' 18/–

Standard 'Powquip,' 14/6

BRETWOOD

(New Model)
Var. Grid Leak 3/–
Anode Resistance 3/–

2 for 1/6



2 for 2/–

33 ENERGO

H.F. Plug-in formers	Trans-
No. 1. 150-450	3/6
No. 2. 250-700	3/11
No. 3. 450-1200	4/3
No. 4. 900-2000	4/6
No. 5. 1600-3000	4/9
No. 6. 2200-5000	4/11

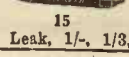
14 Voltmeter, 4/6

21 C and S, one-hole fixing, 1/3

16 Rheostat, with Dial, extra value, 2/6

44 Bretwood Valve-holder, 1/9

D.P.D.T., 1/5
S.P.D.T., 1/2



15 Grid Leak, 1/-, 1/3, 2/6

WATMEL

Var. Grid Leak 2/6
Anode Resistance 3/6

51 Enclosed Detector Micrometer Adjustment, 1/9
By post 2/3.

41 AMPLION Dragon Fly, 25/-

43 BASKET 2-way, 4/11.

McMICHAEL'S H.F. TRANSFORMERS

150–300 }
300–600 } 10/–
1,100–3,000 each
(Manufacturer's advance.)

32

100,000 ohms Fixed 2/6
2 meg. Leak 2/6
Both with clips.

Genuine DR. NESPER HEADPHONES

Adjustable diaphragm, detachable receivers, double leather-covered, head-springs, long flexible cords, nickel plated parts. Very comfortable fitting to the head. LOOK FOR THE TRADE MARK.
4,000 ohms 12/11
Post 6d. pair.

FRENCH THOMSON-HOUSTON

JUST TRY THEM.
4,000 ohms per Pair 15/11

EDISON BELL

·0001 to ·0005 Fixed	1/3
·002 to ·006	2/–
·001	1/3
·0003 with Grid Leak	2/6
Variometer	10/6
Twin Detector	5/6

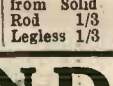
"R.I." NEW MODEL IN SEALED BOX

Don't Buy Otherwise.
Post 25/- Free

49 FORMO SHROUDED 18/-

POST ORDERS

Owing to tremendous pressure on Post Dept. ALL POST ORDERS accepted for delivery in strict rotation and on no other terms.
Delivery for orders received AFTER Dec. 15 NOT guaranteed before the holidays. But we will do our best.



46 Cut from Solid Rod 1/3
Legless 1/3

48 5—1 11/9

ALL VALVES ON POST SENT AT PURCHASER'S RISK.

VALVES

THORPE K4 (5-pin) 17/6
PHILLIPS 4 ELECTRODE 12/6
(Both for UNIDYNE.)

BRIGHT EMITTER 12/6 each

	Type
B.T.H.	R. Type
Ediswan	A.R. "
Marconi-Osram	R. or R 5 V "
Mullard-Ora	"
Cossor	P.1 "
Cossor	P.1 "
Myers-Universal	
Mullard H.F. (Red Ring)	
Mullard L.F. (Green Ring)	

DULL EMITTER 21/- each

	Type
B.T.H.	B.3
Ediswan	A.R.D.E.
Marconi-Osram	D.E.R.

25/- each

	Type
B.T.H.	B.5
Ediswan	A.R.O.6
Marconi-Osram	D.E.3
Mullard	D.F.Ora

DULL EMITTER POWER VALVES
For use with A.R.D.E. and D.E.R. Valves.
Marconi-Osram, Type D.E.6,2-5 volt, ·25 amps. 25/-

DULL EMITTER POWER VALVES
For use with ·06 Valves:
B.T.H. Type B.6 25/-
Marconi-Osram Type D.E.4 30/-
Mullard, Type D.F.A.2 30/-

POWER VALVES
For use with Bright Emitters

B.T.H.	B.4 35/-
Marconi-Osram	D.E.5 35/-
Mullard	D.F.A.1 35/-

·06 French Metal 16/11
·06 Dutch 13/6
Phillips ·04 Type 16/11

FILAMENT RHEOSTATS
Wire Wound Type.
Rotary Action.

IGRANIC ohms each.

Plain Type	4 & 7	4/6
With Vernier Adjustment	4	7/-
Plain Type	30	7/-
The Raymond	6	1/6
The Ormond		2/-

BASKET COIL HOLDERS

No. 1	2 for 2/-
No. 2	2 for 2/6
(both with plug)	
Coil Stand 2-way for Basket Coils	4/11
Universal 2-way for Basket Coils	5/11

"BABY" COIL STANDS

2-way on base	3/-
3-way on base	4/9
(brass fittings)	
2-way ex. handles	4/6
3-way do	5/6
(nickel fittings)	
2-way Cam Vernier, high-class	5/9

Several high-grade patterns

2-way	at 5/-, 5/6
3-way	at 6/11, 7/6

RIGHT OPPOSITE DALY'S GALLERY DOOR

K. RAYMOND

27, LISLE STREET, LEICESTER SQUARE, W.C.2

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HOURS OF BUSINESS:
DAILY - 9 to 7.45
SUNDAY - 10 to 1

'Phone: GERRARD 4637

(*Continued from page 229.*)

Periodicals

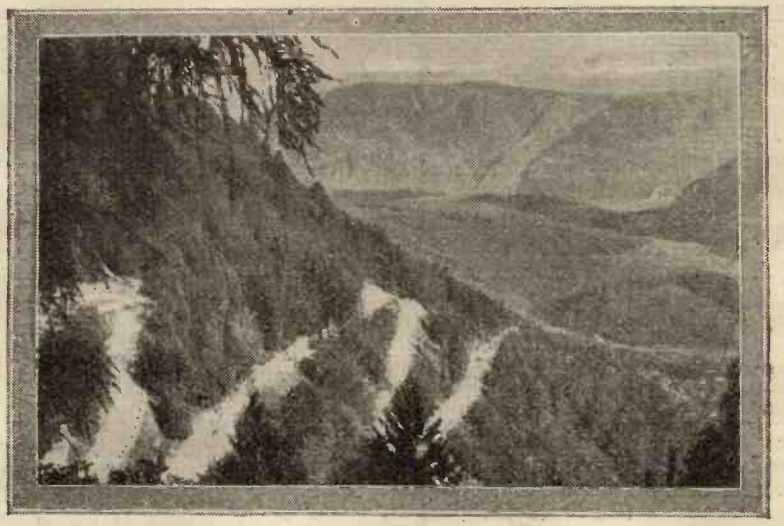
I found a good many wireless periodicals at the bookstalls: "Radio Novita," "Radio Revista Marconi," "Radio fonia," "La Radio per Tutti," "Il Radio Giornale," "Marconifono," and "La Scienza per Tutti"—showing that interest in broadcasting was growing, though somewhat slowly. I even saw one copy of the *Radio Times* on sale, which made me suppose that, at least, someone must be trying to receive the British stations.

After a short stay at Genoa, that wonderful port on the Mediterranean with its many historical associations, I proceeded to Bordighera. Bordighera is a quaint little village that probably owes much of its fame to the proximity of a villa belonging to the Queen Mother of Italy. Most of the shops, including some of the smallest, display the Royal arms as purveyor to Her Majesty.

As I was intending to stay for some time in this delightful and restful spot, I set to work and erected an outdoor aerial. Thanks to the courtesy of Signor Goldfusso, proprietor of the "Hotel Britannique," where I was staying, a very efficient aerial was affixed. One end was secured to a standard well above the roof of the building, and the other end to the highest branches of a large cypress tree in the hotel's spacious grounds. Some kind person informed me that aerials were not allowed in Italy without government authority. I ignored this I am afraid. At Bordighera most of the continental broadcasting stations were tuned in on this 150 ft. single-wire aerial. The land and geographical conditions generally in this part of the world were not very favourable for reception, however. Great difficulty was experienced in tuning in home stations during the daytime. As soon as the stars appeared 5XX was plainly received, as also were Radiola and the Eiffel Tower. Frankfort seemed to come through with greater strength than any of the other German, Austrian, Spanish and British stations. This was strange, considering its small power of 1 kw. and the distance between Bordighera and Frankfort.

Monte Carlo

I went on from Bordighera to Mentone and Monte Carlo. The newspaper "L'Eclaireur" used to have a transmitting station at Monaco. This, however, was taken down and no transmissions have been taking place from that station for the last eighteen months. The Italian wireless periodicals publishing foreign transmissions, however, continue to include this station in their list of regular transmissions, as giving a concert at 8 p.m. daily. In this respect they are not differing from British periodicals, other than those published by the Radio Press,



Another view of the famous Dolomite road, showing some of its three hundred hairpin bends.

Ltd., that have, for the last three months, been giving continental stations—probably copied from foreign papers—as transmitting regularly, which have not sent out a carrier wave for the last twelve months.

Proceeding on to Nice and Cannes, I visited the much advertised station of Nice, owned by Radio-Nice. This station has not been working for the last two years. Attraction of outdoor life and sunshine on these southern shores must be too strong to permit of any wireless enthusiasm. It is no wonder that people spend their time far away from the valves and high-tension batteries.

Turin

Turin, which was the next town on my itinerary, seemed more alive to broadcasting than any of the other Italian cities I visited. One of our leading manufacturers of wireless apparatus has a branch there, and in their stores I saw many familiar looking instruments, condensers, frame aerials, loud-speakers and wireless accessories.

Stopping at Geneva on my way back, I finally arrived at Newhaven, where the Custom officials made no difficulties in allowing me to bring back my wireless purchases.

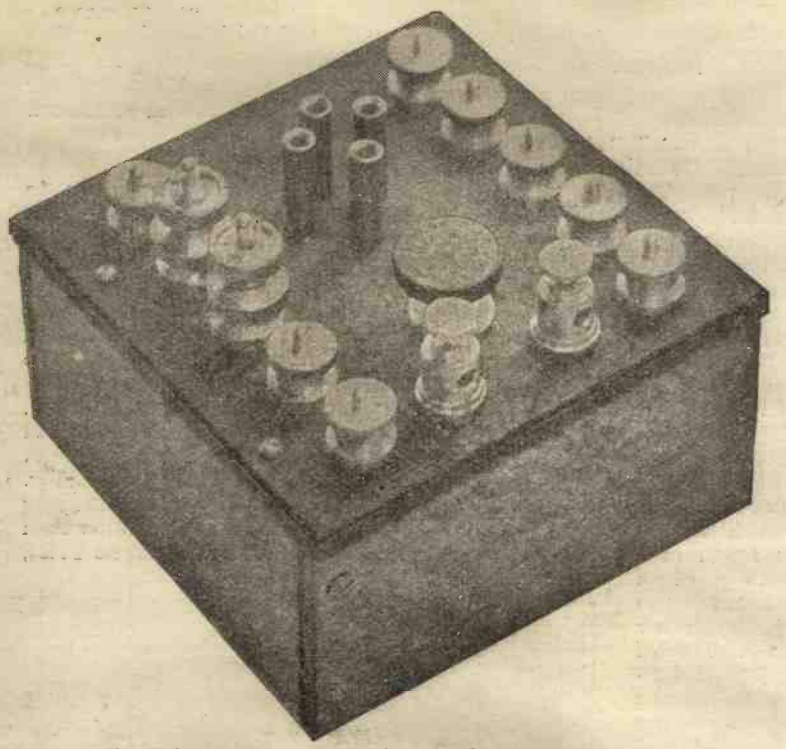
It is only possible in a small article of this description to give but a skeleton account of results obtained, but there appears to be no doubt that the Chelmsford station has become a great boon to listeners on the Continent. It was an admitted fact everywhere that nothing in the matter of wireless could rival the British programmes. Since the erection of 5XX, thousands of foreign listeners, who hitherto were not able to tune in the weaker B.B.C. stations, have been able to log that station and thus realise and appreciate what is being done over here.

From many a conversation I gathered what a wonderful instrument of national propaganda 5XX had become. Most teachers of English have a waiting list of pupils, and schools advertising correspondence courses are fast becoming prosperous; and in no place did I hear anything but praise of the wonderful service provided by the B.B.C. through their high-powered station.

A "Short-Wire" Valve Panel

By A. S. CLARK

A couple of plug-in coils and a variable condenser brought in America on this little set



This shows the compactness of tne panel.

AS its name implies, the wiring of the panel about to be described is especially short; and short wiring is always a good point in any set. Actually, less than a foot of wire is used, which is probably the chief reason for the efficiency of the panel. As it measures only 4 in. by 4 in., and the containing box is not more than 2 in. deep, it is very suitable for incorporating in a portable set. Also, since we need no coil-holder or tuning condenser, comparisons of the efficiency of various tuning arrangements are readily made.

Notes on Components

The components required are few:—

1 ebonite panel, 4 in. by 4 in. by ¼ in.

1 ·0003μF Dubilier condenser with grid leak clips.

1 2Ω grid leak (Dubilier).

1 Lissenstat Minor.

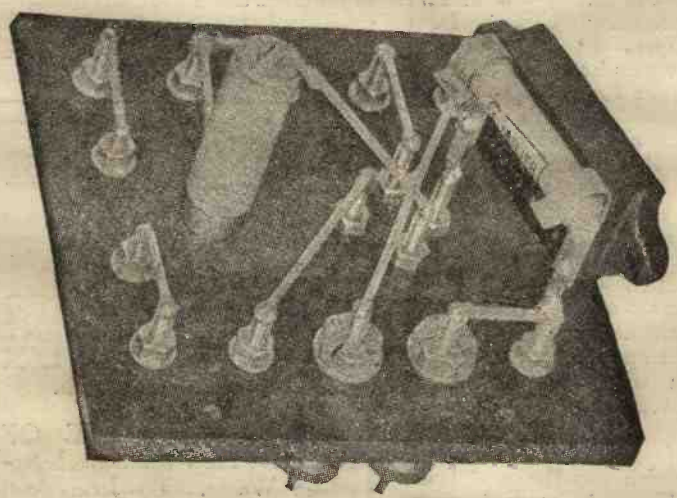
10 terminals (two of which may be of the type with a circular hole for telephone tags).

2 Double-type W.O. terminals.

1 containing box.

1 ft. square section tinned copper wire.

In this particular panel it is necessary that the grid leak and condenser should be of Dubilier pattern, as the panel is so drilled that the distance between the aerial terminal and the grid socket is equal to that between the soldering lugs of the grid condenser. The two double terminals serve to connect the A.T.I. and the A.T.C., this making it unnecessary to provide four terminals for the purpose. Notice that no telephone condenser is included in the list of components; no difference in signal quality or strength could be detected when this component was omitted, the self-capacity of the telephone leads proving sufficient to by-pass the H.F. currents. One may be tried, however.



The short wiring is a special feature.

The Construction

The first step to take in building the panel is to remove the surface skin from the ebonite with fine emery cloth, and then restore its original black colour by rubbing with a piece of rag damped with turpentine. If a guaranteed ebonite is purchased it can be used as bought. Now drill the panel as shown in Fig. 1, marking out the position of the holes with a scriber on the back of the panel. Make the holes of such a size as to allow the terminal shanks and other parts to pass through easily.

Having drilled all the holes required, and fitted the parts and terminals in the positions shown in Fig. 1, all that remains is to wire up the panel. Before commencing it is best to "tin" all shanks and points to which contact is to be made. The panel is wired up in accordance with the wiring diagram given in Fig. 2, the grid condenser being soldered directly to the aerial terminal and grid socket as shown. If desired, ½ in. may be cut off the shanks of the double W.O. type terminals, as these are longer than necessary here.

Containing Box

The containing box need not have any bottom as it is quite small, and will be strong enough without one. The wood out of which it is made

(*Continued on page 237.*)

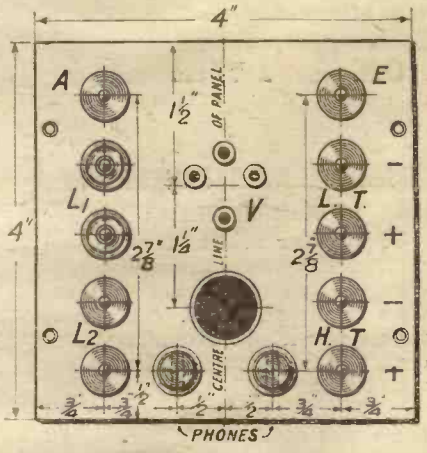


Fig. 1.—The drilling diagram.

(*Continued from page 234.*)

should not be more than ¼ in. thick. This is in order to allow room for the grid condenser, which comes very near to the sides of the containing box; care must also be taken in soldering this condenser on, that it is fixed so as to allow room for the box. Fix the panel down by means of four round-headed screws passing through the holes drilled for them as shown in the drilling diagram.

Results obtained

Although the panel was designed chiefly for tuning with a parallel condenser it is an easy matter to connect the A.T.C. in series with the A.T.I. This is done as in Fig. 3. by connecting the condenser between the aerial lead-in and the aerial terminal of the set, instead of across the double terminals.

The panel was tested with an ordinary reaction circuit connected up. The batteries, telephones, aerial, earth and tuning coils and condenser are joined to their correct terminals, these being clearly marked in the drilling diagram Fig. 1, L_2 being the reaction coil. On what must certainly be called a poor aerial, at about nine miles from 2LO, this station was almost too loud for the 'phones. All the other B.B.C. main stations were obtained, most while 2LO was working. Several Continental stations came in well, including Le Petit Parisien, Ecole Superieure, Hamburg and Madrid. In addition music and speech from the American station WGY were also received one morning at 5 a.m., when conditions were favourable. This, of course, cannot be regularly achieved. So it will be seen that this panel gives all that can be expected of a single valve, and will amply repay trouble and time spent in making it.

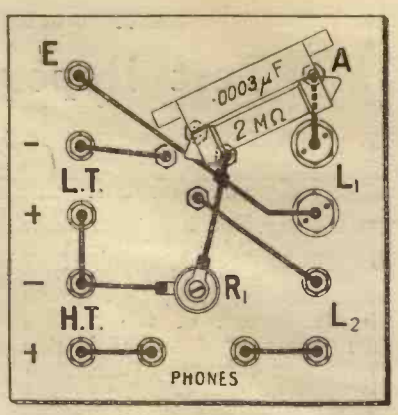


Fig 2.—The wiring diagram.

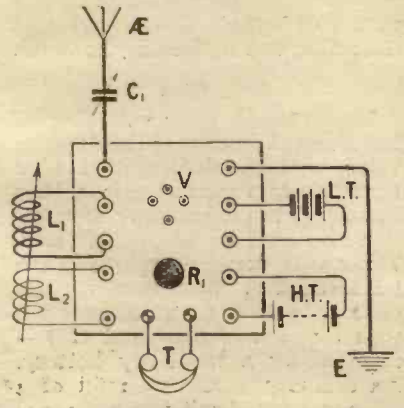


Fig. 3.—Showing how the tuning condenser may be placed in series.

Test Report on the "Polar Blok" Twin Valve Receiver

THIS receiver has been built with "Polar Blok" units, a product of the Radio Communication Co., Ltd., to conform with the circuit of the "Twin Valve Receiver" described in this issue of THE WIRELESS CONSTRUCTOR. The set was tested 13 miles east of 2LO, and the following report indicates the capabilities of the receiver.

The aerial system employed was of average size and efficiency, with normal local conditions. In the first tests, constant aerial tuning was used and a common high-tension voltage of 50 volts applied to the anodes of the two valves; no external grid bias was used, the terminals G.B.+ and G.B.— being connected together. A No. 50 coil was plugged into the aerial socket, a No. 75 in the reaction socket, and an H.F. transformer of correct size was inserted in the socket provided. Under these conditions difficulty was experienced in producing oscillation, and the No. 75 reaction coil was consequently replaced by a No. 100, when adequate reaction was obtained without very close coupling of the aerial and reaction coils. It was then possible to tune in 2LO with ease, at good loud-speaker strength, the music and speech being easily audible in any part of the house. Slight distortion was noticeable, however.

Grid Bias

It was found, upon switching off the filament current of the detector valve, that the dual valve tended to rectify to a marked extent, thus indicating the desirability of negative bias on the grid of this valve. The anode voltage applied to the terminal HT$_1$ was therefore increased to over 90 volts, and the wire between G.B.+ and G.B.— replaced by a small dry battery. An ordinary flashlamp refill of 4 volts was found suitable, and much purer reception resulted, together with an increase in signal strength.

Best Conditions

It was now evident that the set was working under favourable conditions, and some long-distance tests were carried out. In a short time, and without expending much care, two Continental stations were tuned in on the loud speaker, and two British stations. Each of these was comfortably audible all over a small room. With care, others could doubtless have been picked up in the same manner. With the telephones, of course, the range of reception is greatly extended.

Using ordinary parallel tuning, distant stations were not received with the same ease owing to the greater difficulty in producing oscillation.

Many dual circuits suffer from the disadvantage of howling at the least provocation. In the present case, however, it was possible to get well past the oscillation point before setting up a low-frequency howl.

INDISPENSABLES TO MAXIMUM RADIO EFFICIENCY

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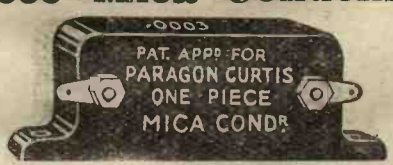
8 × 6 × ¼	3/3	24 × 12 × ¼	17 6	12 × 8 × ¼	6/-
10½ × 8½ × ¼	5/3	8 × 5½ × ¼	2/9	10 × 8 × ¼	6/9
12 × 10 × ¼	7 3	10½ × 7 × ¼	4 7	7 × 5 × ¼	2/3
12 × 12 × ¼	8 6	12 × 6 × ¼	4/6	10 × 9 × ¼	5/8
14 × 12 × ¼	10/-	22 × 11 × ¼	15/3	9 × 5½ × ¼	3/5
16 × 12 × ¼	11/6	16 × 9 × ¼	9/-	10 × 5 × ¼	3/3
18 × 12 × ¼	13 -	12 × 11 × ¼	8 3	12½ × 9½ × ¼	7/6

PARAGON POLISHED MAHOGANY EBONITE

is NOT a composition, but GUARANTEED POST OFFICE QUALITY EBONITE, and is of similar specification to the now universally used PARAGON EBONITE.

PANELS CUT TO SIZE, Squared, edges ground, 1d. per square inch.

Paragon - Curtis One Piece Mica Condenser



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The duty of fixed condensers in wireless receiving circuits is one of paramount importance. While so small a component may appear innocent of reducing the efficiency of any receiver, the function of a fixed condenser is such that it requires a guaranteed uniform accuracy.

The manufacture is of so precise a nature that any two Paragon-Curtis Condensers of the same stated capacity picked out at random are guaranteed to be of uniform accuracy.

AS USED IN THE 3-VALVE REINARTZ DESCRIBED IN THE DECEMBER ISSUE OF "MODERN WIRELESS."

.0008 to .006	2/6
Complete with Grid leak Clips	2/9
Grid leak	1/3

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BUILD your own automatically tuned LONG DISTANCE RECEIVER. Complete set of parts, including drilled and engraved Paragon Panel and Polished Mahogany Cabinet, with suitable circuit diagrams. From £4 15s. 0d.

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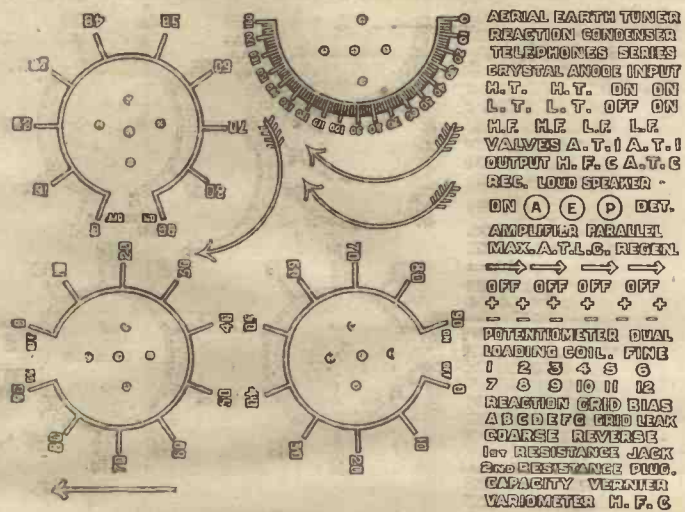
This name on every envelope is your only guarantee against spurious imitations. Nu-graving is guaranteed for an indefinite period against chipping or cracking.

COMPLETE AS SHOWN (Series No. 10), 6d.



REDUCTION IN PRICE.

The following reduced prices for Nu-graving series operate from 15th November: Series 1, 2 and 8, 3d. each. Series, 3, 4, 5, 6 and 7, 2d. each.

Home constructors who wish to build a successful receiver should apply for our 16 pp. catalogue of "Essential Raw Materials and Accessories" free on request.

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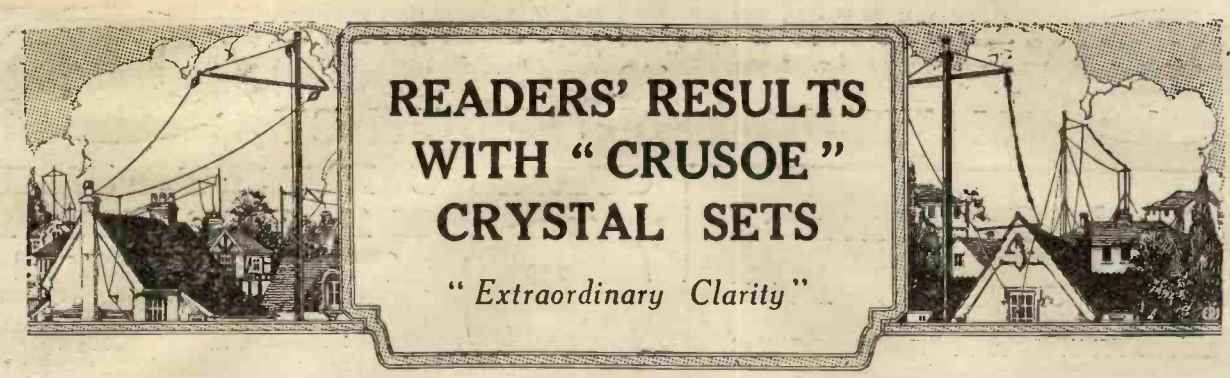


READERS' RESULTS WITH "CRUSOE" CRYSTAL SETS

"Extraordinary Clarity"

DEAR SIR,—I regret very much that I did not see THE WIRELESS CONSTRUCTOR for November before purchasing my first crystal set for receiving 2BE, two weeks ago. Two days ago I constructed a "Crusoe" set as per your first article, and from the instant of connecting up earth and aerial have received 2BE with double the volume that I ever got it on the set I paid 17s. 6d. for. As further co nparison, the signals I get on my "Crusoe" (a jolly fine name for it, too) when using my wire mattress for an aerial are just equal in volume to those of my bought receiver under the best conditions, *i.e.*, attached to my overhead aerial of 90 ft. Am looking forward to No. 2 of "T.W.C." as I am a totally disabled soldier and confined to bed most of the time. Wireless broadcasting has given me new life. Many, many thanks for the "Crusoe" article.

Yours truly,

Lisburn, Ulster. JOSEPH ROY.

DEAR SIR,—I am very pleased to tell you that by following your instructions about making "The Crusoe Set" in the November issue of THE WIRELESS CONSTRUCTOR, I have received London with extraordinary clarity; in fact, the set receives the signals clearer than with my . . . . Crystal Receiver.

Wishing you every success with your wonderful new monthly.

Yours, etc.,

J. SEYMOUR.

Lee, S.E.

Bedtime stories. Rover is not asleep, though!

More Help for the Home Constructor

SOME NEW RADIO PRESS PUBLICATIONS

Two New Envelopes

READERS who have already bought one or more of the Radio Press envelopes will welcome the two new envelopes that have just appeared; while for those who have not yet tried them they present an excellent opportunity of discovering their great utility. These two envelopes are Nos. 8 and 9.

Envelope No. 8

Envelope No. 8 contains complete instructions for the construction of a single-valve reflex set, by Herbert K. Simpson. This circuit is one that has proved itself extraordinarily popular with our readers, probably for two reasons. First, it gives not far short of "three-valve" results with the consumption and ease of control of one valve only; and, secondly, as it employs a crystal detector, the quality of reproduction is very good. The single-valve reflex stands in a class by itself, for it is a set that is very stable in action and yet extremely sensitive. Here in London it has been possible not only once but several times to receive Birmingham on a reflex set with a frame aerial only two feet square, and other stations have also been received at times, while 2LO is just clearly audible in the loud-speaker. This is a set that will prove of great interest to any experimenter who has not yet made up a receiver on these lines, while the beginner who wishes to try out this circuit will find the detailed instructions given will enable him to complete a set from which he can obtain valuable experience with the certainty of making a success of it.

Envelope No. 9

Envelope No. 9, by the same author, gives all the necessary directions for making an efficient single-valve receiver. Although many hundreds of circuits have appeared from time to time, the single-valve set still retains a large measure of popularity because of the reliable and efficient results that can be obtained with it. It is one of the easiest sets to handle after the humble crystal set, and owing to the employment of reaction is extremely sensitive. In this set reaction is magnetic, and the usual two-coil holder serves to couple the reaction coil to the aerial coil. Terminals are provided for constant aerial tuning, and a further refinement is provided in the form of a variable grid-leak; this will be found of help in making final adjustments when receiving distant or weak transmissions. With this set, favourable conditions obtaining, all the B.B.C. stations can be received on an average P.M.G.

aerial, and many Continental stations as well.

Both the above receivers have already been built by our readers, and many extremely favourable reports have been received.

Radio Press Transfers

How many an experimenter has looked at a finished set with pride and thought: "If only I could get this engraved cheaply and without trouble." This is now possible. Results equal in every way to engraving can be obtained by a means which he can employ himself. The Radio Press Transfers, costing but a humble sixpence, provide him with an adequate solution to this problem. Each set of transfers is placed in a sealed envelope for protection, and contains 80 different transfers. Full instructions are given how to apply them, and they can be put on to a set in a few minutes, and so give the completed instrument an appearance of professional finish.

Our Blue Print Service

If you are contemplating building any valve set it is now possible for you to obtain blue prints which have been made from the actual sets and original drawings of the author. The veriest beginner in wireless work is enabled to profit by the experience of technical wireless experts. The actual layout of the set is shown on one blue print, which is full size, and can therefore be used as a drilling template, while the other gives a complete wiring diagram, which is copied direct from the original set itself, and is a full-size reproduction of the back of the panel with all the connections appearing. These blue prints are 1s. 6d. each, post free, and will be found well worth this. We have started this service specially for the benefit of those readers who like to be able to obtain exact information of sets as made up by members of our technical staff. If you will write to the Sales Manager he will be pleased to send you a complete list of all these blue prints.

The Special Test Department

So confident are we in the design of our sets and so sure that the public will find them satisfactory, that we have opened a special test department. This department is completely equipped with up-to-date precision instruments of various kinds.

Would it not be worth time and money to you to be able to benefit by the use of such apparatus in testing out a set that, for some reason or another, has proved faulty?

If, then, you make up a set from our design which you feel is not up to what you expected, you may send it to us, and for the nominal sum of 2s. 6d. per valve we will test the set out thoroughly and send you a complete report. This small charge we make is actually only a fraction of the cost to us for this highly-skilled work, and this offer is an earnest of the confidence we place in sets built and designed by our technical staff.

What Coil shall I Use?

A good deal of doubt frequently arises as to the right size coils to use so as to receive a certain transmission. The Radio Press have published the *Modern Wireless* Coil Table, by means of which this difficulty can be solved at a glance.

In order that this table may be kept as a permanent record, it has been printed on stout card, and may be obtained at 6d. each.

Other data and useful information can be obtained as to our series of books and envelopes, and a card to the Sales Manager, Radio Press, Ltd., Bush House, Strand, will bring you a list of these.

Practical Workshop Hints

How to use your vice—How to treat the soldering iron—Large holes in ebonite.

NEITHER ebonite nor brass should ever be gripped between the bare jaws of a metal vice. Both are comparatively soft substances and, as the jaws are roughened, deep marks will be made which are most difficult to remove. The best tip is to obtain a piece of sheet lead of the same width as the jaws of the vice and to cut two pieces about 4 in. in length. These are bent to fit the jaws so that they remain in position when the vice is opened. If for any reason sheet lead is not available, thick cardboard can be used quite well in an emergency. When it is desired to hold the shank of a terminal or a screw in the vice, bend a thin strip of lead into a V-shape and push the threaded part into it. The lead can now be screwed up tightly and it will grip the threads without injuring them in any way. When a brass nut has to be gripped, always place a screw in it first of all, otherwise it may be crushed out of shape by the jaws of the vice. The screw serves to prevent it from being distorted.

Don't Forget the Oil

Always keep the screw of the vice well oiled. If it is allowed to become dry, a considerable amount of wear will take place and the jaws are apt to become rather wobbly. Be careful when filing a small piece of work not to cut the jaws of the vice. The best tip here is to make a pair of covers of sheet brass of the same size and shape as the lead ones recommended for holding brass and ebonite. Do not use lead covers when filing, for this soft metal clogs up the file and spoils its keenness very rapidly. It is very important that the vice should be firmly fixed to the bench so that there is no movement in it whilst work is being done. If it is of the type provided with a clamping screw, a plate of iron or stout sheet brass about 3 in. square should be placed between the head of the screw and the underside of the table. When this is not done the wood will be crushed and the vice

will come loose as soon as any effort is exerted on the work which it holds. The metal plate protects the wood and allows the vice to be fixed quite firmly to the table. Vices of the type not provided with a clamping screw are best fixed by bolts to the bench. Wood screws, even if of large gauge, do not give a satisfactorily firm grip. Bolts ¼ in. in diameter are generally suitable, and care should be taken to place a large washer below each nut so that the wood may not be crushed when it is tightened up. When buying a vice, screw it up as tightly as possible and then hold the jaws up to the light. If they fit badly, any "gape" will be detected without difficulty. Badly made vices frequently gape at one end or the other. These are a great nuisance since it is impossible to hold very thin work securely in them.

* * *

Take good care of your soldering iron. An iron that is allowed to become dirty and pitted will never do the quick, neat work that is essential in wireless construction. When you buy an iron, do not save a penny or two by purchasing a common article fitted with a bit made of poor-grade copper. Copper that contains a proportion of impurities is most unsatisfactory; it does not take a good coating of tin and solder does not flow well from the point when joints are being made. You will probably begin by purchasing a small, light iron. This is quite a good thing to do, since one gets the "feel" of such a tool much more easily than of a heavy one. The disadvantage of using a small iron is that it cools very rapidly. Later, when the soldering iron has ceased to feel unwieldy, provide yourself with a good-sized one. Most soldering irons are sold with the points not sufficiently trimmed up for wireless work. The shape that I find most useful is something like a screw-driver. The point is filed to a flat edge about ¼ in. wide and $\frac{1}{16}$ in. thick. This enables one to do fine work even with a large iron, and the solder flows very nicely from it. The advantage of having a point of this kind is that it has two fairly big surfaces on to which a large blob of solder can be run for soldering wires to the points of terminals.

* * *

Both the life of a soldering iron and the quality of the work done by it depend very largely upon the way in which it is treated when it is first acquired. When trimming up the point in the way recommended in the last paragraph, you may come across a few small pits in the metal. Always file these right out and polish up the surface roughly with emery cloth. Then give the bit a really good tinning. As good a way as any of doing this is to cut a piece from a flat

Mr. F. G. Kellaway, the new Managing Director of the Marconi Company. Inset: Mr. Godfrey Isaacs, the retiring Managing Director.

biscuit tin, punching a hole at each corner. This should be fastened to a piece of wood with a sheet of asbestos millboard between the tin and the wood in order to prevent charring. To tin the bit, place a little resin or prepared flux on the metal, heat the iron up until green flames show round it and then rub each face in turn over the surface of the tin. The plate may be kept in the workshop toolbox for future use. As its original tin is removed a few chips of *hard* solder should be added from time to time to the flux upon its surface.

Hard Solder

Hard solder makes for better tinning of the iron than soft, but it is not suitable for making wireless connections. Blowpipe solder requires no great heat to make it flow, but the stuff sold in triangular sticks needs a very hot iron. Blowpipe solder makes perfectly sound joints, and if it is used ebonite panels are not liable to be injured by overheating during the process of soldering. Care must be taken not to use for wireless work a flux which has a corrosive action upon metals. The spirits of salts employed by tinsmiths and workmen in other trades, though it makes for neat work, is quite unsuitable. If it is used corrosion will set in around and within the joints made, with the result that a very high resistance may be set up, or even that connections may come adrift of their own accord in time. Powdered resin makes a good flux; but perhaps the easiest thing for the beginner to use are ready-made preparations such as Fluxite, which will be found very satisfactory and quite easy to work with. Avoid as far as possible covering the under surfaces of your panels with the splutterings of whatever flux is used. The best way of keeping ebonite free from flux is this: Before soldering is done take some pieces of blotting paper and push them over the shanks of terminals, valve legs and so on. They will catch and mop up any splutterings, and when soldering has been done they can be removed by simply tearing them away. If a greasy flux does get on the ebonite it is rather difficult to remove. The easiest method, I think, is to wipe off as much as you can and then rub the panel over with a rag that has been dipped in petrol or benzine.

* * *

It happens sometimes that one requires to make large holes in ebonite panels for the accommodation of certain kinds of components. Round holes up to $\frac{3}{8}$ inch in diameter can be made with the breast drill, provided that its chuck will take drills of this size; but when we come to holes 1, 2 or 3 inches in diameter direct drilling is out of the question. To make round holes of large size proceed as follows: Make a punch mark in the panel where the centre of the hole is to be. Run the smallest drill you have right through at this point. Take a pair of dividers, and on each side of the panel scratch a line to mark the circumference. The small hole drilled will, of course, be used as a centre for this

(*Continued on page 251.*)

Things to Remember about Variable Condensers

A variable condenser gives the maximum capacity when the moving plates are right in the stationary plates.

Fitting a larger capacity condenser does not increase your range in miles, it only increases the band of wave-lengths over which you can receive.

If you have two condensers you wish to use together, connect them in parallel to get a higher maximum capacity and in series to get a lower one.

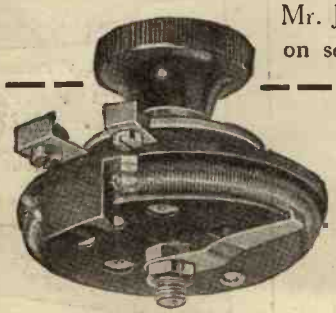
Always connect the moving plates of a variable condenser in the aerial circuit to earth, or, if used in a tuned anode or high-frequency transformer circuit, connect them to H.T.+. This will help in eliminating hand capacity. The term "hand capacity" is used to denote the effect on the tuning of a receiver due to the presence of the hand near the control knob of a variable condenser. When the hand is taken away, the set may burst into oscillation, or the received signal may vanish.

Dust between the plates of a variable condenser may make a set noisy and inefficient. An easy method of removing such dust is to use a woolly pipe-cleaner with a trace of vaseline. Use very little vaseline or the plates will get greasy and get dusty more easily than before.

Build your set the Burndept way

Burndept Components are a little dearer but they are a lot better

WHEN you build your set, use Burndept Components to ensure getting the best possible results. You can buy them from any Burndept Agent and they are exactly the same as those used in the Burndept Receivers, which have a world-wide reputation for their great efficiency and power. The fact that the demand for Burndept Apparatus has increased considerably this year should be a clear guide to you in the choice of components for your set. Furthermore, notice that sets described in *Wireless Constructor*, *Modern Wireless*, and *Wireless Weekly* frequently incorporate Burndept Components, their use being strongly advocated by Radio Press writers. Mr. John Scott-Taggart, F.Inst.P., A.M.I.E.E., has commented favourably on several of them.



The Dual Rheostat

THIS Burndept Component makes possible the use of bright or dull-emitter valves in a set, no alteration of any kind being required. One half of the element is wound to a resistance of 5 ohms and is used to control a bright valve, the other half being wound to a resistance of 25 ohms. The whole 30 ohms resistance is used to control a dull emitter valve. The movement of the brush over the windings is practically noiseless.

No. 222. Dual Rheostat, 5—30 ohms, for fitting to any panel from ⅛ to ¾ inch thick - - - - **7s. 6d.**

Use GUARANTEED Components

All Burndept Components are fully guaranteed. This makes doubly sure that you will get good results. Any piece of apparatus developing a defect within twelve months of purchase will be replaced free of charge. An important point is that the capabilities of any Burndept Component are always described with strict accuracy, the facts being supplied by the Burndept Research Laboratory. Thus you can rely with absolute confidence on the performance of any component. It is true that Burndept Components cost a little more than others; but that "little more" is well spent because of the splendid results you get.

Many of the Burndept Components have unique features. The Dual Rheostat (see panel) enables you to use bright or dull-emitter valves without alteration to your set; the Variable Condensers have special patented bearings which take up wear without changing the capacity and give a particularly smooth movement; the Anti-Phonic Valve Holder entirely eliminates the microphonic noises associated with dull-emitter valves; and so on.

Latest Catalogue sent FREE

The Burndept 84-page Catalogue contains illustrations, descriptions and prices of Components and auxiliary apparatus, accessories, receivers for home assembly and receivers ready for use as well. Whatever you want for radio, you can look it up in the Burndept catalogue, a copy of which will be sent free on receipt of a postcard. It is a handy publication to have by you and contains a great amount of interesting data which you will find very useful. Write for the Burndept Catalogue to-day.

Your nearest Burndept Agent will be willing to demonstrate Burndept Apparatus to you and to advise you on any matters concerning radio about which you may be in doubt.

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Telegrams: Burndept, Westrand, London.

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BURNDEPT
WIRELESS APPARATUS

Purchase Burndept by its name—substitutes are not the same

(*Continued from page 249.*)

purpose. Now put your largest drill into the chuck. Inside the line scratched on the panel make a number of punch marks, placing them so that holes drilled will just not cut the circumference. Drill holes fairly close together all round. Now place the panel in the vice and with a small round file run each hole into the next until the unwanted portion in the middle is cut away. You have now a rough hole, with very ragged edges, slightly less in size than that which is required. Take a coarse half-round file and trim away most of the superfluous ebonite, then finish with a fine D file and with emery cloth. It is surprising how quickly holes up to 3 inches in diameter can be made in this way.

Square Holes

Rectangular holes are made in much the same way. Mark out the position of the hole required on one side of the panel, then run a very fine drill through at each corner. This will help you to do the marking-out on the other side of the panel as well. Now drill the biggest hole you can close to each corner and cut along close to the scribed lines with a fretsaw. If you do not possess a fretsaw, drill a good many holes along the edges and run them into one another with a small rat-tailed file as before. The purpose of marking out either round or square holes on *both* sides of the panel is to enable you to do the final trimming up without any difficulty. If marking is done on one side only it will be found that the edges of the hole are not quite perpendicular to the surface of the panel. Large, round holes in wood may be made in the same way as in ebonite, though by far the best way of doing this kind of work is to use an expanding bit in the brace.

Those Puzzling Letters

To save time, and the repetition of numerous phrases, a kind of shorthand, employing Greek letters and other symbols, is used in wireless. This notation is less complicated than many imagine, and an explanation of the chief symbols used is given here to aid those who have hitherto found it puzzling.

μF—*microfarad (a convenient unit of capacity).*
$\mu\mu$F—*micro-microfarad (a millionth of a microfarad).*
ω—*ohm (a unit of resistance).*
Ω—*megohm (a million ohms).*
λ—*wavelength.*
μ or M—*amplification factor of valve.*

L.F.—low-frequency. *L.T.—low-tension.*
H.F.—high-frequency. *H.T.—high-tension.*
R—with a numerical suffix refers to a resistance, e.g., R_1.
L " " " " an inductance, e.g., L_2.
C " " " " a condenser, e.g., C_3.
Z usually indicates a choke coil.
IP—inside primary
OP—outside primary
IS—inside secondary
OS—outside secondary
} *of low-frequency transformer windings.*

The Single Valve

SOME INTERESTING CIRCUITS OF HIGH EFFICIENCY

Practical notes on several arrangements which will be found to give good results with very little apparatus

THE beginner, as well as the amateur with limited facilities, is naturally anxious to use and get the maximum results from the most simple instruments. In this article are described half-a-dozen single-valve sets, all of which are efficient. All are "straight" circuits, and have all given good results in actual practice.

The Valve as Detector

Fig. 1 is the circuit of a loose-coupled receiver using the valve as a detector, with reaction. This enables distant stations to be received, and makes the set ever so much more selective and sensitive. L_1 is the aerial coil, and is shown as being untuned. There is, therefore, only one actual tuning control, C_1 in the secondary or closed circuit L_2C_1. The grid condenser can be of the usual value of ·0003 μF, and a variable grid leak is connected across it. This latter allows of making fine adjustments when bringing in a distant station. The correct values of the coils for broadcasting will be L_1 a 25 or 35, L_2 a 50 or 75, and L_3 a 50 or 75, while C_2 may be ·0005 or ·0003 μF. A three-coil holder provides a handy means of mounting and coupling these coils, but should the constructor desire to make his own coils and mounting, he can use whatever method is most

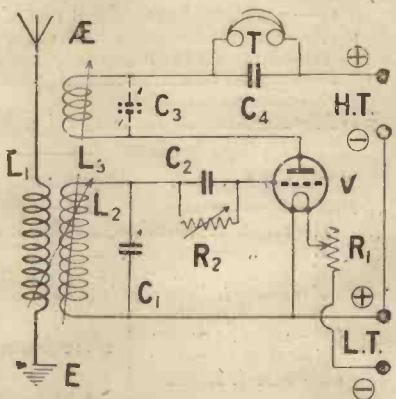

Fig. 1.—A loose-coupled single-valve set employing reaction.

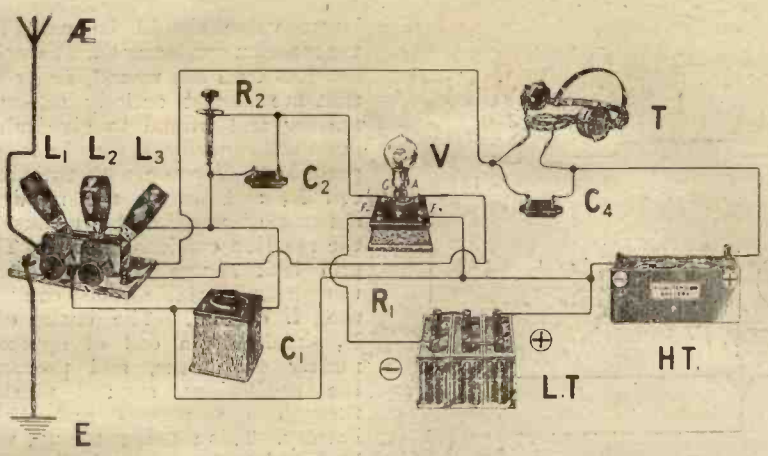

Fig. 1a.—The pictorial arrangement of the circuit shown in Fig. 1.

convenient to obtain the movements of the primary and reaction coils relative to the secondary or closed circuit. Searching should be carried out on this set with the reaction coil well away from the grid coil, or else the set is likely to oscillate and interfere with nearby listeners. With a little care it will soon be found easy to search for distant transmission with the set just off the oscillation point. A condenser C_3 may be connected across the reaction coil, as shown in dotted lines, and frequently helps to give fine control of reaction. If interference from the nearest broadcasting station is met with, the coupling between L_1 and L_2 should be loosened. This makes the set much more selective; at the same time it makes it more easy to

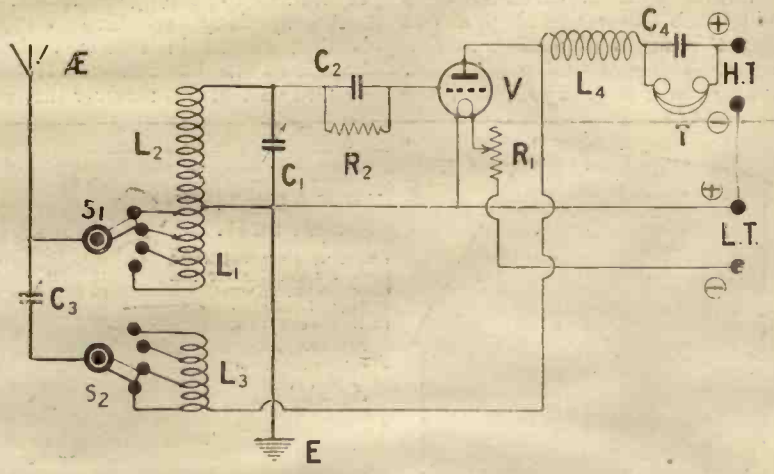

Fig. 2.—The Reinartz Receiver, a selective and sensitive set.

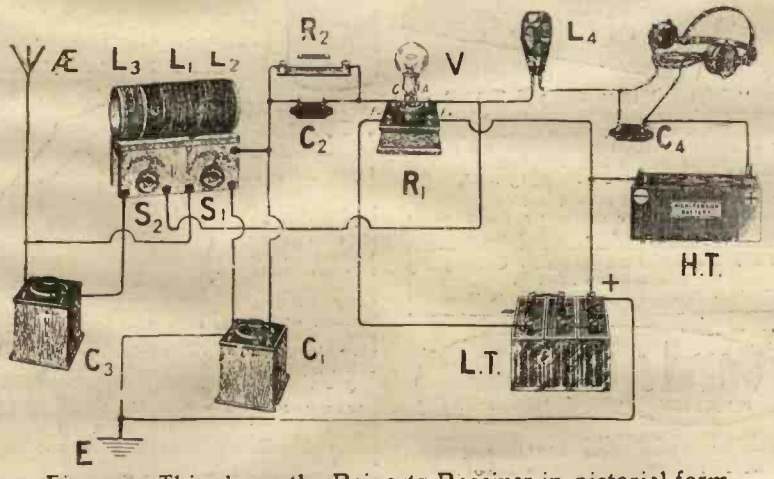

Fig. 2a.—This shows the Reinartz Receiver in pictorial form.

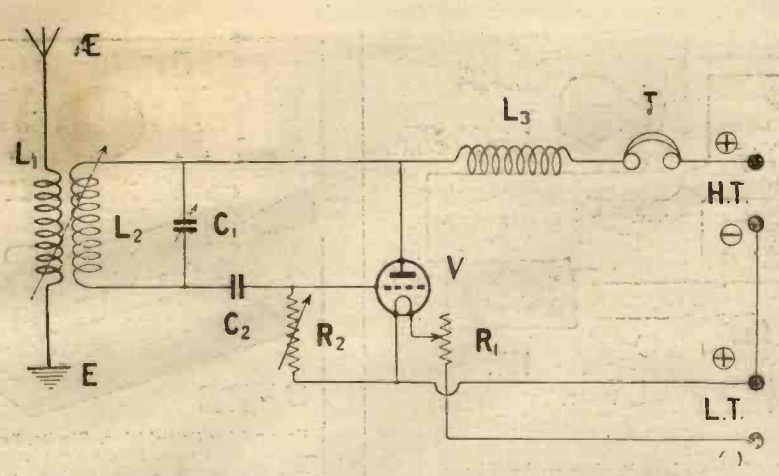

Fig. 3.—A circuit worth experimenting with is the Ultraudion.

oscillate, and it may be necessary to move the reaction coil further away from the secondary. Under favourable conditions this set will receive most of the B.B.C. transmissions, as well as many Continental stations, and gives the amateur valuable experience in tuning and handling a set.

The well-known Reinartz receiver is shown in Fig. 2. Here the aerial is auto-coupled to the grid coil, both coils being wound continuously on the same former, a common earth connection being made at E. The aerial coil is tapped, and thereby gives control of the coupling, allowing increased selectivity to be obtained when necessary. The plate coil L_3 is wound in the same direction as L_1 and L_2, being connected as shown in the figure. For broadcast wavelengths L_1 may consist of 30 turns, L_2 of 60, and L_3 45, wound on to a former 3 in. in diameter or a spider-web former giving a coil with this mean dimension as diameter. The grid tuning condenser can be ·0003 or ·0005 μF, and the larger value should be used for the reaction condenser C_2. If special low loss coils are wound, *i.e.*, coils that are almost entirely self-supporting and wound to give minimum self capacity, it may be found possible to dispense with the plate coil L_3 and obtain the required amount of reaction by means of the reaction condenser alone. The grid leak shown is 2 megohms, though a variable one can be used if desired. The choke coil L_4 should be a coil of approximately 250 turns, and prevents the oscillations from passing through the phones and H.T. battery. This set, if made up, will be found to be most selective and to give a most delightful and smooth control of reaction, and with suitable values for coils and condensers it makes a very successful short-wave receiver. The condenser C_4 is optional, and rarely needed. This set may also be used with a small condenser of ·0001 μF capacity inserted in the aerial lead if it should be found difficult to get the set to oscillate smoothly over the whole wave band covered by the tuning condenser.

A specially selective circuit is that shown in Fig. 3 and is known as the Ultraudion. It will be seen that in this receiver the two

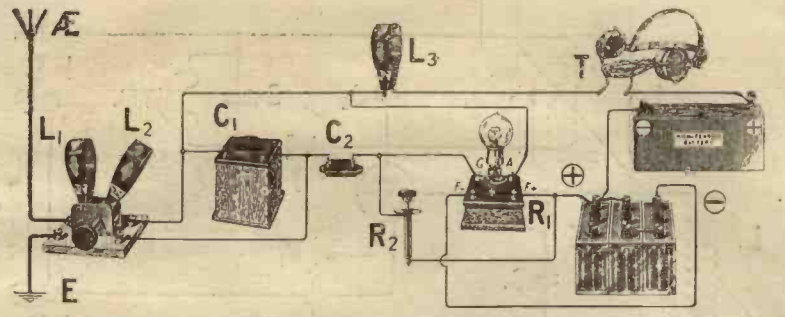

Fig. 3a.—The Ultraudion is here shown pictorially.

leads from what is frequently called the grid coil go to grid and plate instead of grid and L.T. positive, and that the grid leak is connected between the grid and the positive leg of the filament. It is almost essential in this receiver that the grid leak should be variable, and, when getting one, make sure that it is made by a reliabl. firm. A poor grid-leak can ruin reception. The grid condenser is of the usual value. The choke coil L_3 should consist of a low self-capacity coil of about 250 turns and is placed in the plate lead as shown. L_1 and L_2 may be 25 and 50 or 75 coils respectively, although better results have been obtained with this set when using single-layer home-made coils. It should be possible to vary the coupling of the aerial to the closed circuit as this helps in the control of oscillation. The tighter the coupling the less will be the tendency of the set to oscillate. In operating this receiver the valve should be turned to a little below its normal brilliancy, the H.T. battery is then plugged into the highest value that the set will take without oscillating. This will then make it possible to get the set to oscillate by turning up the filament just a little (or by varying the variable grid leak), over the whole scale of the tuning condenser. This last will be of the usual value of ·0005 or ·0003 μF. It should be noted that this set is extremely

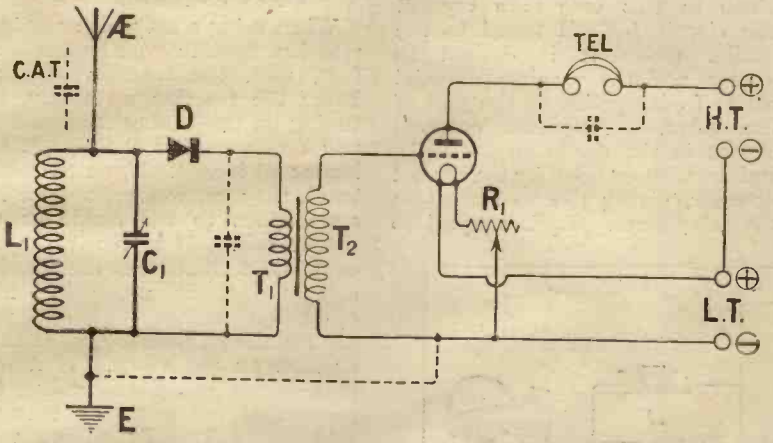

Fig. 4.—A crystal receiver with one stage of low frequency amplification. The C.A.T condenser can be inserted in the aerial lead where shown.

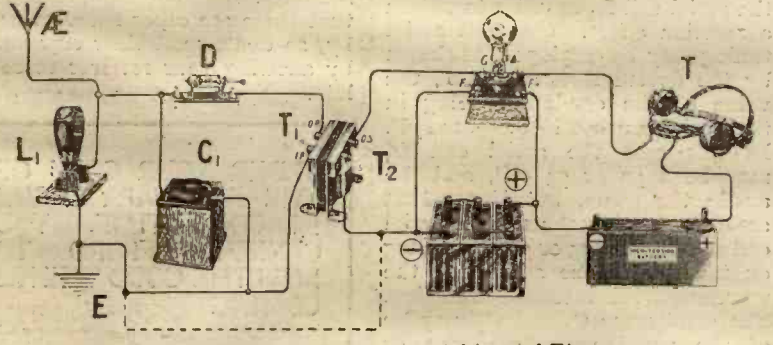

Fig. 4a.—This is the pictorial form of Fig. 4.

liable to cause interference and the tuning is exceedingly critical. It is therefore hardly a set for a novice to commence with.

For Crystal Enthusiasts

There are, no doubt, many crystal users who wish to obtain greater volume from their sets without having to alter their receiver in any way, and also want to be able to get this additional volume without complicating the tuning. Fig. 4 then shows a crystal set with the addition of a valve functioning as a low-frequency amplifier. If the constructor already has a crystal set and merely wishes to add this amplifier, it can be made up as a unit in a box to match the set, or, on the other hand, an amateur who wishes to make the whole set complete can mount both crystal receiver and amplifier on the same panel. The intervalve transformer should be a good one if it is to ensure the greatest volume consistent with quality being given. The connections shown in the figure are very easy to follow, and it may be found an advantage to connect the L.T.— to Earth, as shown by the dotted line. Constant aerial tuning as shown in dotted lines at C A T may also be found an advantage, in which case the value of the condenser will be about ·0001μF. Another thing that may be tried is reversing the two leads from the secondary of the intervalve transformer to the valve. Under favourable conditions this receiver will work a small loudspeaker from your local broadcasting station if this is within five or six miles and the aerial is a good one.

If it is desired to make a set that will give range rather than volume, Fig. 5 shows the circuit to be used. In this set the valve is used as a high-frequency amplifier, amplifying the signals before they are rectified by the detector, which in this case is a crystal. The circuit L_1C_1 is tuned to the station which it is desired to receive, and the varying potential across L_1 is applied to the grid of the valve. Amplified currents appear in the anode circuit L_2C_2, and are then rectified by the crystal detector, giving rise to sounds in the telephones. L_3 is coupled to the aerial coil L_1 in order to obtain a reaction effect. Constant aerial tuning may be employed, as shown by the dotted lines at C A T, the value of the condenser being in the neighbourhood of ·0001μF. In this case the aerial coil L_1 may be a 50 or 75 coil, and the anode the same, but if constant aerial tuning is not used the aerial coil will be a 25, 35 or 50, depending on the size of the aerial and the wavelength it is intended to receive. The condensers C_1 and C_2 may be of the usual value of ·0005 or ·0003μF, and it will be noticed that no grid condenser is used in this circuit.

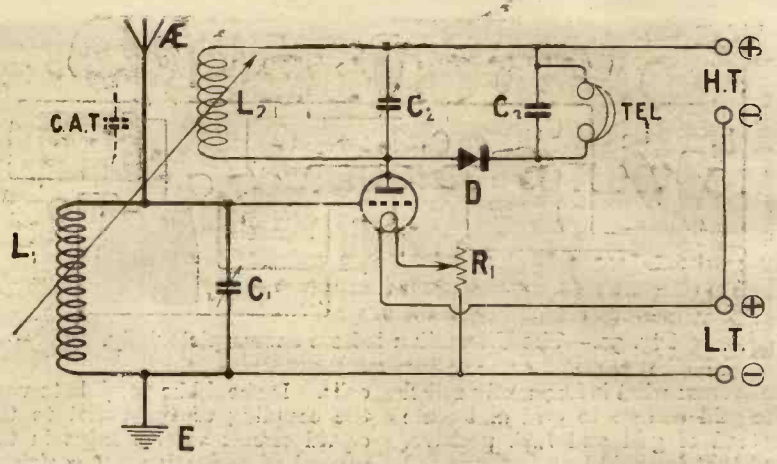

Fig. 5.—High frequency amplification precedes a crystal detector.

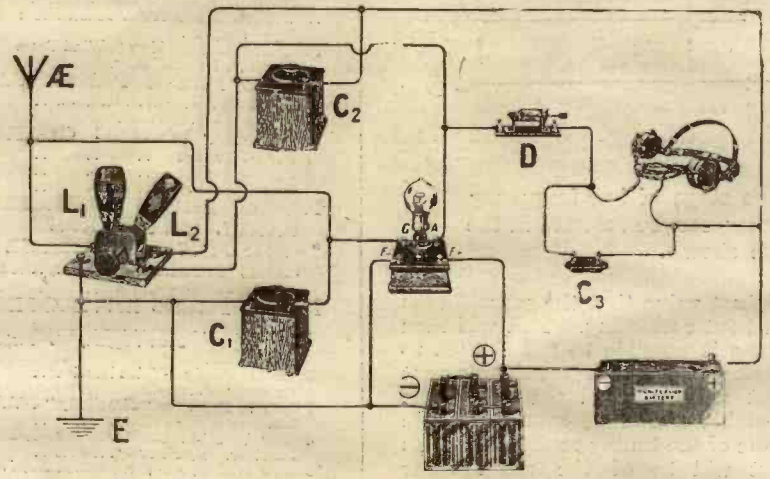

Fig. 5a.—The circuit shown in Fig. 5. appears pictorially here.

Tips on Operating a Set

When using a set which employs reaction, tune in your local station first, with the reaction at zero. Bring the reaction up slowly, retuning on the tuning condenser as you do so, and if the signals get louder all is well. If, on the other hand, they get weaker, reverse the connections to the anode or reaction coil. If a receiver spills over into oscillation as the reaction coil is brought up, going into oscillation with a "plonk," you are probably using too much H.T. or L.T. on the valve. If it still persists on readjusting these, try connecting the grid leak between grid and L.T.+ or replace with a variable leak. Use your wander plug on a distant transmission; you will then be able to get the most suitable value of H.T. for the particular valve you are using. Then leave it alone. When tuning or searching move controls of variable condensers, or move coils slowly. You are then not likely to pass over a transmission without hearing it. Keep dust away from your set. It spoils the efficiency of the receiver, helps to run down your H.T. battery, and may make the set noisy. And, above all, remember that there are other listeners near-by, so don't spoil their enjoyment by allowing your receiver to oscillate.

Ebonite with a pedigree !

THAT is the best description of Radion we can give you. Every panel of Radion that is issued is made in one of the big factories of the American Hard Rubber Company—the largest manufacturers of high-grade Ebonite in the World. Every panel is marked Radion—we are proud of it and are only too glad to back it with a reputation that is second to none.

Every panel is fully guaranteed leakproof, free from warp, and is supplied with a beautiful polished surface which need not be removed before use.

Indeed, the surface should *NOT* be removed because it prevents the formation of dust or moisture—both of which are sworn enemies of clear reception.

Scientific tests have proved that Radion has the lowest dielectric constant and the lowest absorption of moisture of any panel material in the world. It is these two qualities particularly that are responsible for the excellent results obtainable from Radion-built Sets.

All first-class Dealers are stocking Radion, which is conveniently sold in 21 different sizes with edges ground square and packed in stout manila envelopes. Radion is sold in black and mahoganite—the latter being a beautiful simulation of old mahogany with all its tints and colours. Dials and knobs can be obtained to match.

Why risk building a good set on an unknown piece of ebonite or even on an ebonite made to a specification not necessarily most suitable for wireless when at little—if any—greater cost you can use a Radion Panel guaranteed in the fullest sense of the word?

RADION SIZES AND PRICES:

Size	Black	Mahoganite	Size	Black	Mahoganite	Size	Black	Mahoganite
6" × 7"	3/6	4/3	7" × 14"	8/-	10/3	8" × 26"	17/6	21/3
6" × 10½"	5/3	6/6	7" × 18"	10/6	12/3	9" × 14"	10/3	12/3
6" × 14"	7/-	8/6	7" × 21"	12/3	15/-	10" × 12"	10/-	12/-
6" × 21"	10/6	12/9	7" × 24"	14/-	17/3	12" × 14"	13/3	16/-
7" × 9"	5/3	6/3	7" × 26"	15/-	18/6	12" × 21"	19/9	24/3
7" × 10"	5/9	7/3	7" × 30"	17/3	21/3	14" × 18"	19/9	24/3
7" × 12"	7/-	8/6	7" × 48"	28/-	34/3	20" × 24"	39/6	48/-

Special Note :—All $\frac{3}{16}$" thick—quite sufficient owing to Radion's tremendous streugth.

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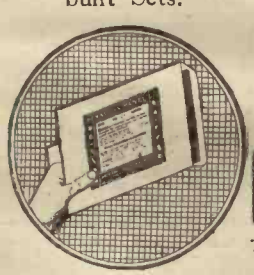
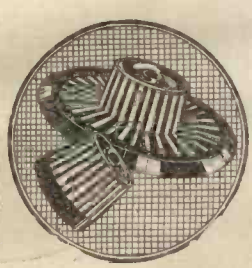


RADION A PANELS
TRADE MARK



Gilbert Ad., 1779.

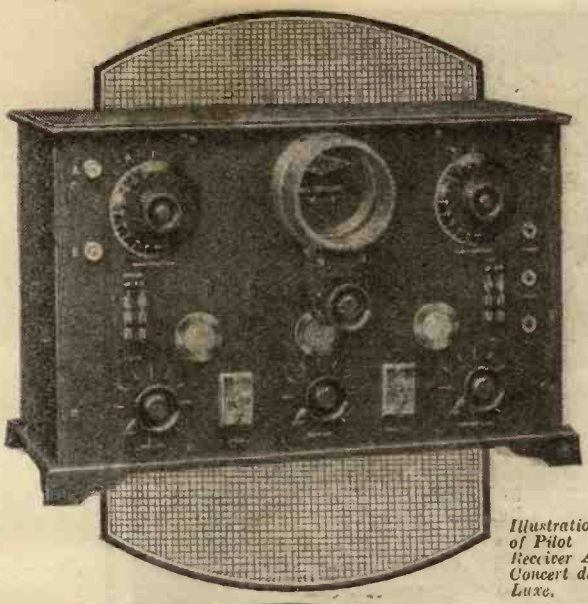


Illustration of Pilot Receiver All Concert de Luxe.

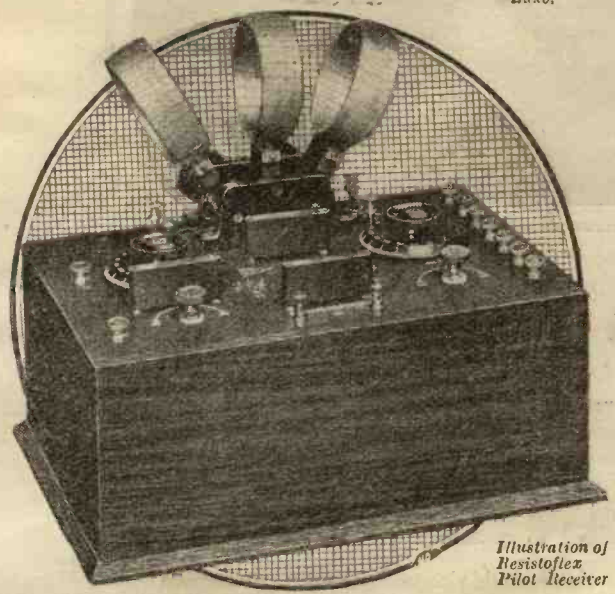
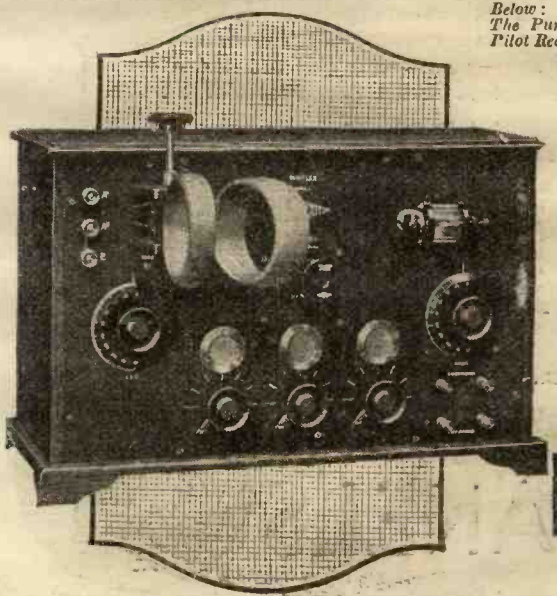


Illustration of Resistoflex Pilot Receiver

Below: The Puriflex Pilot Receiver.



Set building

—details of a new scheme

WHEN a man decides to build a good Receiving Set he immediately comes up against the difficulty of a suitable cabinet and the drilling and engraving of the Panel. Cabinet making is a skilled man's job, and many a perfectly good piece of ebonite has been spoilt by a hole in the wrong position or because it has been incorrectly cut to size.

To eliminate most of the difficulties in Set-building we have instituted the PILOT Service. In future all Sets described in *Modern Wireless*, *Wireless Weekly* or the *Wireless Constructor* will be available in sets of parts for the Home Constructor with panels ready drilled, tapped and engraved. Two types will be placed on the market—Type A following the author's literal specification and using his actual components, and Type B an adaptation using Peto-Scott guaranteed components.

In each case the panels can be obtained quite plain with squared edges and matt finished ready for use or drilled, tapped and engraved without components.

If all Peto-Scott components are used and our instructions carefully followed, we will positively guarantee that any Pilot Receiver Type B will give identical results to any Type A Set. The Pilot Service, therefore, enables any wireless enthusiast —irrespective of experience—to build a Receiving Set equal in every respect to the ready-made Instrument costing considerably more. There is absolutely no need for anyone to be afraid to build up a Pilot Receiver, because full wiring instructions are supplied and nothing can possibly go wrong.

6 Exclusive Pilot Advantages

1. Absolutely no previous Wireless skill required—the only tools necessary are a screwdriver, soldering iron (optional) and a pair of pliers.
2. Every Set when completed is quite the equal in efficiency of the original.
3. Provides a high-grade Instrument at the cost only of the components.
4. Success guaranteed — failure quite impossible if instructions are followed.
5. Every Instrument designed by a recognised expert.
6. The only System for the Home Constructor backed by a Service Department.

"Red Triangle" Panels

The following sizes are now available for all Radio Press Receiving Sets. Every Panel is ready for immediate use with edges squarely cut and surface carefully matt-finished.

		£ s. d.
All Concert de Luxe	16 x 8 x ¼	0 8 0
Transatlantic V	22 x 11 x ¼	0 15 0
All-Britain	16 x 9 x ¼	0 9 0
S.T. 100	12¼ x 9¼ x ¼	0 7 0
Puriflex	14 x 10¼ x ¼	0 9 2
Resistoflex	12 x 8 x ¼	0 6 0
Transatlantic 4	16 x 8 x ¼	0 8 0
Anglo-American	36 x 9 x ¼	1 0 0
Neutrodyne Tuner	12 x 10 x ¼	0 7 6
Neutrodyne Receiver	12 x 10 x ¼	0 7 6
3-Valve Dual	24 x 10 x ¼	0 15 0
Harris Crystal Set (*Modern Wireless*, Sept.)	9 x 5¼ x ¼	0 4 4

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made easy-

for the Home Constructor

In cases where a Pilot Set does not work after it has been built, it may be returned to our Service Department for their expert examination. If the fault is due to an error in wiring, the instrument will be put in working order at a nominal cost. On the other hand, should the fault be due to one of the components it will be replaced and the set put in working order without charge.

Prices of Pilot Receivers

	£ s. d.
All Concert de Luxe (Type A).	
Polished Mahogany Cabinet	1 7 6
Pilot Panel, drilled, tapped and engraved	0 13 0
Mahogany Base-board	0 2 6
Complete kit of components as specified by Author	6 17 6
All Concert de Luxe (Type B).	
Polished Oak Cabinet fitted with 7-ply baseboard	0 17 0
Pilot Panel, matted, squared and engraved	0 13 6
Complete kit of components	4 17 6
Puriflex (Type A).	
Polished Mahogany Cabinet	0 12 6
Pilot Panel, matted, drilled and engraved	0 14 6
Complete kit of components as specified by Author	5 11 0
Puriflex (Type B).	
Polished Oak Cabinet, fitted with 7-ply baseboard	0 17 0
Pilot Panel, matted, squared and engraved	0 12 6
Complete kit of components	4 5 0
All-Britain Receiver (Type A).	
Polished Oak Cabinet	0 15 6
Pilot Panel, matted, drilled and engraved	0 16 0
Complete kit of components, as specified by the Author	4 16 3

	£ s. d.
All-Britain Receiver (Type B).	
Polished Oak Cabinet, with baseboard	0 17 0
Pilot Panel, matted and engraved	0 13 0
Complete kit of components	4 9 0
Resistoflex (Type A).	
Polished Oak Cabinet (mahogany 2/- extra)	0 7 6
Pilot Panel, matted, drilled and engraved	0 10 6
Complete kit of components	3 15 0
Transatlantic V (Type A).	
Mahogany Cabinet with sliding back	1 12 6
Pilot Panel, drilled, tapped and engraved	1 4 6
Complete kit of components as specified by the Author	8 0 0
Transatlantic V (Type B).	
Polished Oak Cabinet with baseboard	0 17 0
Pilot Panel matted and engraved	0 13 6
Complete kit of components	5 4 6

Large illustrated Folder describing all Pilot Receivers sent free of charge on receipt of post card.

Prices given for complete kits of components do not include panels, cabinets, coils or H.F. Transformers.

Parts for the Anglo-American Set described by Mr. Percy Harris

The splendid 6-Valve Set described in this issue is available under the Pilot Service in two models.

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Model A.	Price of complete kit of components	£12 9 9
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	Mahogany Cabinet, extra in each case	3 3 0

These prices are necessarily provisional and subject to confirmation. Send for detailed prices now so that you can commence building the Set without waiting for the next issue of the Magazine.

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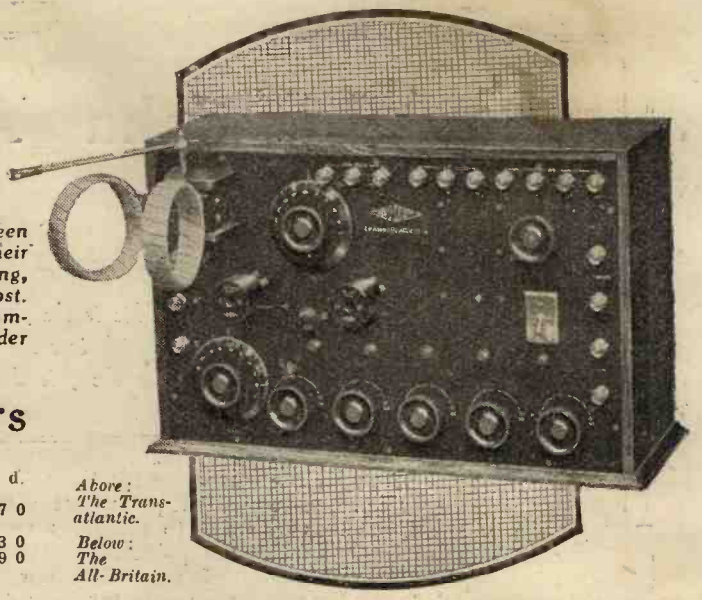

Above : The Transatlantic.

Below : The All-Britain.

Marconi Royalties are payable on all orders for complete outfits to build any of these instruments as they naturally involve Messrs. Marconi's patents and are payable at the rate of 12/6 per valve.

"Red Triangle" Ebonite

We have recently made arrangements to take over the whole of the output of a well-known firm of ebonite manufacturers. This Ebonite will be named "Red-Triangle" Brand and every piece, whether in panel or sheet, will carry our registered design of a red triangle for ready identification. "Red Triangle" Ebonite is being used exclusively for all Pilot Panels.

"Red Triangle" Ebonite has been certified by Professor A. M. Low to have passed the most stringent tests. The following is an abstract from his report :

Insulation tests at 500 volts.
Megohms per cubic centimetre $2,700 \times 10^6$.

Breakdown test.
A sheet 1 mm. thick broke down at 29,700 volts.

These figures definitely prove the immense superiority of "Red Triangle" Ebonite. Remember every Panel is fully guaranteed to be free from surface leakage, and is quite ready for use. All edges are squarely cut and the surfaces possess a smooth matt finish. Supplied in the following stock sizes—each panel being ¼ inch thick sealed and packed individually. :—

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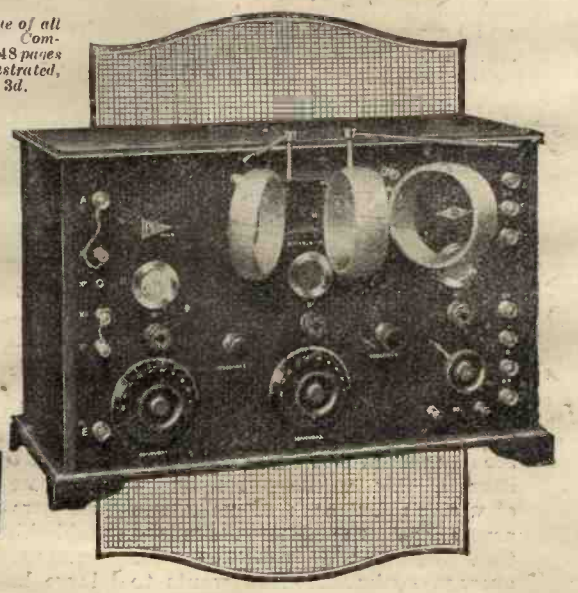

G.A. 1754.

John Anstruther Talks

By

R. W. HALLOWS, M.A.

This is the first of a series of popular chats on subjects which interest every listener. John Anstruther will soon be the friend of every "Wireless Constructor" reader

IT is some little time now since John Anstruther first came to live amongst us. He is a quiet, modest person, always ready to lend a helping hand, though he never airs his knowledge or thrusts unwanted advice upon others. He is, in fact, the sort of man who would be popular anywhere. He kept rather to himself in the early days, and all that we knew of him was that he was something rather big in the electrical world. None of us realised that he knew much about wireless until one night, when the Ainsworths had a party of half a dozen to listen to a broadcast programme and something went wrong with the set. Several of us tried unsuccessfully to locate the trouble, and then Ainsworth asked Anstruther if he could help.

How it Started

"I'll try," said John, and he went over to the set. He asked a question or two, ran over the wiring and put his finger on the defect in a moment. Since then we seem gradually to have fallen into the habit of taking our wireless troubles, great and small, to him. We used to drop in casually to his rooms in the evening, but now we have formed a kind of informal club which meets once a month at Anstruther's to discuss all kinds of points that crop up. Those of us who attend are all more or less beginners. We have a fair working knowledge of wireless, but each of us comes across just the little difficulties that beset the path of the average enthusiast who wants to increase his theoretical and practical acquaintance with the subject and to bring his receiving set to the point of greatest efficiency.

I remember our first meeting very well, for John Anstruther was at his best. I felt somehow that we were making use of him in an unwarrantable kind of way, and told him so. He paused for a moment in the process of filling the large briar of which the stem is nearly always between his teeth, and said:—

"You fellows need not worry on that score. So long as you promise to kick me if I show any signs of becoming a 'superior person,' you just fire away your questions and I will answer them to the best of my ability. As a matter of fact, the obligation is largely on my side, for to be able to explain things properly one must have a very clear idea of them in one's head. You will help me to keep up to the mark, for I shall have to have all my ideas definite and clear cut, and that's just what I want. Now, then, who's going to fire the first problem at me?"

Captain Ian Fraser, M.P., with his little daughter.

The famous chairman of St. Dunstan's, himself blind, has done wonders in alleviating the lot of the sightless. He is a keen wireless experimenter in transmission as well as reception.

What was Wrong?

"I wonder," said Morris, "if you could tell me why I don't get better results with my set. My aerial is a jolly good one and the set ought to be efficient. It is one of the *Radio Press* two-valve designs very carefully made up. We are just twenty-five miles, as you know, from 2LO, and he comes in at fair strength; but other stations are most difficult to get hold of. Another thing is that the set is apt to be rather unstable."

"What valves are you using?" asked John.

Morris mentioned a well-known pattern and John nodded his head. "Nothing wrong with them," he remarked. "But tell me, are you satisfied with your earth? What sort of an arrangement have you got?"

"Oh, I think the earth is all right," smiled Morris, "but I cannot say that I have ever bothered

(*Continued on p. 262.*)

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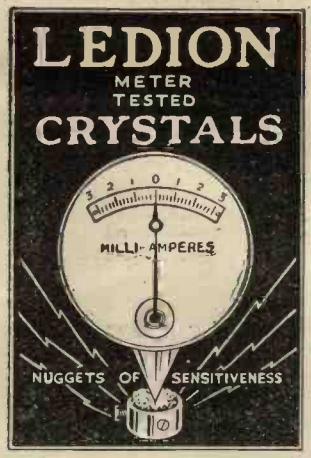

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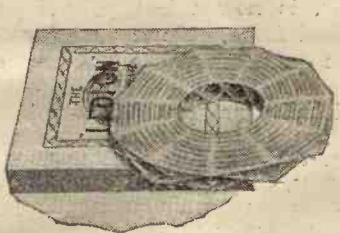

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Giving sharp tuning and having low capacity, Ledion coils are the coils you need for selectivity. They allow you to pass by unwanted stations and easily select the particular one you desire. These are the only coils capable of this at the low prices we offer to the public to-day.

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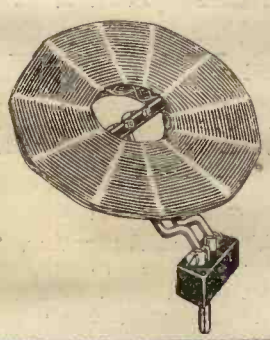

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Telegraphs: "Govapor, Westcent, London."
Telephone: Museum 3791.

Advertisement of LEDION LTD., 43, Johnson Street, London, S.W. 1 *Barclays Ad*

(*Continued from page 260.*)

very much about it. I bought a couple of ex-army telephone earth pins, drove them in about a yard apart, ran a heavy wire between them and joined the earth lead to that."

"If you will forgive me for saying so," went on Anstruther, "you are making just the mistake that ruins the reception of an enormous number of amateurs. You think that the earth does not matter very much. Believe me, it makes an immense difference. A bad earth, and yours *is* a bad one, is enough to account for all the symptoms that you have described. Try the effect of discarding the earth pins and using in their stead an old zinc bath buried three feet or so down immediately under the aerial." "I use that," said Painter, "and I find it very good. I wonder if you would tell me one thing that I do not quite understand. Is it necessary to use insulated wire for the earth lead?"

A Problem

John puffed away at his pipe for a few seconds before answering. "That is a problem," he said, at length, "on which opinions differ a little. For transmitting stations there is no doubt about it that the earth lead should be insulated. In the receiving station I do not think that it matters very much in the ordinary way. Of course, if the earth lead consists of a wire dropping from a fairly high window it is bound to swing in the wind so that it sometimes touches the walls and is sometimes right away from them. In this case I think that insulated wire is probably better. Anyhow, you cannot do any harm by using insulated wire for your earth lead. It will certainly not give worse results than bare, and it may be an improvement. As there is not really much difference in cost between the two, I should be inclined to plump for the covered stuff myself."

"Talking about earth pins, as we were a moment or two ago," said Richmond, "I used to use much the same arrangement as Morris and, curiously enough, I got quite good results with it. In fact, when I rigged up an improved earth on really sound lines there was not a great deal to choose between its performances and those of the original ground connection. How do you explain that?"

Different Soils

"It is very largely a question of the soil," John replied. "Your house is in quite a different part of the town from Morris's, and the soil in your garden is probably of a damper nature, so that you get quite a good connection even though the actual contact surfaces may be small. In some places the soil seems to offer a much lower resistance than others, and in these almost any kind of earth will do. Still, I think that on the whole you will find that, especially for long-distance work, you do get better results with the new arrangement than with the old."

Earth Pins

"There is something in that," Richmond admitted, "for now you come to mention it, I remember that I had very great difficulty in getting any of the American stations last year when I was using the earth pins, though now I generally pick some of them up on anything like a favourable night."

"What do you think of the counterpoise?" asked Ainsworth. "Is it usually an improvement or not for receiving purposes?"

"Before you answer Ainsworth's questions," I interposed, "perhaps you would not mind telling us just what a counterpoise is and what it does. I have heard quite a lot about it, but I cannot say my ideas on the subject are very clear."

Counterpoises

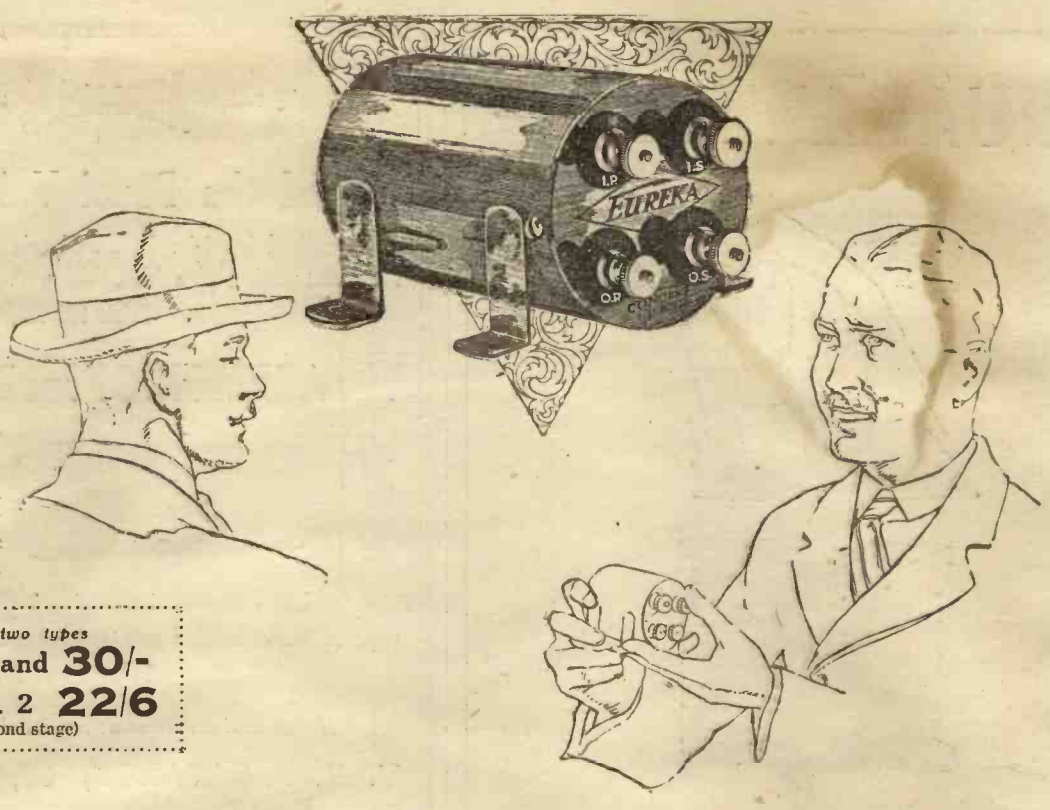
"Well," smiled Anstruther, "I had better take the two questions, Cartwright's and Ainsworth's, as one, and deal with them both together. The usual counterpoise of a receiving station is simply a second aerial slung below the main set of wires. Its height from the ground should not be under six feet, and it is better to make it seven or eight, for there is then plenty of room to walk about underneath it. There are few more unpleasant things to encounter than a low counterpoise on a dark night! It should contain quite as much wire as the aerial itself, and it should be just as carefully insulated. How does it work? Well, in the ordinary aerial-earth system you have a condenser of large dimensions, but with a small capacity. The capacity of the average amateur aerial is in the neighbourhood of ·0003 microfarads. In this system the suspended wires form the top plate and the ground itself is the bottom plate of the condenser.

Ex Warrant Officer Collins, who was seriously injured in the war, is now a bed patient in a hospital in Ducane Road, Wood Lane. He is an expert in making crystal sets, and had one on show at the Wireless Exhibition at Shepherd's Bush.

A Condenser Effect

In the counterpoise we have again a condenser, but the bottom plate is formed by the lower set of suspended wires. It has several advantages over the earth system, and in many cases its adoption leads to an increase in signal strength. If your set is of the unstable kind, or if you have not the skill to do your tuning without oscillating, the counterpoise is best left alone. For the really skilled man it is excellent, and it is most useful in places where earth induction noises are bad. Those are really the main points about it."

(*To be continued.*)



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Do you know ? That there are two methods in use for obtaining volume from L.F. Transformers ? One economises in wire by using a high step-up ratio between primary and secondary windings. The other utilises a very low step-up ratio and extremely massive coils. The former is adopted in cheap Transformers but the latter is the method employed in the Eureka. Of course, it costs very much more, but the results are incomparably better and entirely free from distortion.

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Do you know ? That most Transformers break down owing to the frequent surges of current which find out the weak spot in the soldered joints of the secondary winding ? The wire used in the Eureka is absolutely joint-free and therefore more expensive to buy. But it is well worth it, because it permits the Eureka being guaranteed indefinitely against breakdown as against others carrying only a 12 months' guarantee.

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THE simplest Detector ever invented—and the most efficient, too. The Eureka Gravity Detector consists of three parts only: two cone-shaped plated brass caps insulated from each other by an ebonite ring. Around the inside of each of these two end pieces is situated a row of points so arranged that any crystal placed inside must rest upon both rows simultaneously.

Looking at the illustration above, the simplicity of the whole idea is at once apparent. The Gravity Detector is mounted between two stout plated clips.

The minute currents from your aerial pass first through one end-piece and then through the Crystal via the two rows of contact points to the second end-piece. Perfect rectification is ensured because the pressure of the crystal on the contact point *must* be just right. As a crystal user, you will appreciate the importance of correct contact pressure.

The whole idea underlying the Gravity Detector is so novel that experts can be well excused for doubting its efficiency. But the proof of the pudding is in the eating. They have soon found that it works easily.

Here are half-a-dozen exclusive Gravity features—many more will readily occur to you after a few days' use of this wonderful Detector.

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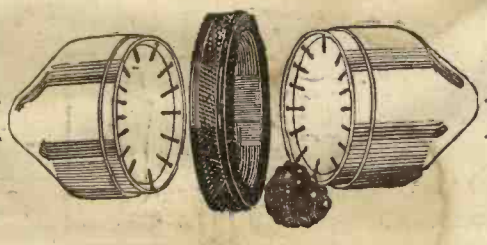
AN END TO ALL



DETECTOR TROUBLES

Gilbert Ad. 1777

HINTS ON PANEL LABELLING.

The making of labels and scales for wireless panels has become quite a fine art, it now being possible to give a panel a very finished appearance with a minimum of trouble.

A good idea has been evolved by a works specialising in these things in the form of terminal labels which can be actually recessed into the panel. This label is known as the No. 12, being made by Messrs. Money Hicks & Mills, Ltd., of Wimbledon, who claim to be the largest makers of wireless scales and labels in the world.

The label in question is so worded that it can be read from any point of view. It is fixed by simply passing the terminal through the label itself. The recessing is accomplished in a moment by means of a little tool that is sold with these labels when required, and it is recommended that amateurs and constructors should ask their dealers to show them these labels, together with the tool. They will be impressed with the beautiful way in which they are engraved, the simplicity of fixing, and the handsome appearance given to the finished panel, there being no waxed edges, as is the case with transfers. Also a few weeks of use cannot destroy the wording, which means great disappointment to those who have made a panel look so nice with transfers when it is new, only to be damaged and obliterated in a very short while. The No. 12 labels can be had in black, white and red.

Another excellent product of Messrs. Money Hicks & Mills, Ltd., is their No. 22 bevelled Variometer and Condenser Dial. This can be had in either Ivorex (white) or Ebonex (black), and it might be mentioned that it has passed the necessary tests, and has been adopted by many large makers in assembling their condensers, &c. The dial has a finish and appearance far above the average, and yet, owing to its method of structure, and the fact that it is produced on a mass production basis, the manufacturers are able to market it at such a price that it can be sold to the amateur through his retailer at as low a price as 7d. The bevel is just at the right angle for beauty of appearance, and the engraving is all that can be desired for clearness and accuracy.

Messrs. Money Hicks & Mills, Ltd., will be pleased to send a full price list of their labels and scales, together with samples, to any reader who cares to send 3d. in stamps and the name of his usual dealer to them at York Road, Wimbledon, S.W.19.

Advertisement of Money Hicks & Mills, Ltd.

Index to Advertisers

Buy Confidence! A Word to Every Reader

THIS magazine has brought thousands of new readers into contact with Radio Press, Ltd. From now on you will be our friends, and we do not want you to think that the Radio Press is a cold-blooded publishing company. It is not. It is a collection of the keenest wireless enthusiasts—names known throughout the world—the authors of articles translated, because of their merit, into a dozen different languages.

If you knew us you would realise the feeling of responsibility we have. What we say goes out to 450,000 readers every month in our three papers. We realise our influence, and we never intend to let you down.

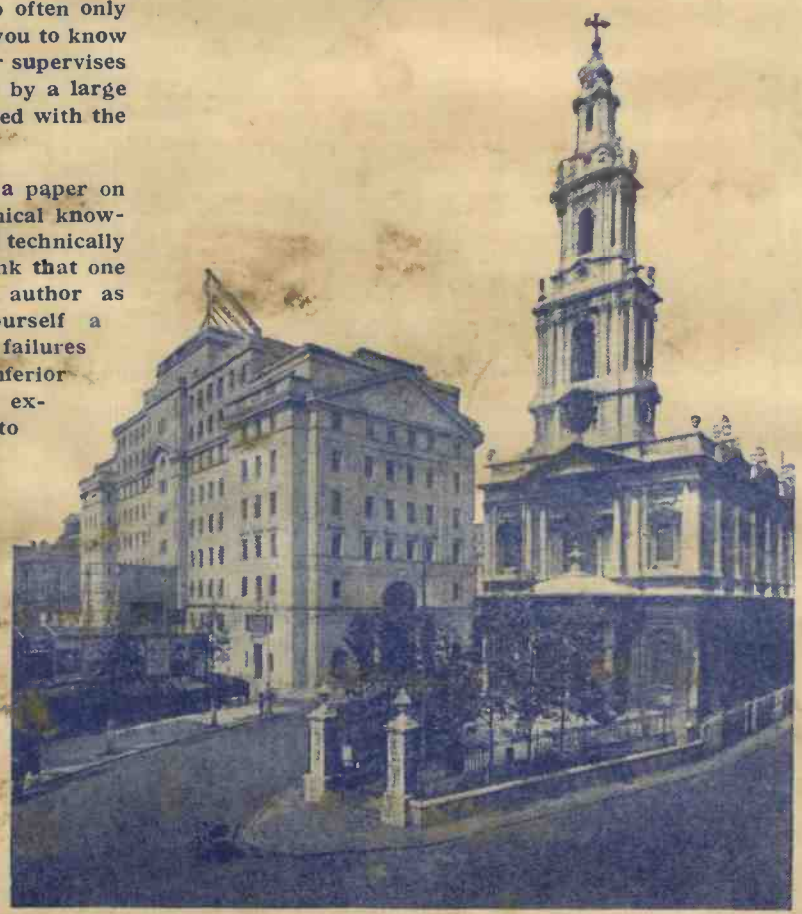
We are wireless people from the Managing Director to the junior office boy. The policy and every detail of the Company is personally directed and supervised by John Scott-Taggart, F.Inst.P., A.M.I.E.E.—the business and editorial control being in the hands of one man. When editors of "technical" journals are so often only journalists, it means an immense amount to you to know that a fully competent technical radio engineer supervises the publications you read, very ably assisted by a large technical staff trained for the work and imbued with the same ideals and the same vital keenness.

Many of you are beginners. You buy a paper on trust. You have not the experience or technical knowledge to know whether what you read is sound technically and practically or not. You may at first think that one wireless article is as good as another, one author as able as another. You will soon find yourself a sadder and wiser man if you do; a few failures due to making untested sets which give inferior results, a few words with an experienced experimenter, and you will find that it pays to stick to people you know—to a firm which has built up a huge business simply by selling confidence.

You see the photograph here of Bush House and the aerial on the roof? This is where the head office of the Radio Press is installed—magnificent offices in which every detail is organised to give YOU sound designs for sets you want to build, sound theoretical articles, sound advice on every aspect of wireless. The brilliant success of the Radio Press, financially and in reputation, is due to the ideal of never letting a wireless reader down. Every single article is sifted to ensure its accuracy and reliability, and every set is scrupulously tested.

Only the magnitude of our business—we have one weekly and two monthly wireless journals, and do a very big business in handbooks—enables us to give that service which has commanded the respect of every reader who knows us.

We ask you, if you need confirmation, to ask an experienced friend what he thinks of the Radio Press, their writers and their publications. We will abide by the opinion he gives you. We know what he will say because we know he himself has bought Radio Press publications, and in buying them has bought confidence which has been justified by his subsequent experience.



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