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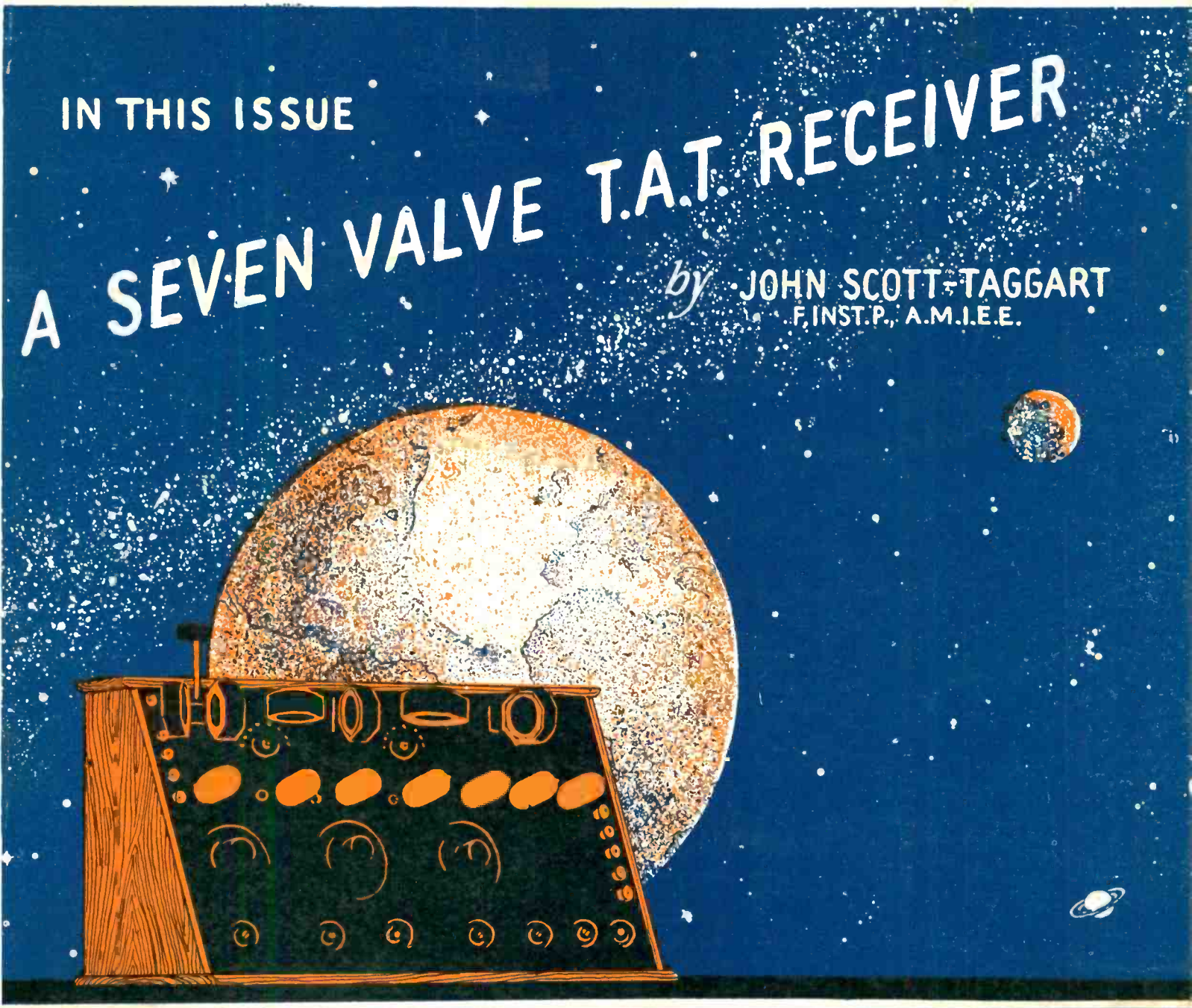
by JOHN SCOTT-TAGGART
F.INST.P., A.M.I.E.E.



Vol. III.

No. 8

HOW TO MAKE:—

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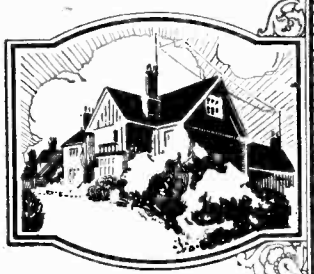

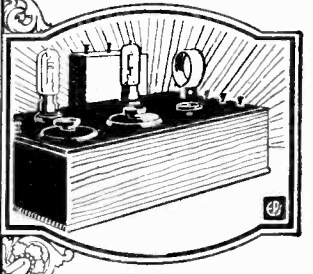

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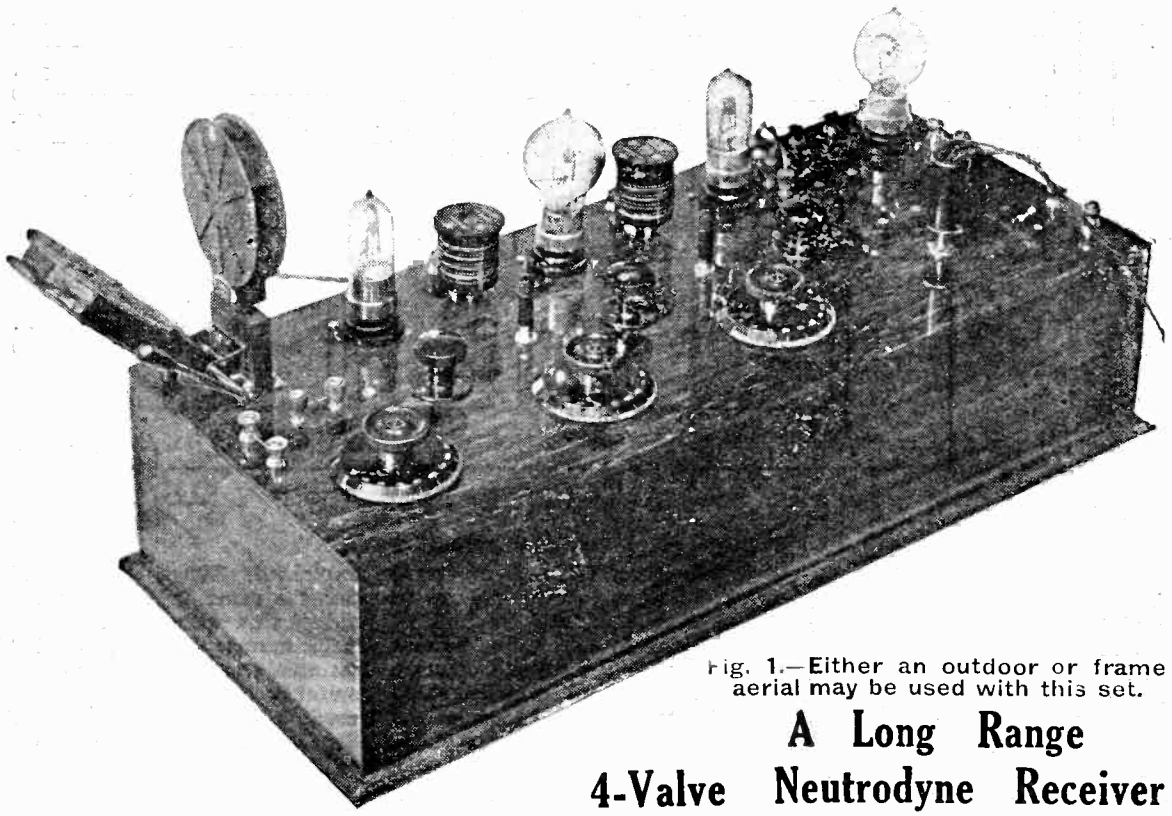


Fig. 1.—Either an outdoor or frame aerial may be used with this set.

A Long Range 4-Valve Neutrodyne Receiver

By JOHN UNDERDOWN

This distinctive 2 H.F. Receiver is the outcome of several months of experimenting with the modified form of Neutrodyne circuit evolved by Mr. A. D. Cowper.

RECENTLY I have been carrying out some experiments using a frame aerial and the 1 H.F. detector and 1 L.F. Neutrodyne receiver, described in *Wireless Weekly* of August 6th and 13th of 1924, and have had excellent and, in some cases, surprising results. At 12 miles S.E. of 2LO, that station gives sufficient loud speaker results for an average room, Madrid, several German stations and some of the distant B.B.C. stations being obtained at good phone strength. No reaction was used and a .00025 condenser across the frame was found to cover the whole 300 to 500 metre range comfortably. The set is quite stable and reaction control is easily obtained on the neutrodyne condenser.

General Considerations

Reviewing these results it was decided to apply the Cowper Neutrodyne circuit to two stages of high-frequency amplification, followed by a valve detector and one stage of power amplification, using a low-frequency transformer.

The set was to be as flexible as possible consistent with the use of no switches at all on the high-frequency side, where their inclusion so often leads to instability. With the present receiver one, two or four valves may be used with very little trouble and the method of obtaining these will be dealt with fully later.

The tuning is designed to give a number of arrangements for working with both frame and outdoor aerials, also without using switches. Dual rheostats have been incorporated so that where current consumption is a serious consideration dull emitter valves may be used, and the last valve is arranged so that a higher low-tension voltage than on the first three may be applied to this valve, as, for example, when .06 valves are used for the first three stages and a 6 volt .25 ampere type for the power stage.

The Circuit

From the circuit diagram given it will be seen that a direct coupled circuit is used consisting of an inductance coil L_1, tuned by a variable condenser C_1 of .0005 μF. A loosely coupled circuit was not thought to be necessary here as the two stages of H.F. separately tuned render the set sufficiently selective without the additional complication of a further control. L_2 L_3 and L_4 L_5 are high-frequency transformers of which one winding in each case is utilised as a tuned anode coil (L_3 and L_5) and the other as the neutrodyne coil which effects a phase reversal essential to this method of stabilising tuned anode circuits.

The condensers C_2 and C_4 are the neutrodyne condensers whilst C_3 and C_5 of .0002 mfds. tune the anode circuits of the two H.F. valves.

Reaction Coil Connections

L_6 is a reaction coil variably coupled to the aerial coil by means of a two-coil holder. This may be inserted in the plate circuit of the detector valve V_3 by means of the two Clix sockets 6 and 7 in this latter circuit and the two sockets 1 and 2 connected to the moving coil block of the two-coil holder. These connections are effected externally by means of a length of twin flex seen in the photograph of the set with coils and valves inserted. Two Clix plugs on each end of the flex serve to make this connection and at the same time to get the direction of the reaction coil correct.

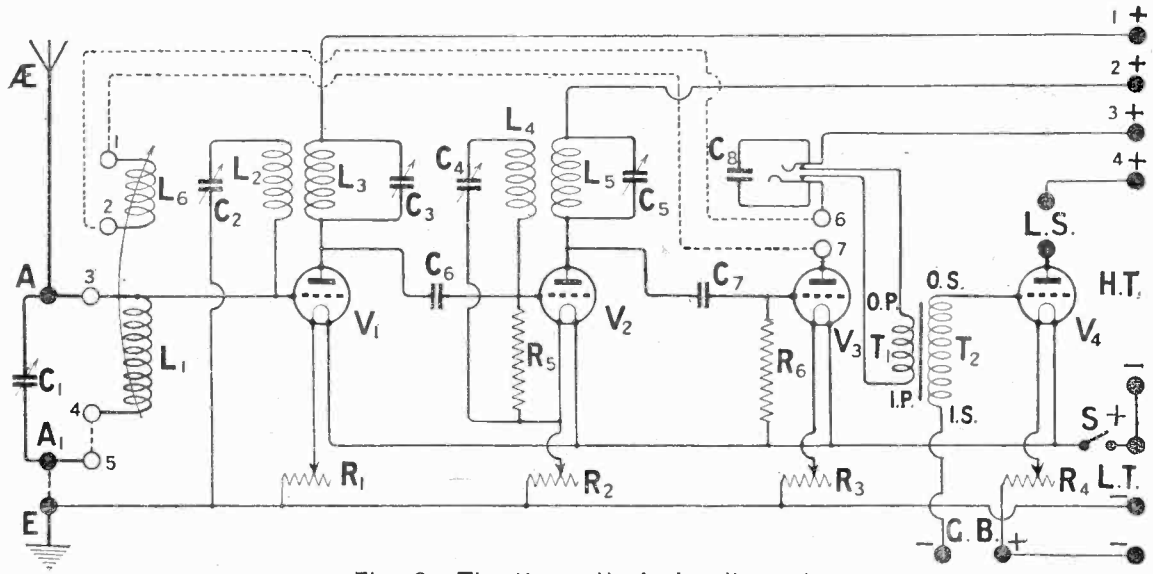


Fig. 2.—The theoretical circuit used.

The Use of a Jack

A double-circuit jack is used in the plate circuit of the detector valve so that telephones may be used here if desired with the last valve switched off on its filament rheostat R_4. This jack, when the phones are not in use, brings the low-frequency transformer T_1 T_2 into circuit. V_4 should then have its filament lit by switching on R_4 and the loud speaker should be connected to the terminals marked loud speaker in the diagram.

The fixed condenser C_8 of .002 is used either across the phones or the primary winding T_1 of the L.F. transformer to act as a bypass condenser to give smooth reaction control. The grid condensers C_6 and C_7 are .0002 mfds., whilst the leaks R_5 and R_6 have values of 1.5 megohms. The more usual .0003 mfds. and 2 megohms may equally well be used here.

H.T. and L.T. Connections

It will be observed that the lead from the rheostat R_4 is not taken direct to low-tension minus as with the other three resistances but goes to a separate terminal. The purpose of this has been previously explained. When it is desired to use the same L.T. voltage on all valves this is shorted to the other L.T. minus terminal. Grid bias terminals are included so that a suitable biasing battery may be used on the note magnifying valve. Separate terminals are also provided so that suitable plate voltages may be applied to each valve, allowing the best working conditions to be attained in each case. In the circuit diagram given terminals are shown throughout as full black circles, whilst Clix sockets are shown merely as plain circles with a distinguishing number.

Aerial Tuning Arrangements

There are four possible aerial tuning arrangements which are obtained as follows :—

The direct coupled system of tuning with parallel condenser,

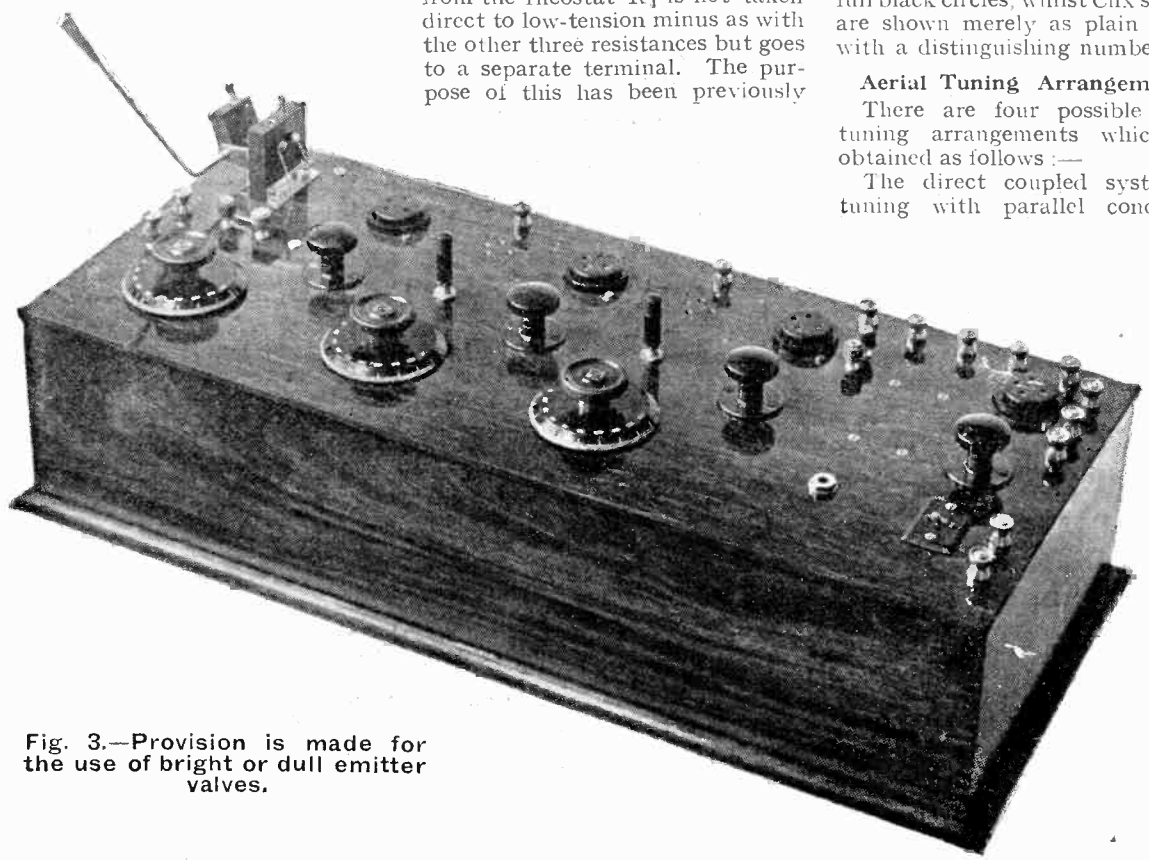


Fig. 3.—Provision is made for the use of bright or dull emitter valves.

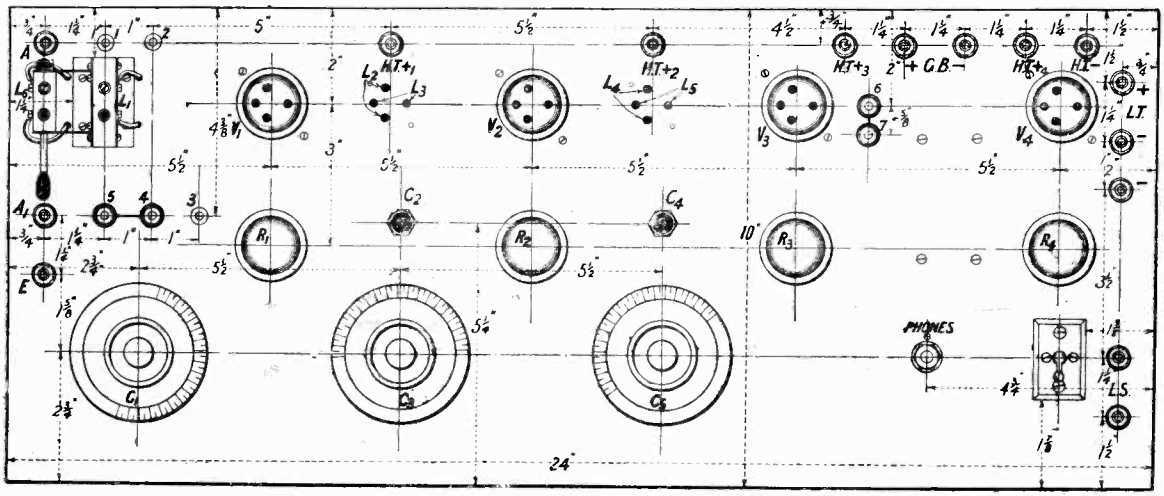


Fig. 4.—The front of panel drilling diagram should be consulted in setting out the panel. Blue Print No. 84A.

suited to the use of an ordinary outdoor or indoor aerial. In this case the aerial is taken to A, A_1 connected to E and to earth. Clix sockets 4 and 5 are connected together by two plugs joined by a short length of flex. If it is desired to use magnetic reaction, sockets 1 and 2 are joined to 6 and 7 as previously mentioned. This latter is necessary in all cases when reaction is obtained by coupling to the grid coil L_1.

Series tuning is obtained by connecting aerial to A_1, E to earth and also to socket 4.

Frame Connections

Frame aerial reception is effected by plugging the two ends of the frame into sockets 3 and 5, with A_1 connected to E. This arrangement is shown in Fig. 8, and has a number of advantages which will appeal to those who have no facilities for erecting the more usual outdoor aerial or who wish to take advantage of the directional properties of this type of aerial to get rid of interference. It also forms a serviceable arrangement where portability is desired, a collapsible frame in this case being ideal for the purpose. Reaction can easily be obtained by slightly upsetting the neutrodyne adjustments of either C_2, C_4 or both, as determined by experiment.

On the longer waves magnetic reaction may be found useful and this is obtained as in Fig. 9, the frame being plugged into sockets 4 and 5, A_1 joined to E. A small coil is then inserted in place of the usual aerial coil L_1, and reaction obtained on this from the plate circuit of the detector in the usual way.

General Layout

The photographs of the set clearly show how the components are disposed; the aerial condenser is seen on the left-hand side with the two anode tuning condensers to the right of this.

The two-coil holder is in the left-back corner, the fixed socket taking the grid coil and the moving that of the reaction. Connection to this latter is obtained by plugging into the Clix sockets immediately to the rear and those shown near the third valve holder. Valves and H.F. transformers are disposed in one line to the rear of the panel and the resistances and neutrodyne condensers are arranged in the centre so that a symmetrical and pleasing appearance is obtained. H.T. and L.T. terminals are to the back and right-hand side of the panel, with the aerial-earth ones to the left, as are the sockets for the frame connections. These will be clearly

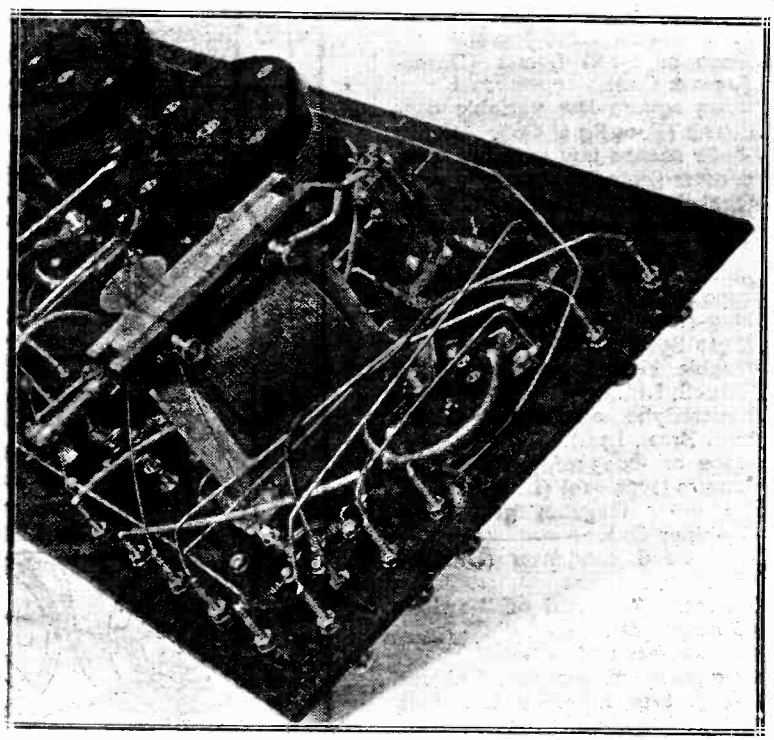


Fig. 5.—This photograph shows the last valve and jack connections.

seen in the front of panel diagram. The jack and a filament and H.T. "on and off" switch are seen to the right front.

Panel Arrangements

The under-panel arrangements are very compact, so that short leads are obtained. Type 610 Dubilier fixed condensers have been used with the new detachable clips allowing of very little room being taken for these. Since dull emitters can be used, dual rheostats are incorporated. "Antiphonic" valve-holders have been used for the valves as the former are in some cases inclined to be microphonic. The photographs clearly show the disposition of the components so that nothing further need be written on this subject.

Components Required

In order that readers who wish to exactly duplicate the set may be saved trouble, the names of makers, as well as the components used, are given. From this it need not be implied that other good makes are not equally suitable, except in certain cases where space only allows those incorporated to be used.

The components are :—

1 Radion Mahoganite Panel, 24 in. by 10 in. by ¼ in. (American Hard Rubber Co.).
1 Oak or mahogany box, 24 in. by 10 in. by 5 in. deep and of ⅜ in. thick wood (Burne-Jones).
1 Magnum 2-coil holder (Burne-Jones & Co.).
1 ·0005 square law variable condenser (Peto Scott Co.).
2 ·0002 square law variable condensers (Peto Scott Co.).
4 Dual rheostats (Burndept, Ltd.).
4 Antiphonic valve-holders (Burndept, Ltd.).
2 H.T.C. valve-holders under panel type (H.T.C. Co.).
1 Max-amp power transformer (Peto Scott).
1 Double circuit jack and plug (Elwell, Ltd.).
2 Neutrodyne condensers (Gambrell Bros., Ltd.).
2 ·0002 or ·0003 mfds. fixed condensers (type 610) (Dubilier Co.).
2 1·5 or 2 megohm grid leaks (Dubilier Co.).
1 ·002 fixed condenser (Dubilier Co.).
1 Filament "on and off" switch (Connecticut).
7 Clix sockets and—
6 Clix plugs (Autovevors, Ltd.).
15 W.D. type nickelled terminals (Burne-Jones and Co.).
Quantity of 16 and 20-gauge tinned copper wire and small lengths of twin and single flex.

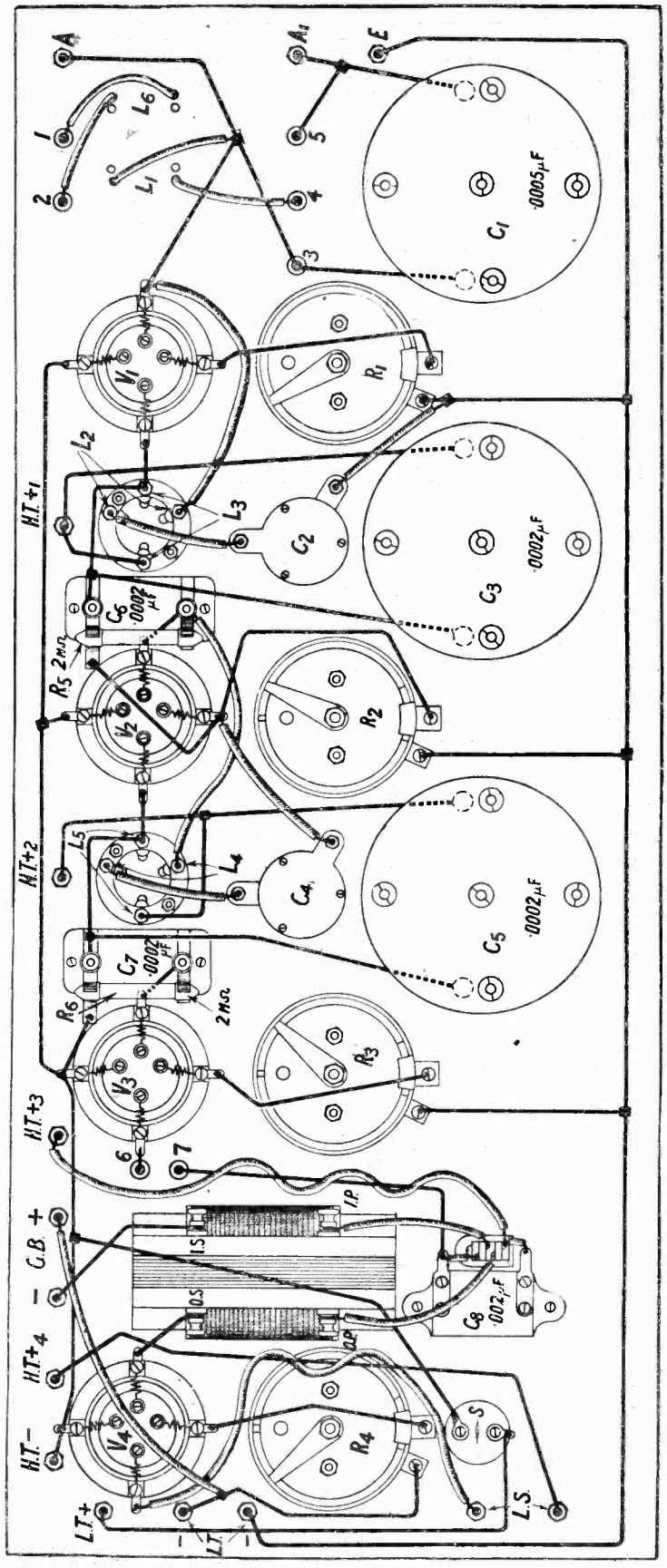


Fig. 6.—Wiring diagram. Blue Print No. 843.

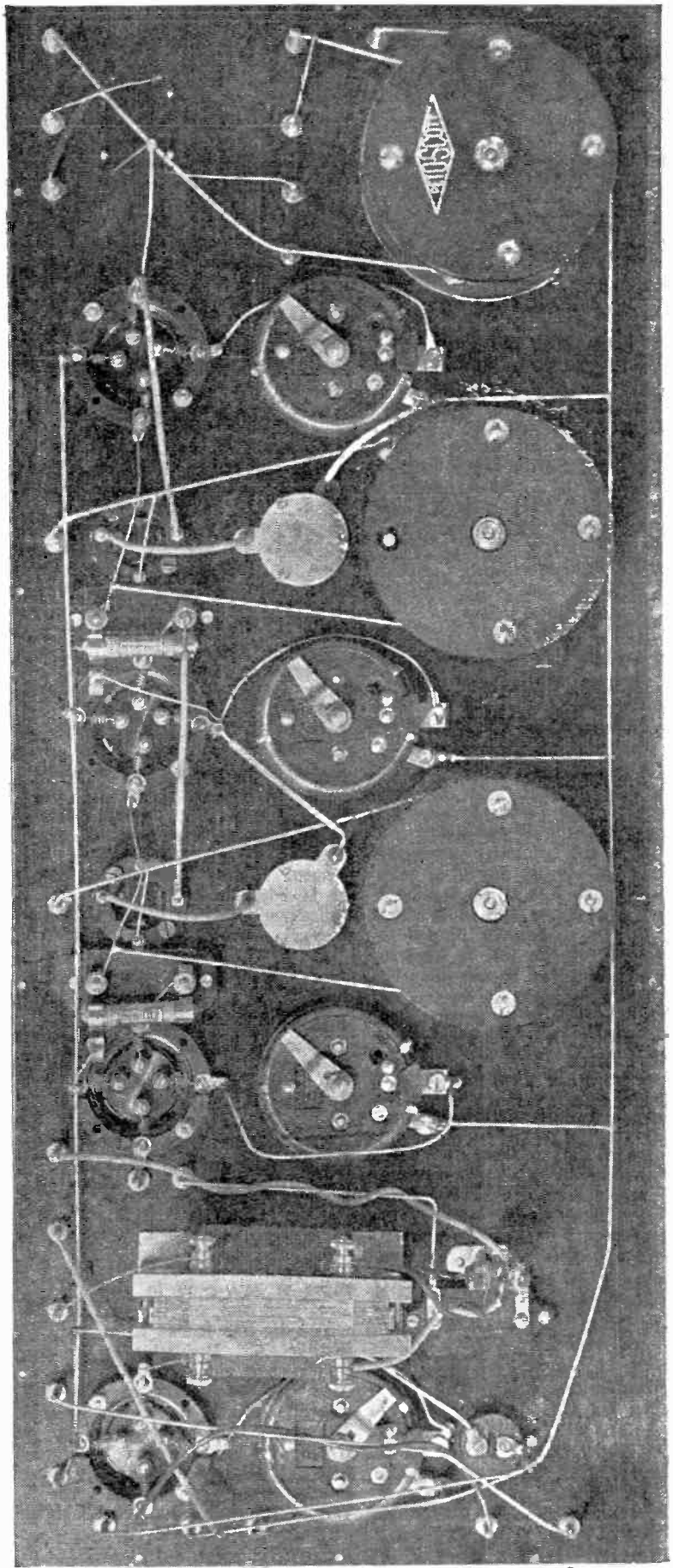


Fig. 7.—This photograph plan view clearly shows how the set is wired.

Construction

The use of guaranteed ebonite is strongly advised for the panel, in which case no matting to remove the surface skin is necessary and the panel may be at once marked out from the drilling diagram given. Little difficulty should be experienced in drilling the panel once it is set out. The only holes that present any difficulty are those for the "Antiphonic" valve-holders. These holes may be cut with an expanding type of bit in an ordinary carpenter's brace, or failing this, the valve-holders may be mounted on top of the panel.

The valve and transformer sockets and other of the lighter components should first be mounted and then the heavier variable condensers and transformer. The coil-holder need not be mounted until all the wiring below the panel is completed and then the latter can be placed in position on the case while the former is carried out. This is the most convenient method possible.

The Wiring

Tinned copper wire of 16 gauge has been used for the longer wires and 18 gauge for very short leads, which have to be bent at sharp angles.

The former wire should be thoroughly stretched until felt to give, when really straight lengths giving the set a professional appearance will be obtained. In my case I have carried out the neutrodyne circuits in the smaller wire covered with systoflex sleeving so that they are easily distinguishable from the remainder of the circuits. Care should be taken to keep plate and grid wires well spaced and all leads as short as possible.

In some cases leads have been twisted together to minimise interaction and in these cases one wire is covered with sleeving. These will be seen in the photographs.

Testing the Set

Having completed the wiring place the set on test. First merely connect the L.T. battery, joining the two minus terminals together unless you are using a 4-volt accumulator on some valves and a 6-volt on the others. Place the filament switch S to the "on" position and plug a valve in turn into each valve-holder, seeing that it lights correctly as the rheostat is rotated.

A point to be noted here is that when a higher L.T. is applied to the last valve than to the others the last valve should be always switched off on its rheostat R_4 when the set is not in use. If this

(Continued on page 991.)

New Year Paving Stones

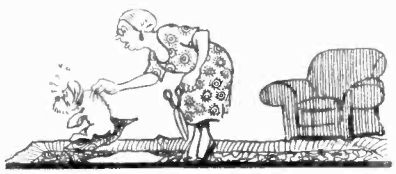
I SUPPOSE that I am pretty safe to say that you have been engaged recently in the manufacture of paving stones, or to put it more plainly, in making good resolutions. I only trust that you will be more successful in keeping them than I usually am. The only resolution that I have made myself this new year is that I will make no resolutions. Still there is no doubt that there are many wireless men who ought to do so at this time of year.

Resolutions

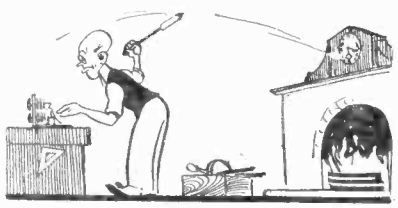
Some of you will promise yourselves, no doubt, no longer to have unsoldered joints beneath your panels; some, again, will forswear the use of solder. Speaking of solder reminds me that poor Professor Goop is terribly worried just now, for his wife has forbidden him absolutely to drop any more soldering paste on the drawing-room carpet. This, I should explain, is a new carpet, the old one having become so thoroughly impregnated with the sticky mess that all sorts of terrible things have been happening. Bingo, for instance, the Professor's little terrier, may be described as very much attached to it. In an unguarded moment the dog sat down upon it to warm himself before the fire. Later on, when Mrs. Goop called him to come for his evening meal, he looked at her pathetically and did not move. Thinking that he was sulky she admonished him and decided to carry him down to his kennel. When she tried to lift Bingo, she found that he was so firmly anchored that there was nothing for it but to cut out the portion of the carpet to which he was attached. This was five months ago, and Bingo is still wearing his quaint garment.

When the Professor Solders

What the Professor will do now that the new carpet has been put down I really cannot think. He is one of those thoroughly conscientious people who must solder every joint, even if it is decently hidden away from view beneath the panel. My own motto is, "What the eye doesn't see the heart doesn't grieve for." I have the reputation for being one of the best solderers in Little Puddleton, acquired, I think, entirely from the fact that I have never allowed anyone to see the inside of my set. After all, who wants to be a plumber? But the Professor will not listen to my wise counsels. His brain, I know, is engaged in hatching out a new set, and when the soldering ceremony takes place almost anything may happen. He has what I should call a free action with the soldering-iron, for he frequently pauses in the middle of the job to explain some knotty point to anyone who is listening, or even to no one at all, in which case he gesticulates rather wildly and is apt to wave his iron about quite a lot. On one occasion he turned up two hours late at a meeting of the wireless club at which he was to give an address, explaining that his clock had misled him. The glass covering its face he broke some time before with a blow from his soldering-iron, but on this occasion it appears that during one of his backward sweeps he had flung a blob of solder which fixed the hands firmly at half-past three. With soldering paste he is simply awful.



Bingo is still wearing his quaint garment.



. . . fixed the hands firmly at half-past three.

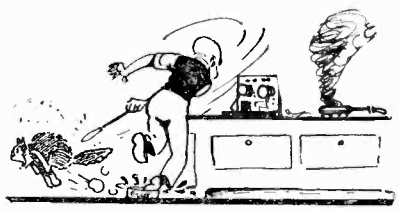
Open-handedness

I do not believe in being stingy, but I think that you can overdo open-handedness with stuff of this kind. The Professor buys his a dozen tins at a time, running the contents of the lot into an old jam jar. When I tell you that he generally puts it on with a teaspoon, you will agree with me that he does not err by using too little. And the worst of it is that he carries the hot soldering-iron idea rather to extremes, chiefly through absent-mindedness. He believes in having several irons in the fire, but usually forgets all about them until they are white hot. Then he seizes one and brings it down squarely into the middle of the mess that he has made round his proposed joint. The result is that his room always smells as if somebody had been frying sausages in it, and the stuff simply flies all over the place.

The Poddleby Method

Mrs. Goop has approached Poddleby and myself with a view to our giving the Professor some instruction in the art of wielding the soldering-iron in the correct manner. Luckily the Professor is one of the kindliest and the most polite of men, and he has so far taken our tuition in the best part. Poddleby's ideas and mine, unfortunately, do not quite coincide. He gives him an hour in the morning, whilst I take him in the evening. The result is that I spend most of my time in getting the Professor out of the bad habits which he has learnt from my co-instructor. Poddleby is far too much of a stylist. He believes that the whole art of soldering depends chiefly upon the stance. His method, I understand, is to make the pupil stand with his feet well separated and the weight evenly distributed between them. With the hot iron held in his right

hand he must keep his eye firmly on the joint, and swing his weapon slowly back without moving his head. During the back stroke solder is collected—or should be collected—from a conveniently placed stick. The weight is now chiefly upon the ball of the left foot whilst the right heel is slightly raised. During the forward stroke there must be an even gentle swing without any pressing, and a good follow-through must take place after solder has been applied to the joint. This is all very well in theory, but in the case of an impulsive person like Professor Goop, it does not work out at all in practice. He simply will not



. . . landing it on the cat.

keep his eye on the joint, he will rise on his toes, and during the back swing he as often as not misses the solder altogether, landing his hot iron on the table-cloth, the cat, or anything that is within range. When coming forward again, he nearly always presses very badly. This usually means that he hits the table instead of the joint, and it is, of course, quite impossible to replace the divot which has been consumed by the heat of the soldering-iron.

My Own Idea

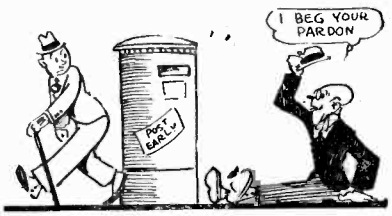
To this method my own ideas on the subject are diametrically opposite. I do not believe that stance matters a hang. I am sure that all these instructions of Poddleby's serve simply to cramp the Professor's style, and to make him more uncertain than ever. With a short-sighted pupil like the Professor, I feel that an entirely different method is required. For this reason, when I am instructing him, he goes to work quite differently. On his left hand he wears an asbestos glove. Having placed a blob of solder upon the bit of his soldering-iron, he makes a correct billiards bridge with the left hand, and, using the soldering-iron like a cue, would get there every time if only in his absent-mindedness he would not occasionally imagine that he was potting the red. When this happens he is apt to dig instead of making a smooth, even stroke, so that as often as not the joint is destroyed even before it is made. Really, I am rather in despair over the Professor's progress, for after a month's hard work I do not think that he is much further on in the art of soldering than he was. If I were allowed to instruct him alone I am quite sure that he would shortly be making breaks of fifty before a joint was missed. And Poddleby, on the other hand, says that if he were himself in command, he could easily get the Professor's soldering handicap down to twenty-four. This I beg leave to doubt.

Something New

And now I am afraid that the Professor must work out his own salvation so far as solder and carpets are concerned, for I understand that as soon as he is left to himself he forgets all that I have taught him, and does not even adopt Poddleby's inferior idea. He just goes on the old slap-dash way, of which nothing, I am afraid, will cure him so long as he has two instructors. But what, after all, do a few carpets matter so long as he continues to turn out those amazing circuits which have for so long been the wonder and the despair of the world of wireless men? He is engaged at the moment upon what he calls his "Ether Super-purifier." I would like very much to give you the full details of this, but as his right-hand man in the experimental work, which has been occupying the whole of his time for the last six months, I am sworn to the most profound secrecy until the thing is perfected. In the strictest confidence, however, I may give you just a brief outline of what he is going to do.

The Ether Super-purifier

Why do people howl? Rather, perhaps, I should say why do people make their sets howl? Simply and solely because they pick up carrier waves and heterodyne them. Very well, then. It becomes at once quite obvious that if there were no carrier waves, even you, dear reader, could not send out far and wide those horrible noises which cause good men and true to lose their erstwhile sunny natures and to become potential, if not indeed, actual murderers. Working on these lines, the Professor and I have between us evolved a great scheme. When I say between us, I mean that I have been an extremely good listener whilst he talked, and that I have always been able to find the pliers when he wanted them. Anyhow, I have generously consented to his dividing with me the honour of the wonderful discovery which will shortly be given to an astonished world. To put it in a nutshell, our idea is an elaboration of the wave-trap. We make use of a carrier wave-trap, which successfully bottles up all carrier waves that may be knocking about. These are subjected to a straining process by means of an entirely new circuit, in which the Bothoff-Therunyum effect is utilised to the full. Before the year is out every city, town, village and hamlet of this country will have erected a communal Ether Super-purifier on the Goop principle. With its help the objectionable carriers will be removed, and even the most hardened sinners of the locality will find that, use their reaction coils as they may, they are quite unable to get so much as a squeak by them. We have already been offered enormous sums for our idea, and there are not wanting those who, finding that fair means are of no avail, do not hesitate to use foul. Both the Professor and I have been followed of late by suspicious-looking characters, and the local authorities have told off P.C. Bottlesworth to guard us wherever we go. I am afraid that the worthy P.C.'s task is rather a difficult one, for though the Professor and I frequently take walks together, his average speed is a little over two miles an hour, whilst mine is about five. The Professor, too, has a disconcerting habit of stopping to



. . . exchanging greetings with pillar-boxes.

exchange greetings with pillar-boxes, lamp-posts and so on, which, owing to his short-sightedness, he mistakes for members of the wireless club. This, of course, still further reduces his rate of progression, and the only way that I can find of adjusting my pace to his is to follow every second step forward with one smartly executed pace to the rear. Even this is not perfectly satisfactory, for the Professor has a way of advancing in slight curves rather than in straight lines, and I frequently knock him down as many as seventeen times in the course of one short stroll.

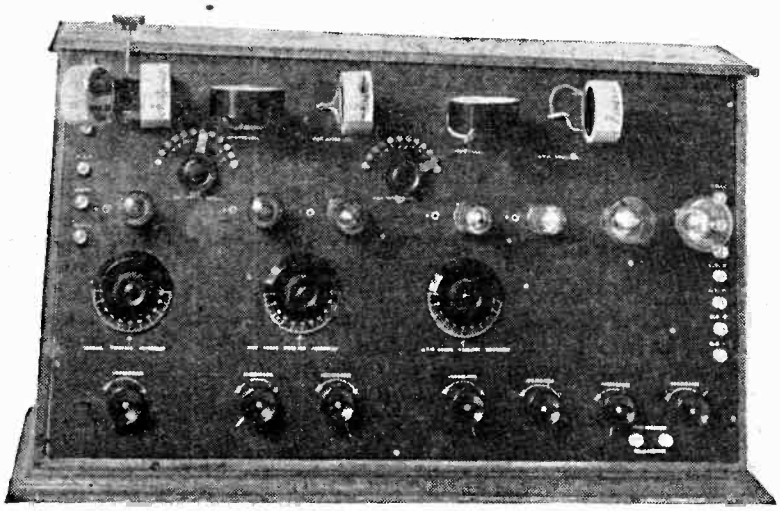


Fig. 1.—The panel lay-out is simple and symmetrical.

THE SEVEN-VALVE T.A.T. RECEIVER for Long-Distance Reception.

Designed by

JOHN SCOTT-TAGGART,

F.Inst.P., A.M.I.E.E.

IN the set described below I have carried the T.A.T. principle to a stage where four high-frequency amplifying valves are employed, one detector valve and two note magnifying valves. The result is an extremely sensitive long-range receiver which will give truly remarkable results on the most inferior of aerials.

Appreciation

The greatest interest seems to have been aroused by the preceding articles on the subject of the T.A.T. method, which appeared in the November and December issues of MODERN WIRELESS. More letters have been received in connection with this circuit than in the case of any circuit articles previously published by the Radio Press. The letters are unanimous in support of the claims which I have made for efficiency and stability, and I would like to take this opportunity of expressing my appreciation of letters from readers giving their results of different circuits. Such letters are not only of extreme interest to other readers, but they really contribute to a fuller appreciation of the advantages and disadvantages of different circuits under all sorts of varying conditions and in skilled and unskilled hands. It is only by getting a very large number of letters that a true appreciation is obtained.

Multi-Stage H.F. Amplification

In the present case I have not the slightest doubt that the T.A.T. method of multi-stage high-frequency amplification will achieve very great popularity, particularly amongst those who desire two stages of high-frequency amplification. For the benefit of these latter, the set in the December issue of MODERN WIRELESS is undoubtedly the best, although a special five-valve set is in process of being designed, and will probably

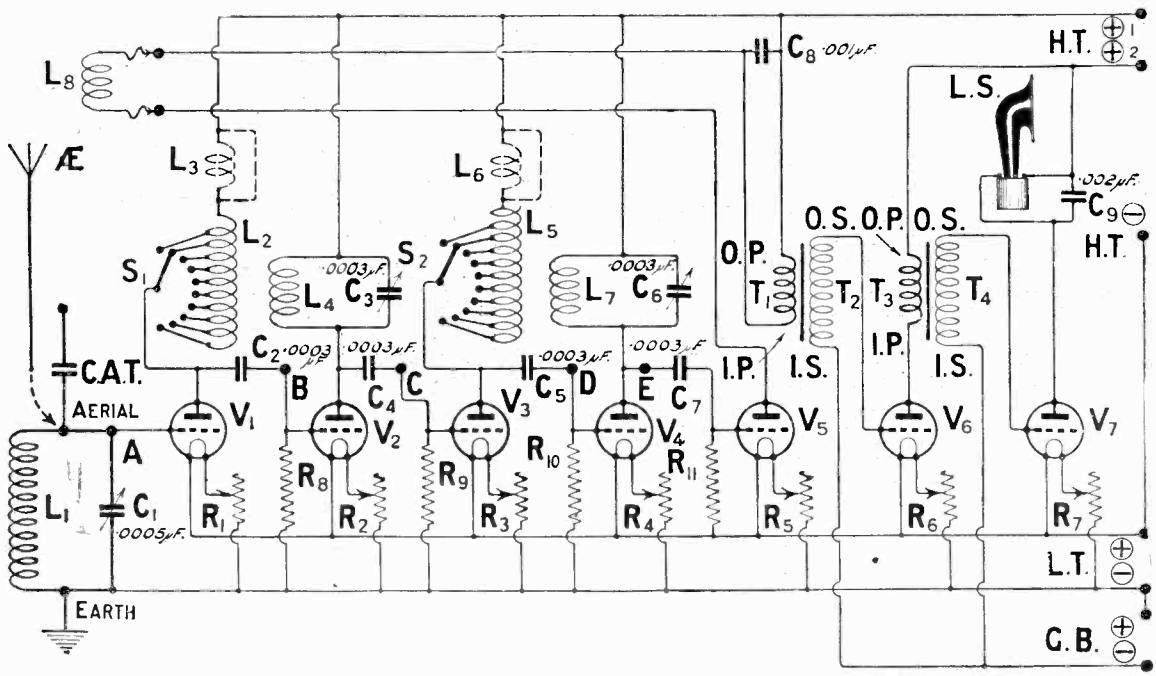


Fig. 2.—The theoretical circuit used in the receiver.

A

Distinctive

4 H.F. SET

for

Long Range

Working.

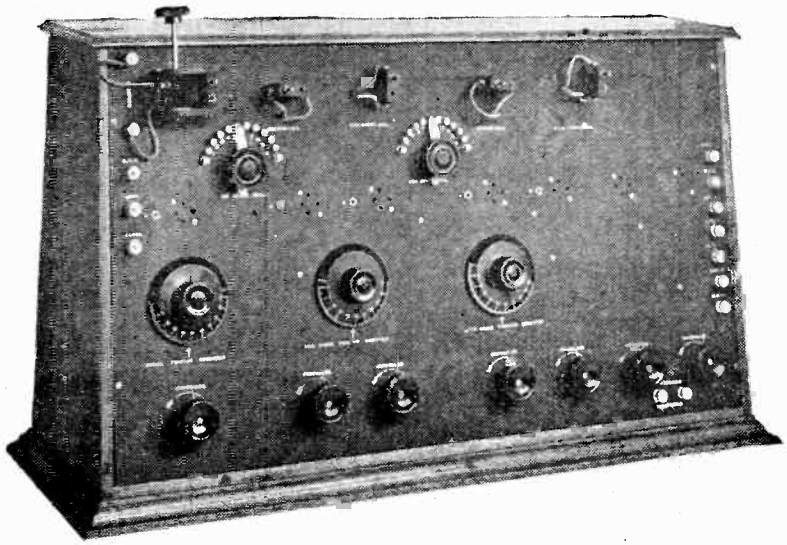


Fig. 3.—Rotary switches are used for the tapped reactances.

be described in the next issue of MODERN WIRELESS, combined with special means of increasing the selectivity. It is obviously of little use to increase the range and amplification unless selectivity is simultaneously improved, because the great trouble is that frequently, even if one receives a distant station, there is also a good deal of jamming.

Selectivity

For those who desire more than two stages of high-frequency amplification, the set described in this article will give them all they require. I believe this is probably the first article dealing with a practical set using as many as four stages of high-frequency amplification.

A test report is appended, the tests being carried out at Bedford.

The set may be used in connection with wavetraps if it is desired to obtain greater selectivity, and on certain wavelengths it may be found that the set will choke up, due to excessive amplification of incoming signals. In such cases a fewer number of high-frequency amplifying valves may be employed; the method of making the adjustment is described later.

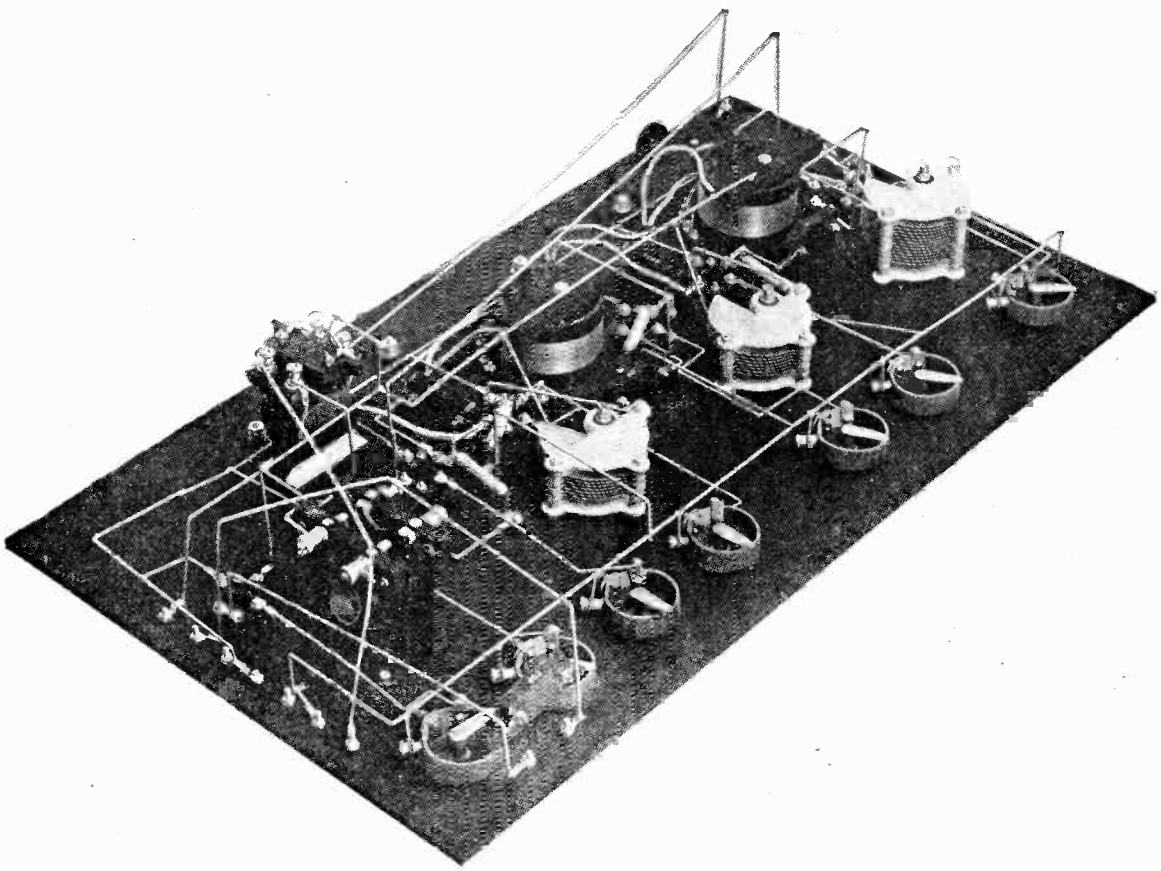


Fig. 4.—This view of the wiring shows the elevation of various leads.

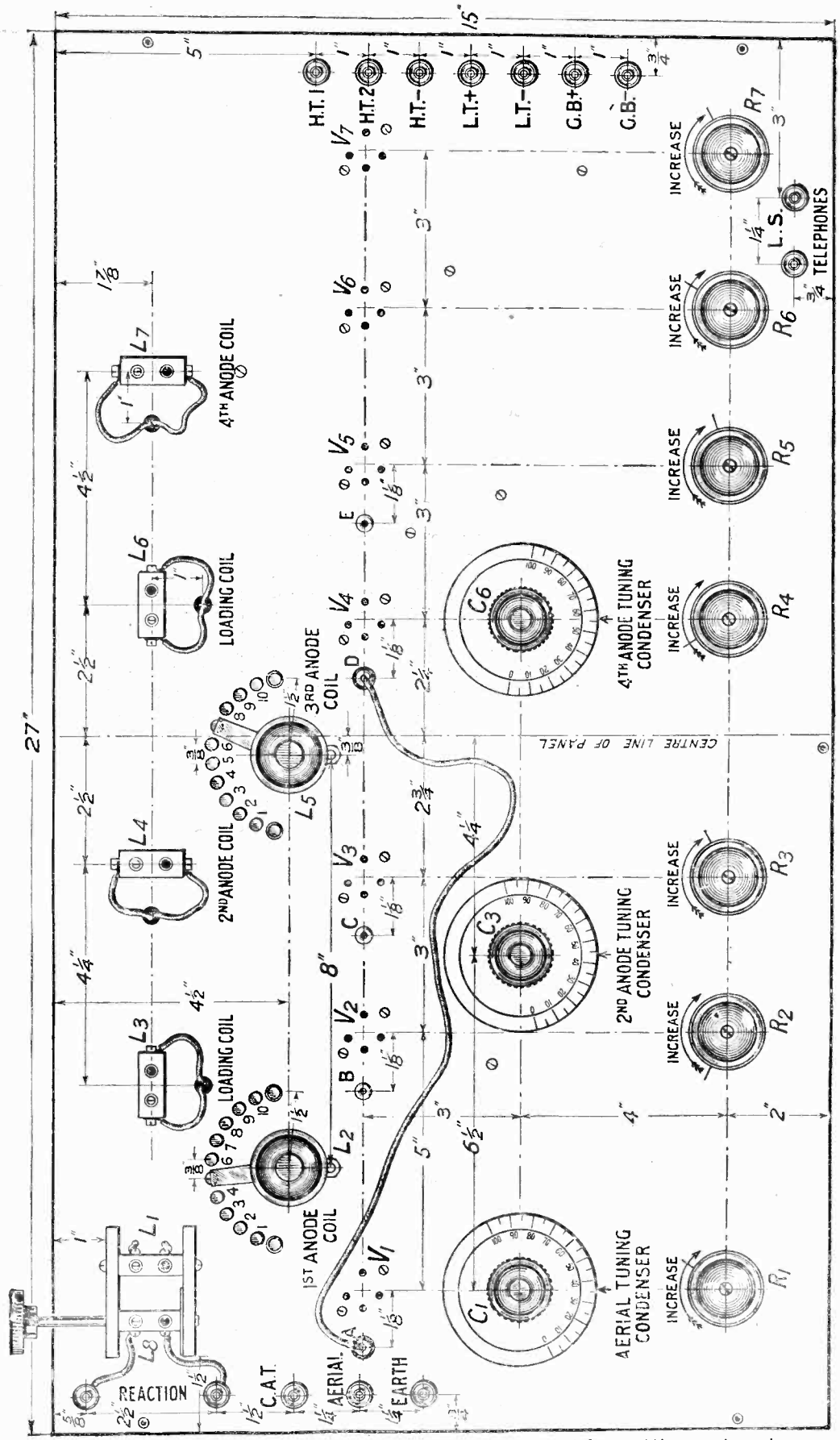


Fig. 5.—This front of panel diagram should be used for setting out and drilling the panel. Blue Print No. 85A.

I hope that all readers who make this set, or the one in the December issue of MODERN WIRELESS, will communicate to me the results which they have obtained.

In the seven-valve set described, the resistances which form an alternative aperiodic coupling have been left out, because it was considered that the number of readers who would like to receive the longer wave stations, such as 5XX, over very great distances would be very small.

A Hint to Manufacturers

With regard to the tapped reactances, it is to be hoped that manufacturers will place a suitable unit on the market which may readily be fixed to a panel, and any assistance I can give in this direction will be accorded. No doubt, some enterprising manufacturer will realise the big demand which will undoubtedly arise in connection with a suitable reactance for T.A.T. circuits.

The seven-valve T.A.T. circuit is illustrated in Fig. 2, and it will be seen that alternate anode circuits of the high-frequency amplifying valves are substantially aperiodic, and have no variable condenser in the circuit. The coils L_2 and L_5 are tapped, a description of these coils appearing later. Means are provided for inserting loading coils L_3 and L_6 in series with the reactances L_2 and L_5, these loading coils being used for the longer wavelengths.

A constant aerial tuning condenser C.A.T. is provided, but it will be usual to connect the aerial directly on to the main aerial terminal.

Reaction

Reaction is introduced into the aerial and into the intermediate oscillatory circuit by means of the reaction coil L_8 coupled to L_1. The coil L_8 is included in the anode circuit of the detector valve V_5. The two valves V_6 and V_7 are low-frequency amplifiers, a loud-speaker being included in the anode circuit of V_7. A condenser of ·002 μF capacity will usually be connected across the loud-speaker.

To cut out high-frequency valves, a flex lead terminated at each end by a Clix plug is used. One end of this lead is plugged into the socket marked A on the set, and shown in the drilling diagram. The other end is plugged into the socket B, C, D or E, according to the number of H.F. stages it is desired to use. When plugged into these sockets it is always necessary to remove the coils or shorting plugs of valves not in circuit.

Operating the Receiver

Suitable coil sizes are indicated in the test report on the receiver, and these should be plugged into the sockets indicated. A glance at the circuit diagram will show that all the H.F. valves are cut out of circuit by joining A to E. One H.F. stage is employed by joining A and D, two stages by joining A and C, three stages by connecting A to B, and the total number of four by removing the flexible lead altogether.

Tuning is carried out simply by adjustment of C_1, C_3 and C_6, and by varying the inductances of the first and third anode coils. The latter, of course, is effected by means of the two rotary switches. In general, ordinary tuning will be employed, the aerial being connected to the terminal marked aerial.

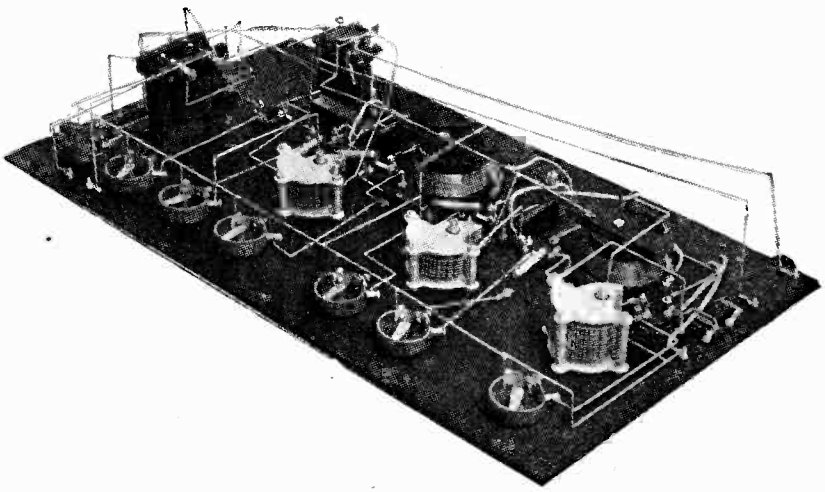


Fig. 6.—Another helpful view of the wiring.

Constructional Details

No special skill is required to make an exact copy of the set, although it certainly has a rather complicated and imposing appearance when completed. It should be borne in mind, however, that a departure from the design of the set, which has been adopted only after careful testing, is liable to affect its working and is not advised; also that all joints should be well soldered if best results are to be obtained.

Components Required

The advisability of purchasing components of good quality has often been emphasised in these pages, and applies particularly to complex receivers in which one faulty component may result in mediocre or even very poor results.

The actual components used are as follows, and makers' names are given to assist readers who wish to exactly duplicate the receiver:—

Ebonite panel 27 in. by 15 in. by ¼ in. (Peto-Scott Red Triangle).

Cabinet of suitable dimensions.

1 "Efesca" type C. transformer (T_1T_2) (Falk, Stadelmann).

1 L.F. transformer (T_3T_4) (U.S. Radio Co. "Super").

7 valve holders (H.T.C. Electrical Co., type C.).

7 bright emitter valve rheostats with fuses (Shipton and Co.).

1 Polar Junior vernier two-coil holder (Radio Communication Co.).

4 adjustable single coil sockets (Penton Engineering Co., Ltd.).

1 ·0005 μF square law condenser ("Utility," Wilkins and Wright).

2 ·0003 μF square law condensers ("Utility," Wilkins and Wright)

4 ·0003 μF fixed condensers ("Paragon," Peter Curtis).

1 ·002 μF fixed condenser ("Paragon," Peter Curtis)

1 ·001 μF fixed condenser ("Paragon," Peter Curtis).

1 ·0001 μF fixed condenser (Dubilier).

4 2 megohm grid leaks with clips (Dubilier).

2 tapped reactance coils (Burne-Jones and Co. These are similar to those supplied for the "Simplicity" receiver, Envelope No. 3).

2 nickel plated switch arms and 20 nickel plated contact studs (Burne Jones and Co.).

1 ft. of 2B.A. threaded brass rod, 2 pieces of ebonite, each 4 in. by 1 in. by ¼ in.

14 W.O. type terminals.

2 Clix plugs. (Autoveyors, Ltd.).

4 Clix sockets (Autoveyors, Ltd.).

Square tinned copper for wiring.

Quantity of rubber covered flexible wire.

Packet of Radio Press Panel Transfers.

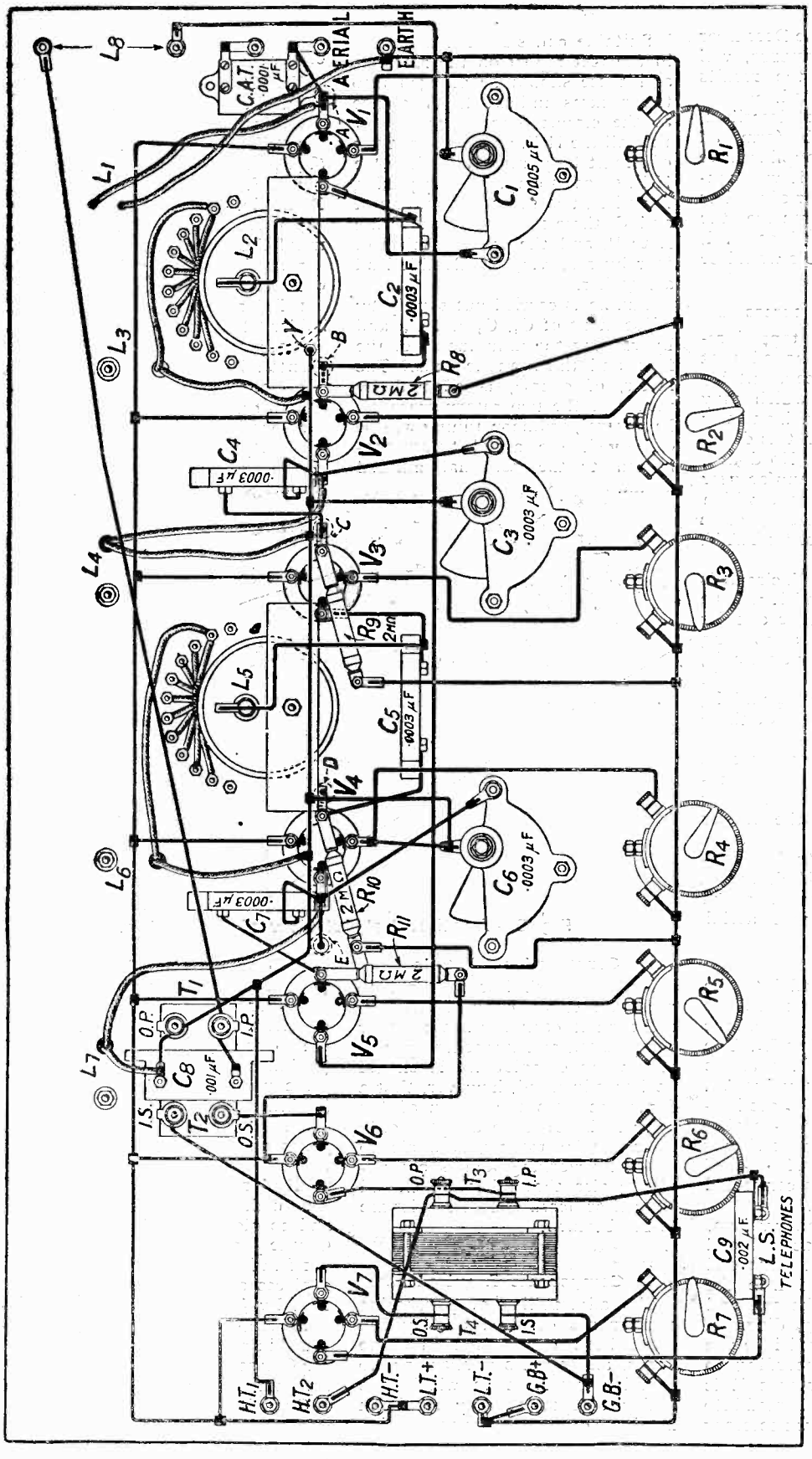


Fig. 7.—Practical working drawing of the wiring. Blue Print No. 85B.

Drilling the Panel

The diagram showing the positions of the various holes to be drilled in the panel, is given in Fig. 5. Much time may be saved by drilling all holes of one size irrespective of their positions on the panel, without changing the drill.

The Reactance Coils

The two tapped coils may be made if desired. Two formers 2¾ ins. in diameter by 2 ins. long, and 2 ozs. of 40 gauge single silk covered resistance wire are necessary. Each coil should be of 150 turns, tapped at 50, 60, 70, 80, 90, 100, 110, 120 and 150 turns.

Mounting the Components

The four fixed coil sockets, it will be observed, are mounted in such a manner that it is possible to rotate them and thus obtain a minimum degree of coupling between the coils they hold. The mounting, as may be gathered from the wiring diagram and photographs, comprises a 2 B.A. spindle which passes through the panel and is secured on one side in the socket itself, while on the back of the panel a spring washer and two lock nuts are employed to obtain the requisite rigidity.

The mounting of the tapped anode coils is really quite simple, the 2 B.A. rod and small pieces of ebonite mentioned in the component list being employed for this purpose. The ends of the coils having the 50 untapped turns are placed farthest from the

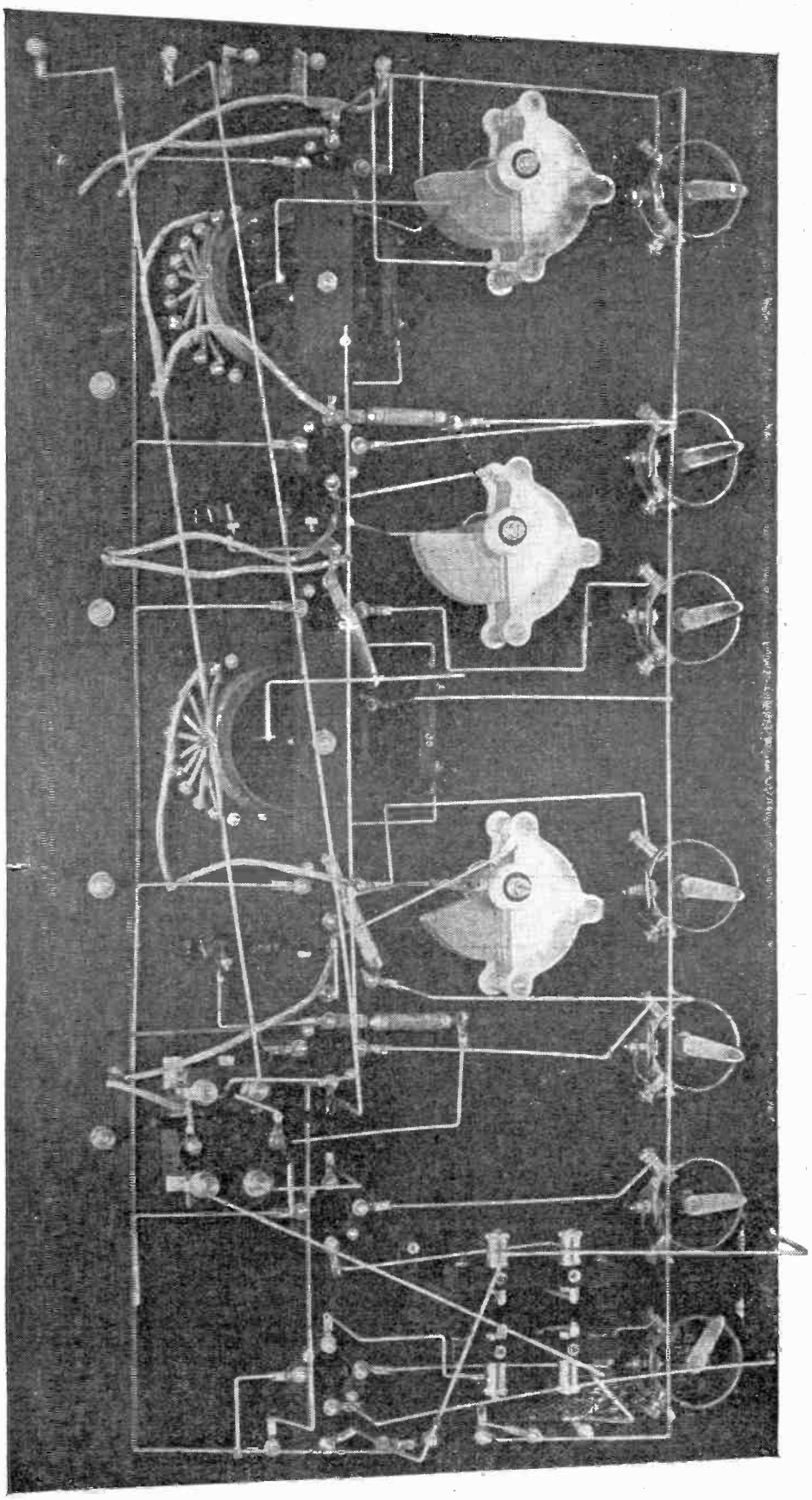


Fig. 8.—This photograph clearly shows how the leads are taken.

panel. Here again the photographs and diagrams show the method of mounting. The coil is held firmly to the panel by means of a length of 2 B.A. rod passing through the 4 in. by 1 in. piece of ebonite placed on the top end of the coil, and through the panel, a nut being fitted to each end of the rod. The clips holding the grid-leaks are in some cases fixed to grid sockets of the valve holders and in others to convenient spots on the back of the panel. These are all clearly shown in the wiring diagram, Fig. 7. In the present case, the clips have been made from sheet brass, these replacing the usual clips quite effectively.

Wiring

This should not prove difficult if method is employed in making the various connections. A careful study of the photographs giving views of the back of the panel will show which wires are near to the panel and those which are arranged on a higher level.

Soldering lugs have been used profusely in wiring this receiver, an advantage in their use being the ease with which good soldered joins may be made.

It will be observed that each fixed condenser is held in position by means of the stiff wiring to which it is soldered.

In the drilling diagram the studs of the rotary switches are numbered 1 to 10. 50 turns of the anode coil are included between studs 1 and 2, 10 turns between each consecutive pair of studs from 2 to 9, and 30 turns between 9 and 10.

At the point Y in the wiring diagram, a screw is inserted to which one of the wires is soldered for extra support. It should be mentioned that this is the sole purpose of the screw.

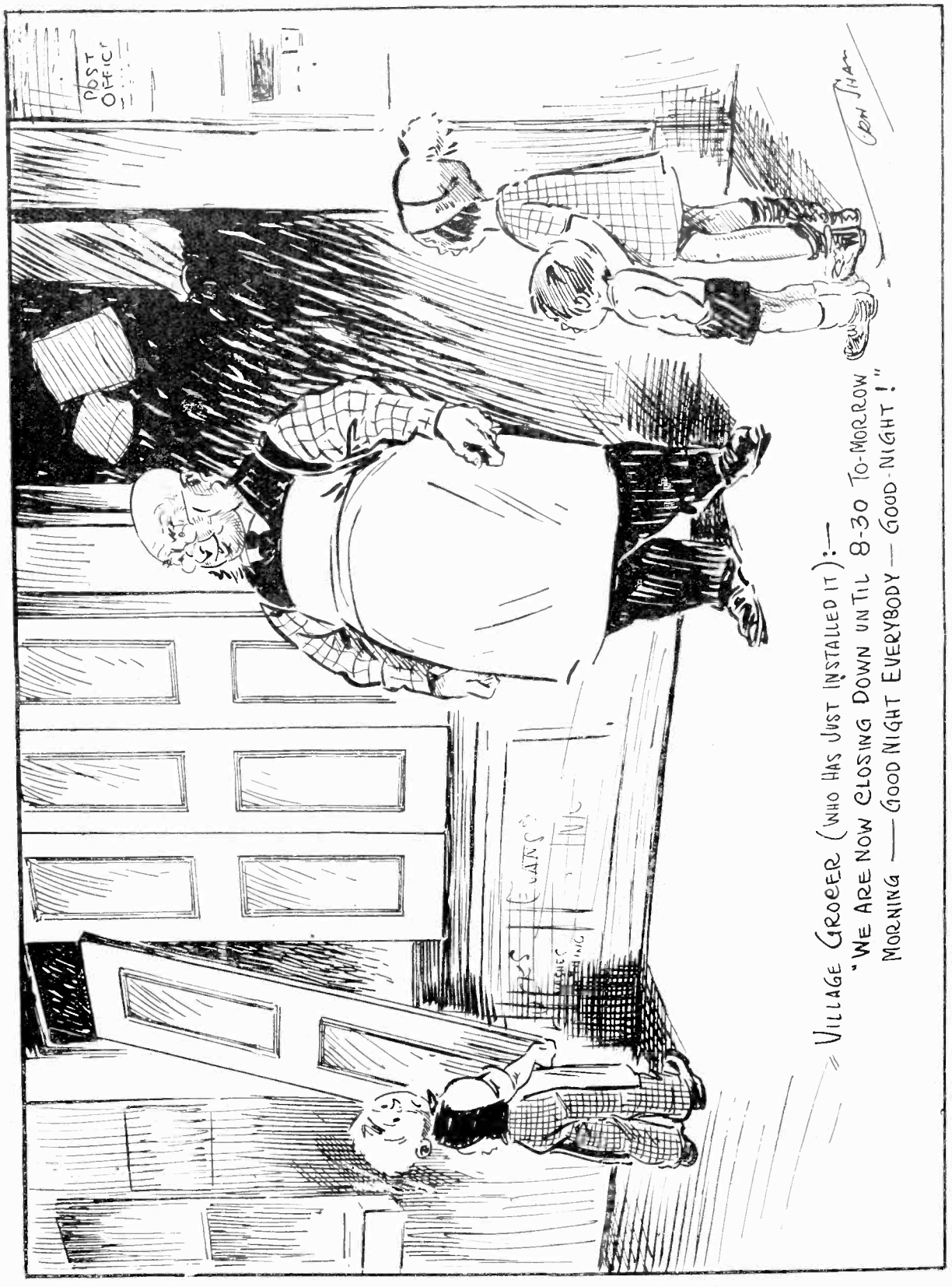
Tabulated Test Results.

Seven-valve T.A.T. set tested at Bedford, December 5th, 1924. Aerial used in all tests:—100 ft. single wire, 45 ft. high. **Parallel aerial tuning** was used throughout. High tension: 78 volts on HT + 1 and 120 volts on HT + 2. Grid bias: 4 volts negative. General purpose bright emitter valves were used in the first five stages and power valves in the last two stages.

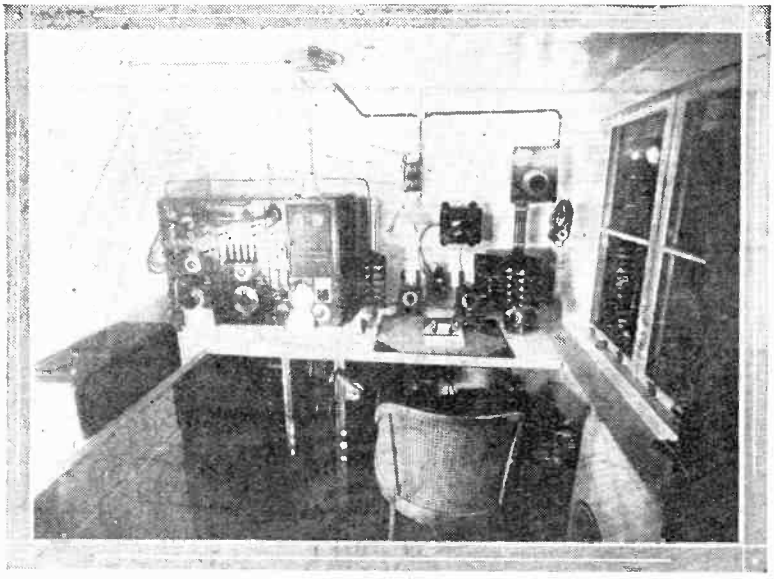
Call Sign and Wavelength.	Name.	Distance.	Grid Connections.	No. of Valves.	Aerial Coil.	Aerial Condenser.	First Anode Coil Stud	First Anode Choke Coil.	Second Anode Coil.	Second Anode Condenser	Third Anode Coil Stud.	Third Anode Choke	Fourth Anode Coil.	Fourth Anode Condenser	Reaction.	Results.	Remarks.
2LO 365 metres	London	... 50 miles	A to E	3	No. 35 Tangent	49°	—	—	—	—	—	—	—	—	No. 50 Tangent	Very good loud speaking	
2LO 365 metres	London	... 50 miles	A to D	4	No. 35 Tangent	61°	—	—	—	—	—	—	No. 75 Tangent	35°	No. 50 Tangent	Loud speaking too loud to be comfortable	Reaction coil could be coupled with very good effect
2LO 365 metres	London	... 50 miles	A to C	5	No. 35 Tangent	69°	—	—	—	—	Stud 9	Shorted	No. 75 Tangent	35°	No. 50 Tangent	Too powerful for the L.S.	Reaction loosely coupled
2LO 365 metres	London	... 50 miles	A to B	6	No. 35 Tangent	55°	—	—	No. 75 Tangent	30°	Stud 8	Shorted	No. 75 Tangent	45°	No. 50 Tangent	Very small increase in volume	Choking effect obtained. Changed detector valve from a Cossor to a B.T.H. B.4—better control but still overpowering the valve.
2LO 365 metres	London	... 50 miles	—	7	No. 35 Tangent	?	?	Shorted	No. 75 Tangent	?	?	Shorted	No. 75 Tangent	?	No. 50 Tangent	Excessive choking	Unable to control owing to excessive choking.
5WA 351 metres	Cardiff ...	... 120 miles	A to C	5	No. 35 Tangent	36°	—	—	—	—	Stud 8	Shorted	No. 75 Tangent	30°	No. 50 Tangent	Good loud speaking	No interference from London.
5WA 351 metres	Cardiff ...	... 120 miles	—	7	No. 35 Tangent	?	?	Shorted	No. 75 Tangent	?	?	Shorted	No. 75 Tangent	?	No. 50 Tangent	London flooding and completely paralysing the set although no actual signals from London were received	
2ZY 375 metres	Manchester	... 120 miles	A to C	5	No. 35 Tangent	82°	—	—	—	—	Stud 8	Shorted	No. 75 Tangent	46°	No. 50 Tangent	Good loud speaking but slight interference from London.	
2ZY 375 metres	Manchester	... 120 miles	—	7	No. 35 Tangent	?	?	Shorted	No. 75 Tangent	?	?	Shorted	No. 75 Tangent	?	No. 50 Tangent	Unable to tune owing to choking effect of London station (no actual signals received from 2LO).	
6BM 385 metres	Bournemouth	... 120 miles	A to C	5	No. 35 Tangent	90°	—	—	—	—	Stud 9	Shorted	No. 75 Tangent	49°	No. 50 Tangent	Very good loud speaking but slight interference from London.	
6BM 385 metres	Bournemouth	... 120 miles	—	7	No. 35 Tangent	?	?	Shorted	No. 75 Tangent	?	?	Shorted	No. 75 Tangent	?	No. 50 Tangent	London paralysing the set.	
5NO 400 metres	Newcastle	... 200 miles	A to C	5	No. 50 Tangent	10°	—	—	—	—	Stud 9	Shorted	No. 75 Tangent	51°	No. 50 Tangent	Good loud speaking.	
5NO 400 metres	Newcastle	... 200 miles	—	7	No. 50 Tangent	11°	Stud 8	Shorted	No. 75 Tangent	50°	Stud 9	Shorted	No. 75 Tangent	50°	No. 50 Tangent	Full loud speaking	Fading bad. When at maximum signals were too powerful. Much interference from Morse and static.
5SC 420 metres	Glasgow	... 300 miles	A to C	5	No. 50 Tangent	15°	—	—	—	—	Stud 9	Shorted	No. 75 Tangent	56°	No. 50 Tangent	Good loud speaking	Reaction could be usefully applied
5SC 420 metres	Glasgow	... 300 miles	—	7	No. 50 Tangent	19°	Stud 9	Shorted	No. 75 Tangent	54°	Stud 10	Shorted	No. 75 Tangent	56°	No. 50 Tangent	Very good loud speaking	
5IT 475 metres	Birmingham	... 65 miles	A to C	5	No. 50 Tangent	57°	—	—	—	—	Stud 10	No. 35 Tangent	No. 75 Tangent	71°	No. 50 Tangent	Very good loud speaking	Much interference from Morse.
5IT 475 metres	Birmingham	... 65 miles	—	7	No. 50 Tangent	?	?	Shorted	No. 75 Tangent	?	?	No. 35 Tangent	No. 75 Tangent	?	No. 50 Tangent	Set paralysed	
2BD 495 metres	Aberdeen	... 350 miles	A to C	5	No. 50 Tangent	66°	—	—	—	—	Stud 10	No. 50 Tangent	No. 75 Tangent	79°	No. 50 Tangent	Very good loud speaking	
2BD 495 metres	Aberdeen	... 350 miles	—	7	No. 50 Tangent	?	?	Shorted	No. 75 Tangent	?	?	No. 50 Tangent	No. 75 Tangent	?	No. 50 Tangent	Birmingham paralysed the set, although no actual signals were received from this station.	Excessive interference from Morse.
5XX 1,600 metres	Chelmsford	... 45 miles	A to E	3	No. 150 Lissen	65°	—	—	—	—	—	—	—	—	No. 200 Lissen	Very good loud speaking.	
5XX 1,600 metres	Chelmsford	... 45 miles	A to D	4	No. 150 Lissen	84°	—	—	—	—	—	—	No. 200 Lissen	80°	No. 200 Lissen	Uncomfortable loud speaker strength. Set overpowered if more than this number (4) of valves was used at the distance.	

Condenser Readings.

A ? indicates that no definite reading could be obtained as the set was choked in these cases. Where a valve is not in use a — indicates no coil or shorting plug is inserted, and therefore no condenser reading is obtained.



A SIGN OF THE TIMES.



The wireless room on board the ZR-3, showing the transmitting and receiving apparatus.

How the ZR-3 was Piloted by Wireless

By Captain
H. C. FLEMMING,
Chief Wireless Operator of the ZR-3.

THE safe conclusion of the Transatlantic voyage of the ZR-3 would never have been possible without complete and efficient wireless telegraph and telephone equipment. There are so many factors entering into the proper navigation of such a huge aerial transport device that safe navigation of it over such extreme distances would not be possible if the navigating officers were not in touch with various sources of information at all times during the voyage.

The weather conditions alone are of such extreme importance, that even the direction of the course of such a ship is dependent upon minute and voluminous weather information which must be obtained from authentic sources.

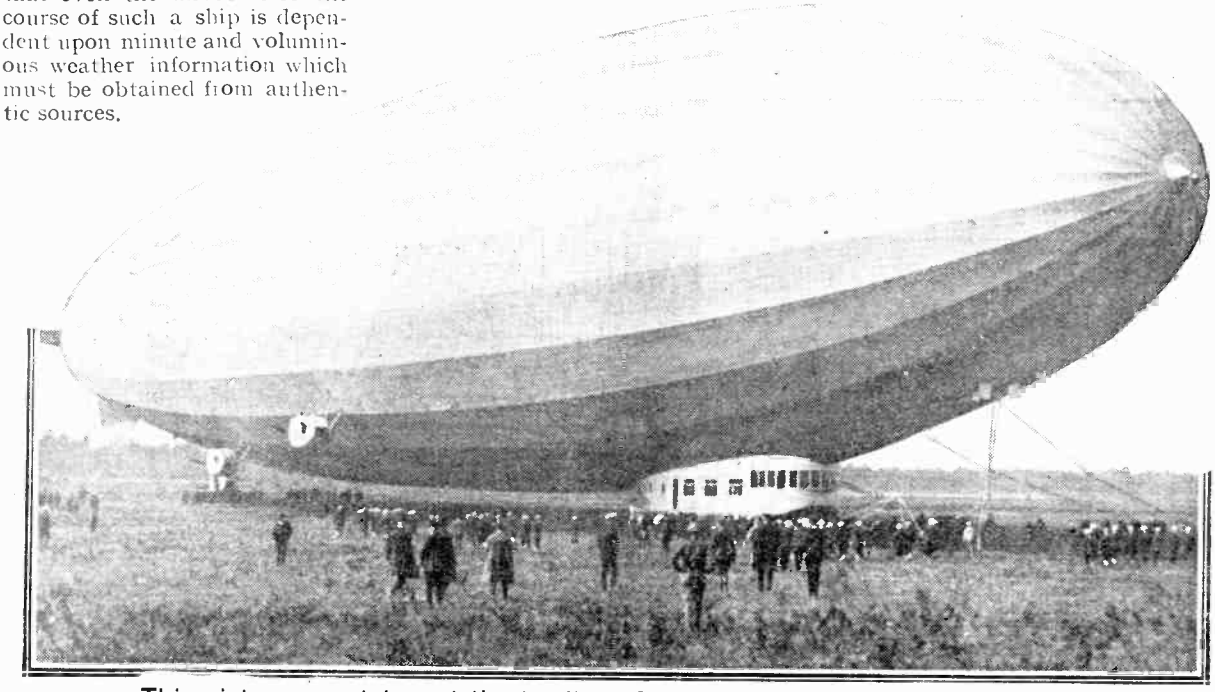
The Wireless Compass

An entirely different situation confronts the captain of a dirigible than that of the skipper of a steamship in the point of navigation. The salt water officer has always his sextant, his log and sometimes landmarks. The aerial skipper is not so blessed with means of finding his way about. Consequently his every position and even his course is checked by the use of the wireless compass. Without this highly sensitive piece of apparatus, there would be no end to his difficulties in knowing where he was at any given time.

So, considering these few factors alone, it is easily understood why such sensitive wireless equipment was included in the cabin of the ZR-3.

The Main Transmitter

The apparatus consisted of five distinct units. There was the regular transmitter of 400 watts capacity capable of working on wavelengths between 300 and 3,000 metres. This set was of the standard valve transmitter type so arranged that it could be operated upon C.W. or I.C.W. This was the transmitter which was relied upon during the greater part of the journey to furnish connection with the outside



This picture was taken at the landing of the ZR-3 after its successful flight from Germany to the U.S.

In this fascinating article the chief operator on the ZR-3 graphically describes how wireless, to a large extent, made possible this epoch-making flight from Friedrichshafen to New York.

world. It had a proven range of about 1,400 miles for dependable communication.

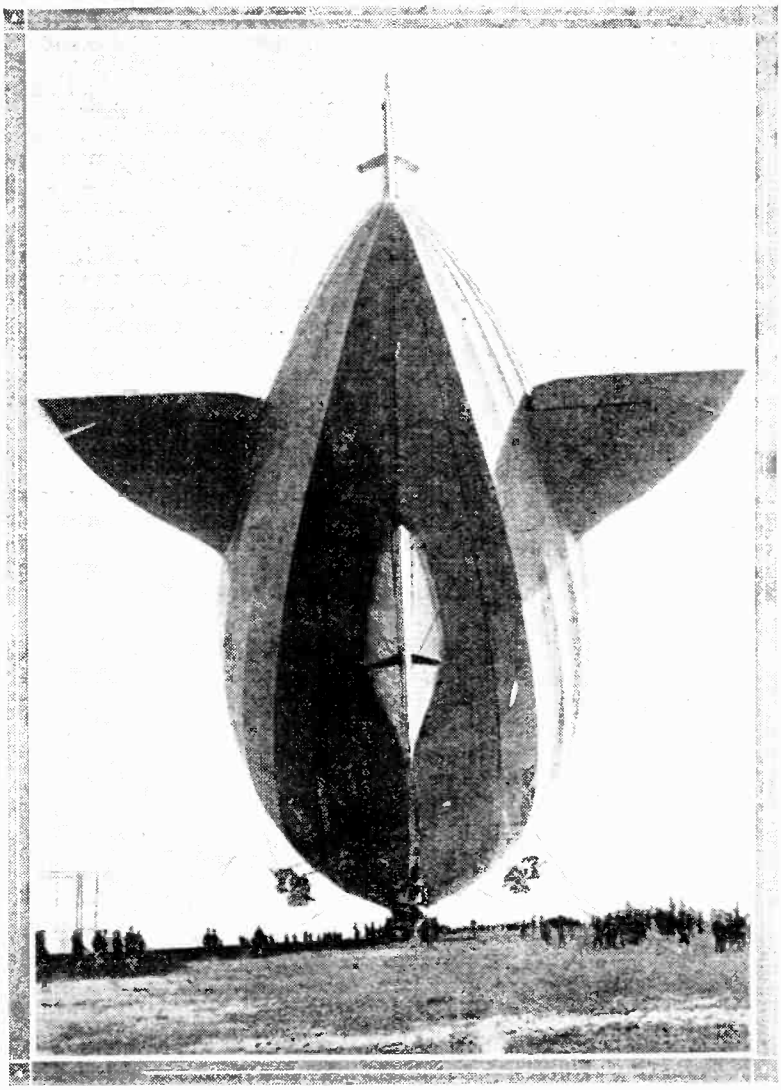
Power Supply

Power was furnished by a 1½ kilowatt, wind-driven generator, which was arranged to swing out from the side of the cabin. A novel method of adjusting the speed of the generator to the speed of the dirigible was obtained through this system of raising and lowering the generator unit in regard to the side of the cabin. By changing the angle, proportionate changes in speed could be obtained, thus enabling the operators to obtain the proper voltage from the generator at all times. The air currents created by the speed of the dirigible, of course, furnished the power for turning the propeller which was directly connected to the shaft of the armature. The voltage from the generator was stepped up to 3,000 volts through a transformer and then rectified by the usual valve rectifier. After passing through a series of filters it was impressed on the plates of the transmitter valves. Power for lighting the filaments of these was also obtained from the wind-driven generator through the agency of a step-down transformer.

The Receivers

The bulk of the receiving on the Transatlantic voyage was accomplished on a detector and two low-frequency set of a standard German make. Two of these sets were used jointly. The arrangement was of the ordinary reaction type. For general work this set was found to be thoroughly reliable.

The most novel piece of apparatus was the radio compass, which contains besides the detector and two stages of audio frequency amplification, *six stages of radio frequency amplification.* Obviously, this set is extremely sensitive, and purposely so, since several times en route the captain took recourse to it in order to check his position and bearing. As a matter of fact, he used it upon every occasion, for the radio compass is the one arrangement which may be absolutely relied upon for accuracy. Through the use of a uni-directional loop, it was possible with this compass to obtain a course by taking observations on one known point alone. This is a great improvement over previous installations which require that two points be located and then the position or course of the ship is obtained by triangulation.



The aft cabin in which the operating room was located is seen in this photograph.

The Telephony Transmitter

The wireless telephone installation was comparatively small, being of about 50-watts capacity, since it was intended primarily for use when making landings. The only efficient way by which the captain of such a ship may direct his ground crew in making a landing is through the use of wireless telephony; other means of signalling, such as the semaphore system, might conceivably be used, but wireless is the only practical method.

An Emergency Spark Set

A reserve set installed for use in case of an emergency was of a standard Telefunken quenched-spark type capable of working on waves between 300 and 800 metres. During the voyage this set was kept in working condition so that it could be brought into operation at a moment's notice, in case of major damage to the regular valve transmitter. Of course spare parts were carried to replace practically any breakdown.

The filament current for the receiving valves, as well as the plate supply, was obtained from storage batteries charged by the wind-driven generator.

The Operating Room

The operating room itself was in the aft cabin. A peculiar method of construction was employed so that the room was both sound and shock proof. The terrific roar of the engines was deadened by a wax compound lining which covered the entire interior. Several precautions were necessary in installing the apparatus so that all danger from sparks would be eliminated; even the transmitting valve was surrounded by wire gauze which would protect any spark originating at the contact points from igniting stray gases which might have been present. Similar precautions were taken at every point in the apparatus where there was a possibility of an open discharge. On every occasion when the ship was taken to a higher altitude, the operators were notified to cease transmitting, since each rise in altitude was accompanied by a slight escape of gas, and the gas being hydrogen was, of course, highly explosive. At the conclusion of the rise, when the captain thought it safe, he would signal the operators again to resume their work.

The Aerial

The aerial system consisted of three stranded cables of the Litz type. Each wire was attached to its individual winch and could be lowered or raised independently of the others. Through a switching arrangement the operators were able to use any wires separately or any combination of them together. Their total length was 360 feet. A torpedo shaped weight hung from the bottom of each one and was of sufficient size to keep them taut.

The Departure of the ZR-3

At 6.35 GMT, on the morning of October 12, the ZR-3 departed from Friedrichshafen on Bodensee for its voyage to the U.S. Naval Air Station at Lakehurst, N.J. Apart from the crew of seven men there were aboard the ship three naval officers and a representative of the U.S.A. No passengers were carried on the ship, since every extra ounce of lifting capacity was given over to carrying the 30 tons of benzine, two tons of oil and a ton of food.

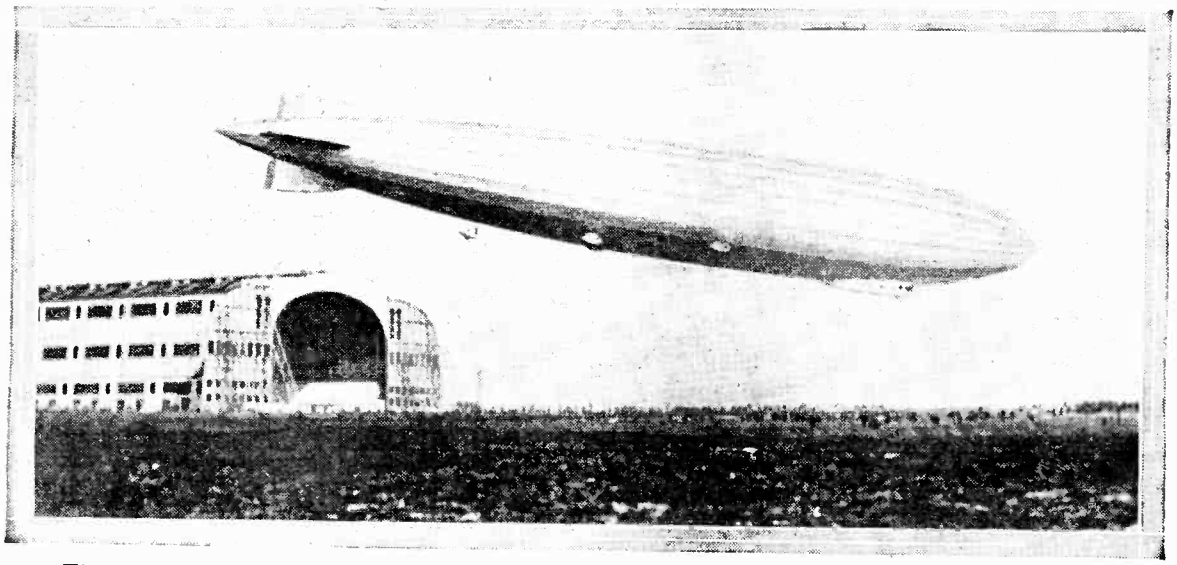
In the morning before our departure a heavy fog descended on Friedrichshafen so that the thousands of people who had gathered to see us take off were unable to watch the ship more than leave the ground.

The take off was accomplished without event. The early part of the voyage was made through the clouds and fog. Soon, however, the ship was piloted to a height of 2,200 feet, and we passed above the clouds. The Swiss Alps appeared in the morning sun. Almost immediately the aerial was lowered and the apparatus started. Before we left complete weather reports had been received daily for more than two weeks, covering the course over which we intended sailing. It was of the utmost importance to keep in close touch with any changes which took place in the weather along the route, and that we were immediately notified of any unknown circumstances. It was, therefore, with great interest that the first operator took his place and began tuning the receiver.

First Transmission

This first attempt was unsuccessful, since one of the three aerial wires snapped before we were able to work with the home station at Friedrichshafen, which we were calling. What repairs were possible were made on the broken wire and later, as we were passing over Basle, Switzerland, we succeeded in getting into communication with Friedrichshafen, working on 1,510 metres. Of course the first messages were for the Press. Following these there was a large number of weather reports detailing the atmospheric conditions along the first part of our proposed route. It must be noted here that these first reports caused us to change our course. At first we had intended to fly south to the Gulf of Lyons and then cross over the Spanish Peninsula. However, after the reception of these first messages, we changed direction and headed for the mouth of the river Gironde in France and thence across the headland of the Spanish Peninsula.

Among the stations furnishing us this very necessary information was Deutsche Seewarte, Hamburg Marine Information Bureau. Messages from this source came by way of Nauen, call OUI, and were transmitted on a wave of 1,460 metres. These reports, which were sent four times a day (at 5 a.m., 11.05 a.m., 5 p.m. and 10 p.m.) were supplemented by others from Eiffel Tower station in Paris, call sign FL, and the United States Naval Station at Arlington, Va., call sign NAA. The United States



The special telephony set installed on board was primarily for use when landing.

station at Annapolis also furnished us with a further report of conditions on the American side of the Atlantic.

Naval Assistance

The transmission of the reports was by no means the largest part of the job. The conditions had to be observed. For this purpose the United States Navy provided three ships which were placed at points along the course that we were to take, and weather officials on these craft made observations, which were transmitted direct to us, or at times when the stations aboard the observing vessels were unable to make connection with us, relayed their reports to the Annapolis or Arlington station.

Apart from the weather reports, the time signals sent out from Nauen and Eiffel Tower were of great importance. With the aid of these, the chronometers of the ship were checked.

Prearranged transmissions

Previous schedules of transmission had been arranged before the departure of the ship. That is to say, a number of stations were to be listening for our call at certain hours of the day, so that we would be able to send out wireless correspondence with the greatest ease and despatch. The hours between 1 and 2 a.m., 7 and 8 a.m., 1 and 2 p.m., and 6 and 7 p.m. were to work with Norddeich, KAV, Germany, and from 2 to 3 and 8 to 6 a.m. and 7 to 8 p.m. we made connection with Bar Harbour, NBD, in the United States.

Some idea of the huge amount of weather information which had to be handled may be gained from the fact that the transmitter was comparatively quiet during our passage over France, for during this time the operators were busily engaged in receiving the reports.

B.B.C. Interference

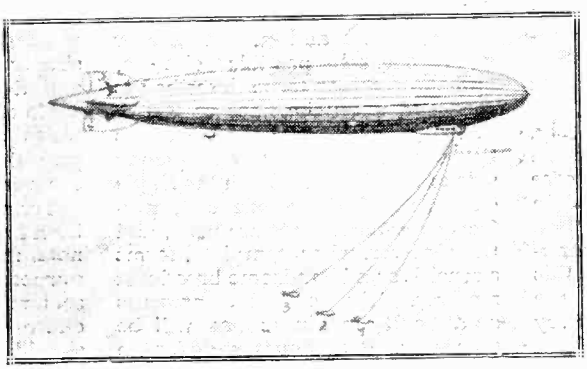
Immediately we left the French mainland and started for the point off Spain, heavy wireless traffic began. All three operators were kept busy at the apparatus. Matters were not improved by the fact that many liners along the route of the voyage across the Atlantic took occasion to call us, wishing us good luck. While passing over Spain all wireless work became extremely difficult on account of interference from the British Broadcasting Stations.

Difficult Working

The following morning, shortly after midnight, a very bad period of wireless weather set in, during which we worked the stations at Eilvese and Norddeich with extreme difficulty. Even when we put the radio compass into service with its six stages of radio frequency amplification, we could not obtain satisfactory results. This condition maintained for several hours. At 8 a.m., however, the air cleared, and for fifty minutes we enjoyed what might be termed perfect working conditions. During this time we obtained an answer from Norddeich and succeeded in working off most of the constantly mounting pile of messages.

During this period we passed the steamer *City of Boston*. She signed herself GFRG, and was so kind as to give us her position—30 degrees 18 minutes N. Lat. and 49 degrees 16 minutes W. Long.—by which the captain checked his observation of our own course.

On approaching the Azores, reports came in from Ferinca, and at 2.30 a.m. we left the islands aft and started directly for Lakehurst. At this time the wind was in the west and was growing constantly stronger. It was only a matter of minutes until we were called by the *Detroit* and told that a low point of barometric pressure was located just off the point of Newfoundland. With this information, the course was changed accordingly in order to avoid it.



Different weights cause the aerial to spread fan-shape.

Atmospherics and Morse

It was about this time that our difficulties in the wireless room became really acute. First, we were proceeding at about ninety miles per hour. After the change in course it was only a short time before the clear sky under which we had been sailing for the past ten hours gave way to dense clouds. Previously we had been in constant communication with the *Detroit* through the aid of the wireless compass. As we proceeded, reception became constantly more difficult on account of atmospherics. But this was not the worst. All the ships along our course were working, and created no end of interference. NERM — the call assigned to the ZR-3—called many of them time after time, giving the international signal, QRM, which means "you are interfering, please use less power or cease transmitting," which had not the slightest effect. Conditions finally became so bad that it was impossible to continue with the work. It was decided that the working wavelength should be changed. To no avail, however, since we found as much interference on the higher wavelength as previously. There were a number of ships carrying spark equipment which were quite bad in this quarter. They created constant QRM at all wavelengths. It was principally through the kindness of WSO and WCC that we were able to get through our quota of traffic.

The Landing

As we approached the American shore matters righted themselves, and by the time we were passing over New York our business was cleared and the wireless staff was quite ready to make landing. Of course, the telephony equipment was gone over and placed, ready to stand-by for the landing operations. However, this preparation was not necessary, since the crew at the field handled the situation with perfect ease.

Not the least enjoyable features of the journey was the reception of programmes from various broadcasting stations. One of the officers of the ship produced a loud-speaker which worked with the conventional horn and without additional power of any kind. During the trip a little more than 12,000 words were handled in code. This record was made in spite of the great number of repeats and the extremely bad atmospheric conditions.

As for the range of our transmitter, WSO heard us while we were flying over Basle, Switzerland. The *New York Times* station picked up our signals while we were cruising over the Spanish shore. A peculiar thing in connection with this station's performance was the fact that the *Times* station reported hearing us just as well while we were in Europe as it did while we were passing over New York City.

In spite of the difficulties encountered on the journey, the station worked very satisfactorily.

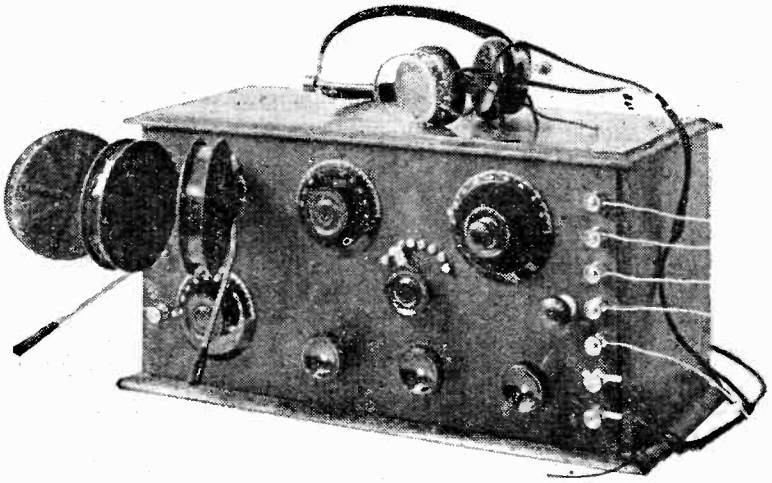


Fig. 1.—Valves are enclosed in this compact receiver.

A Three-Valve "Neutral-Grid" Receiver.

By JOHN W. BARBER.

MUCH interest has been aroused among experimenters by the publication in *Wireless Weekly* of an article by A. D. Cowper, M.Sc., describing the "Neutral-Grid" method of coupling a high-frequency amplifying valve to the detector valve, and many will no doubt have tried the arrangement.

The principle, for the benefit of those who may not have seen the original article, is, briefly, as follows: In a tuned-anode circuit the capacity coupling in the valve itself is often sufficient, with well-designed inductances, sharply tuned, to cause the set to oscillate freely, without the aid of intentional reaction. When this is the case the circuit has to be stabilised in some way, the most common method being by the introduction of damping in one form or another, this reducing the efficiency of the first valve as a high-frequency amplifier.

The Neutral Tapping

Considering the case of a loosely coupled aerial circuit, if the grid coil be connected, not across grid and filament, but across grid and a tapping point at or near the centre of the anode tuning coil, the grid circuit will, theoretically, be held neutral with respect to oscillations in the anode circuit, and the set will thus be stabilised.

In practice, however, the grid-filament capacity of the valve is generally larger than that between the grid and anode of the valve; therefore the tapping-point will be displaced from the centre of the anode coil, and will be located nearer to the "H.F. earth" (H.T. +) end of that coil.

We now have an oscillating circuit interposed between the tapping-point and the grid of the valve, and this circuit will be unaffected by oscillations in the anode coil. The oscillations in the grid coil will, however, by the action of the valve, appear in magnified form in the anode circuit. Reaction may be introduced into the grid coil from the anode circuit of the detector valve, and thus a three-coil tuner is a necessity.

Circuit Details

In his articles in *Wireless Weekly*, Vol. 5, Nos. 2 and 3, Mr. Cowper gave several possible circuits, and the receiver to be described is modelled upon the lines of Fig. 4 of No. 3, with some modifications in respect of the low-frequency side of the circuit. With the single exception of the anode coil, perfectly standard parts are used, and the receiver, when complete, forms a sensitive and handsome broadcast receiver. The coil L_3 presents no difficulty in winding, as will be seen later. Provision is made for the inclusion or omission of the note-magnifying valve, the change being effected by means of a Bretwood anti-capacity switch, the connections to which are clearly seen in Fig. 8. The switch cuts off the filament supply to the last valve and changes over the telephones.

Parallel Tuning

Separate anode voltage supply to the note magnifier is made possible by the inclusion of a separate terminal HT+2, that marked HT+1 being a common supply for the high-frequency and detector valves.

No advantage has been found in series aerial tuning, so that no provision for such has been made, the parallel method being adopted.

Terminals for grid bias have not been included, as with one stage of note magnification, using general purpose valves, external grid bias is seldom necessary, provided the anode voltage is not unduly high; but should the experimenter desire to introduce a biasing battery, the

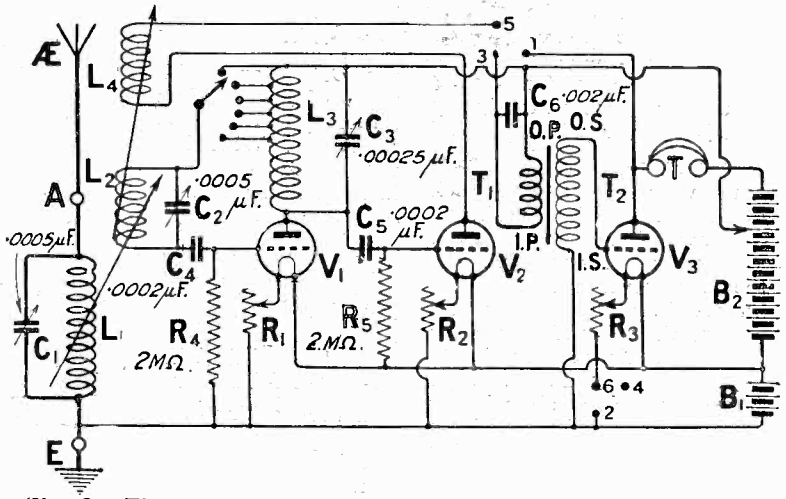


Fig. 2.—The theoretical circuit; the numbered leads go to the switch shown in Fig. 8.

An All-Round Receiver employing a Circuit described in "Wireless Weekly," Vol. 5, No. 2.

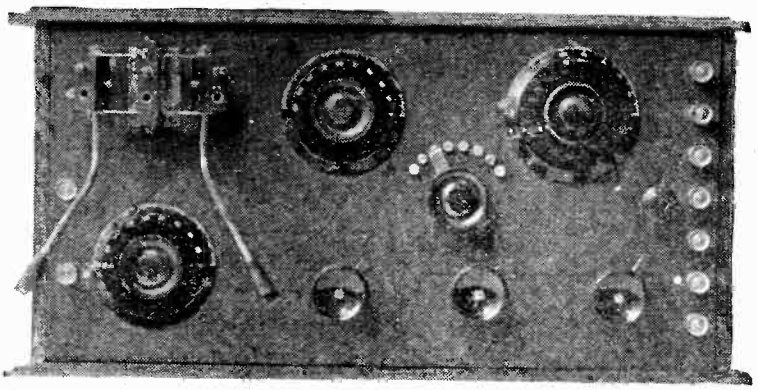


Fig. 3.—Simplicity is the keynote of the panel layout.

lead from the I.S. of the low-frequency transformer to L.T.— is taken out, and the I.S. is connected to the negative terminal of the grid battery, the positive terminal of which is joined to L.T. —.

Components Required

For the benefit of those readers who desire to construct this receiver, the necessary parts are listed below, and as some may want to know the names of the actual parts used, these are added. It is not essential that the constructor should use the parts named, any of good quality being satisfactory; values, however, should be strictly adhered to.

1 Cabinet (All Concert-de-Luxe type).
1 Ebonite panel, 16 in. by 8 in. by ¼ in.
1 Ebonite strip, 14 in. by 1½ in. by ¼ in.
2 0·0005μF Variable condensers (Jackson Bros. square-law type).
1 0·00025μF Variable condenser (Sterling square-law with vernier).
1 3-way Coil-holder (Magnum).
3 Filament resistances (Shipton).
1 Low-frequency transformer (Super-Success).
3 Valve sockets (H.T.C., Type C.).
2 0·0002μF Fixed condensers (Dubilier).
2 2MO Leaks (Dubilier).
1 0·002μF Fixed condenser (Dubilier).
1 Switch arm, 1¼ in. radius (McMichael).
6 Studs, 2 stops.
9 Terminals (Magnum, nickel-plated).
1 Ebonite tube, 4 in. diameter, 5 in. long (Britannia Rubber Co.).
About ½ lb. of No. 20 S.W.G., D.C.C. copper wire.
1 Anti-capacity switch (Bretwood).
Some wire for connections and flex for leads to coil-holder.

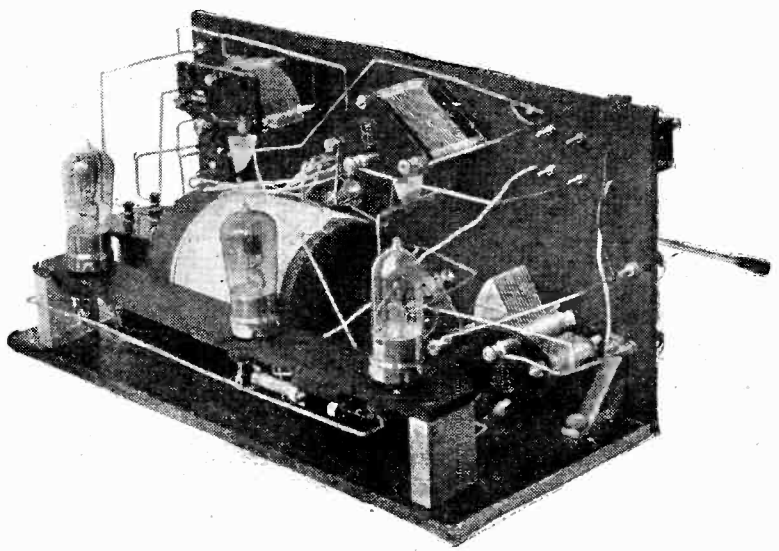


Fig. 4.—This photograph shows the connections to the "Neutral-Grid" coil.

The Anode Coil

This is very simple to construct and may be wound in any manner convenient. Tappings are required from the last six turns. The method I adopted in making the tappings may seem unnecessarily complicated, but in reality is very simple and gives a neat job with no soldering, excepting on to the studs of the selector switch.

First wind on 85 turns and cut the wire adrift from the remainder on the bobbin. Remove 11 turns and drill a hole in the ebonite tube at the point where the tapping is to be taken. The free end of the wire is threaded through and pulled tight, when the end is passed *back again* through the hole, until a loop about three inches long remains inside the tube. A turn is now wound on and the procedure repeated, the last turn being threaded in one hole and out through another, thus effectively securing the wire in position. The extra five turns put on over and above the 80 necessary will be found ample for the tappings. Those who prefer may wind on 80 turns straight off and then make the tappings by scraping the insulation off each turn for a small portion and soldering a wire on at each point.

Drilling

The design of this receiver is such that only the operating controls are on the main panel, the valves being mounted upon a sub-panel at the back out of harm's way. The method of drilling the main panel is seen in Fig. 5, which gives all the necessary dimensions. The sub-panel is only to be drilled to take the three valve-holders

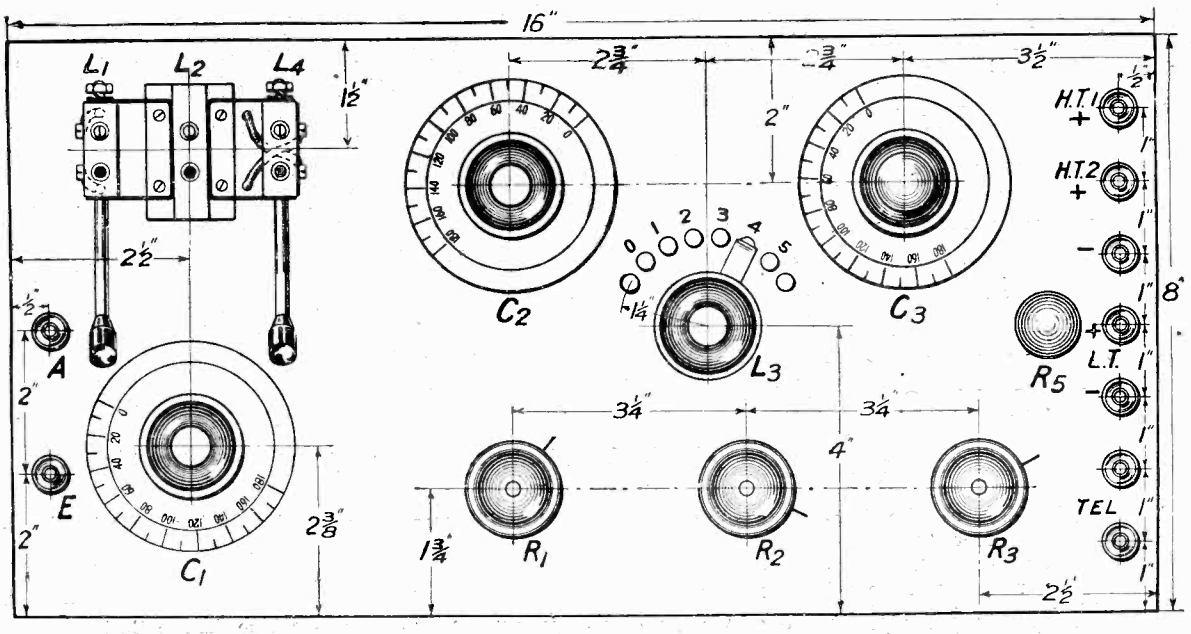


Fig. 5.—Front of panel drilling diagram. Blue Print No. 87A.

and one fixed condenser. The former may be drilled from the templates supplied, while the holes for the condenser may be drilled, using the component itself as a template. The sub-panel is mounted upon two pieces of wood which are secured to the base-board, the latter being in turn secured to the main panel by means of a stair-rod bracket at each side. Very few holes are required on the main panel, and no difficulty is anticipated in this direction. The low-frequency transformer is screwed directly on to the base-board.

Wiring

The wiring of the receiver may need a little care, owing chiefly to the leads to the sub-panel, but if the wiring diagram (Fig. 7) is carefully followed, the task need not present any difficulty. Either round or square section wire may be used, as preferred, and I recommend that wiring actually on the main panel be carried out first, the leads to the sub-panel being fitted and soldered first to it; afterwards connections are completed to the main panel.

Valves

Any good make of general-purpose receiving valve will give satisfaction in this receiver, and the maker's instructions regarding filament and anode voltages should be carefully followed. If dull emitter valves are employed suitable rheostats must be incorporated. As the receiver was intended for use with such valves, the resistances are of the 30 ohm type.

Coils

For the broadcast waveband from 300–500 metres a No. 35 or 50 coil will be required in the aerial socket L_1. L_2 and L_4 may each be a No. 50, or a No. 50 and 75 respectively. The coil L_3, as wound, will cover this band with the condenser used, but clearly a larger coil will be required if the set is used on the higher wave signals such as those of Chelmsford or Radio-Paris. The chief object of the principle is, however, stability on the ordinary broadcast waveband, as other methods of high-

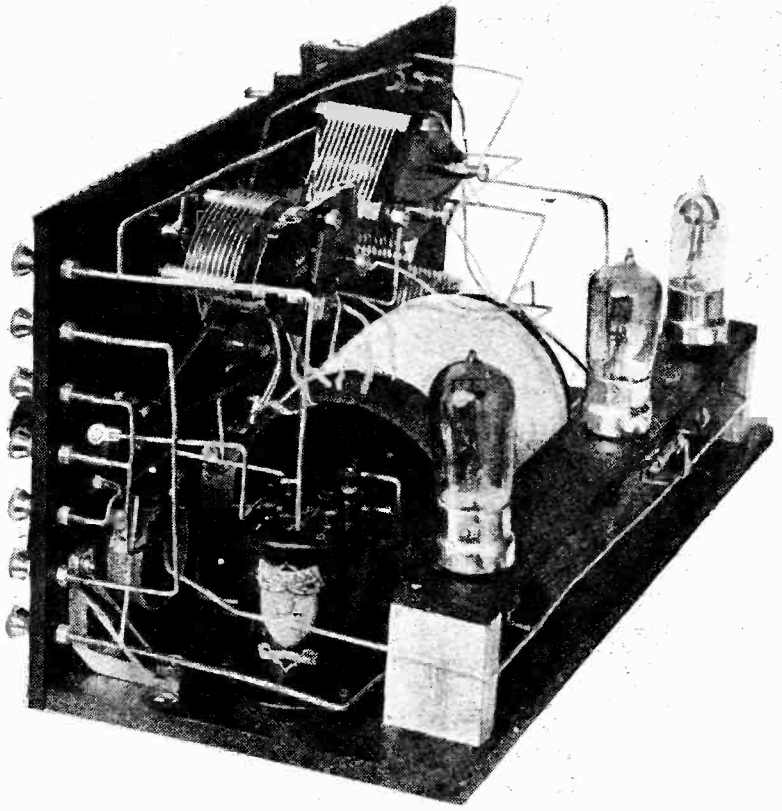


Fig. 6.—Transformer connections are seen to the front of the photograph.

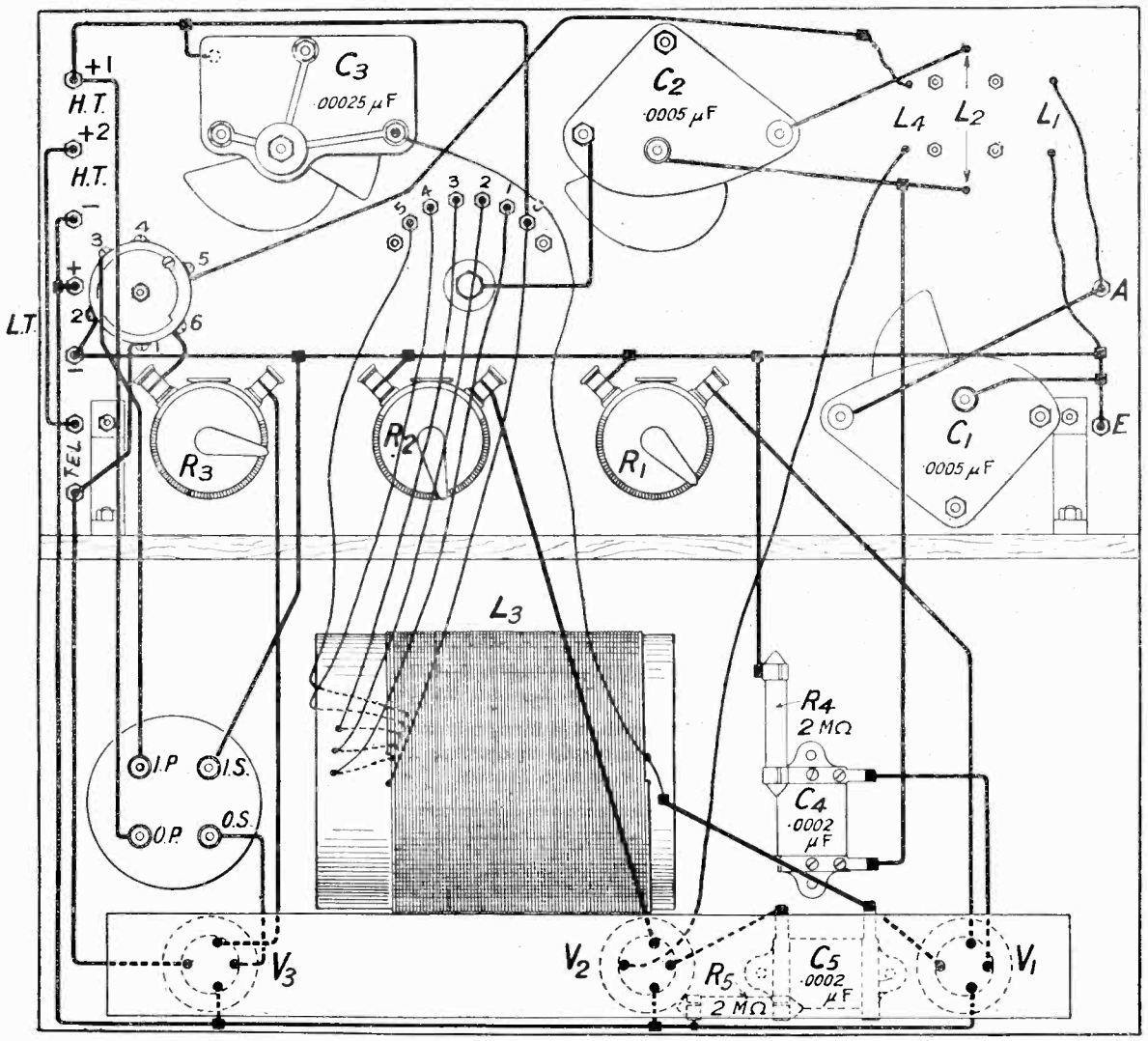


Fig. 7.—If this diagram is followed, no difficulty should be experienced in following the wiring of the set. Blue Print No. 87B.

frequency amplification may be used on the higher wavelengths.

Operating

Testing the receiver is the next operation, and this is carried out as follows: Connect the aerial lead to the top left-hand terminal, and the earth to that immediately beneath it. Telephones to the bottom two terminals in the right-hand row, low-tension negative and positive respectively, are next connected, reading up the row, while the negative high-tension lead is joined next.

The top two terminals are for the positive high-tension supply to the high-frequency and detector and the low-frequency amplifying valves respectively, reading from the top. This completes the external connections, and the valves and coils are next inserted. For average aerials a No. 55 coil will suffice in the aerial circuit for the lower broadcasting wavelengths, but a No. 50 will be needed in addition if the whole 300-500 metre band is to be covered. A No. 50 will be required in the fixed socket, while the reaction coil may be a

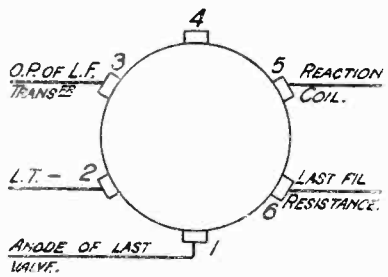


Fig. 8.—Showing the switch connections.

No. 75 or No. 50, according to the ease with which the set will oscillate.

The tuning is accomplished by setting the aerial condenser at some arbitrary setting, having the aerial coil coupled fairly closely to the grid coil, and the reaction coil swung well away. The selector switch-arm should be over to the right during preliminary trials. The anode and secondary condensers are then simultaneously varied until the desired signal (the local station is best at first) is heard.

Adjust the three condensers to the best positions, and bring up the reaction coil slowly to the fixed (grid) coil. If there is an increase in signal strength, all is well, but if the closest coupling will not produce oscillations, the connections to the reaction coil should be reversed by changing over the flexible leads to the right-hand moving socket.

The best results will be obtained when the aerial coil is loosely coupled to the secondary, as the set is then more selective, and

closer tuning to the desired wave is called for. It may be noticed that in the photographs the ·002μF condenser across the primary of the low-frequency transformer is missing. This was not in the set at the time the photographs were taken, but will be found an advantage in giving smooth reaction control.

Results Obtained

The set was tried out on a 100 ft. aerial in South-east London, about six miles direct from that station. Signals were all that could be desired, the set operating a loud-speaker with comparative ease. On turning out the filament of the high-frequency valve, signals were reduced in volume to a more marked extent than with the conventional tuned anode circuit.

Unfortunately, one of the now frequent "S.B." nights was accidentally hit upon for the first test, but the carrier of each station, with the exception of Bournemouth and Cardiff, was picked up and resolved, this being a fairly simple matter with square-law condensers. Later on, Madrid and a Continental station, unidentified, were received at good strength, the former being of sufficient strength to operate a loud-speaker in a small room.

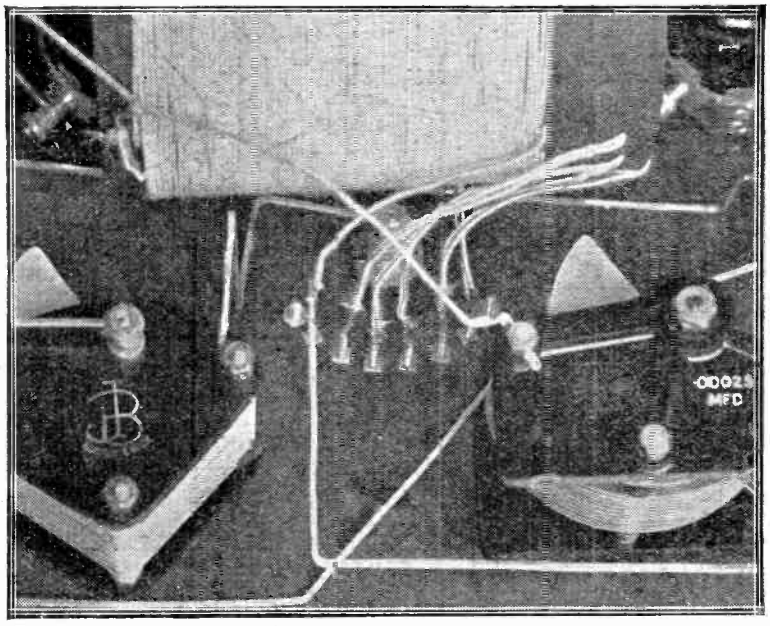
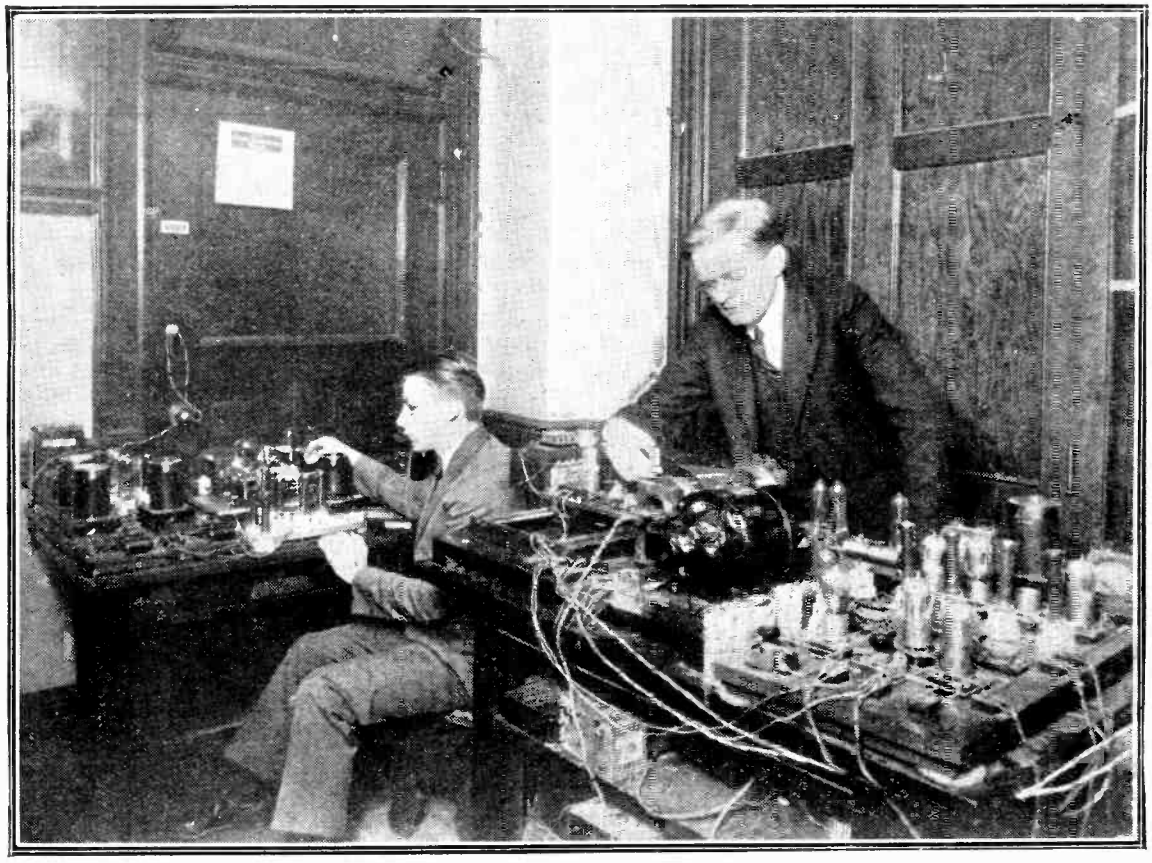
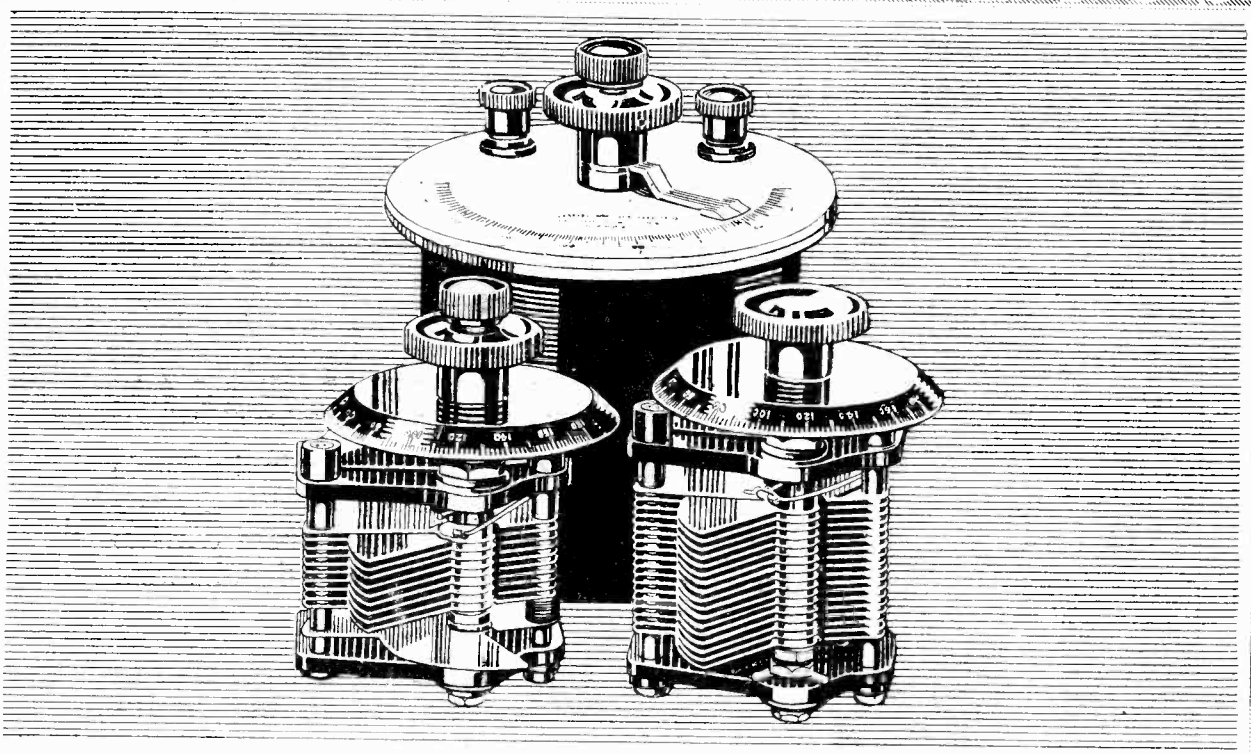


Fig. 9.—This photograph shows the connections to the coil L_3 and its tapping switch.

On subsequent nights the set brought in all B.B.C. stations easily and regularly.



Photographs were recently transmitted by wireless from London to New York. Our picture shows some of the apparatus used in London.



STERLING SQUARE LAW CONDENSERS finish tuning troubles

Owing to the special shape of the vanes in these Condensers the wave-length curve is a straight line, i.e., the wave-length is directly proportional to the number of degrees through which the knob is turned. This gives much greater ease of tuning, a fact readily appreciated by any experimenter.

The end plates are of reinforced insulating material, and the vanes are of brass. Made in three capacities, either with or without Vernier attachment. A small knob controls the latter independently of the other vanes.

Sterling Square Law Condensers are unrivalled for use in receiving sets and are specially recommended for use in the construction of wave-meters and other radio measuring instruments. Ask your dealer to show you these Condensers — *then note the difference and perfect finish.*

With Vernier Adjustment

Capacity	*For Panel Mounting*		*In Case with Ivorine Dial*	
·00025 mfd.	R.2724	£1 3 0	R.2733	£2 2 6
·0005 mfd.	R.2725	£1 5 6	R.2734	£2 5 0
·001 mfd.	R.2726	£1 10 6	R.2735	£2 10 0

Without Vernier Adjustment

Capacity	*For Panel Mounting*		*In Case with Ivorine Dial*	
·00025 mfd.	R.2729	£1 0 0	R.2737	£1 19 6
·0005 mfd.	R.2730	£1 2 6	R.2738	£2 2 0
·001 mfd.	R.2731	£1 7 6	R.2739	£2 7 0

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R.2740	·0002 mfd. (each unit). *For controlling two stages*	£1 7 6
R.2743	·0002 mfd. (each unit). *For controlling three stages*	£1 15 0

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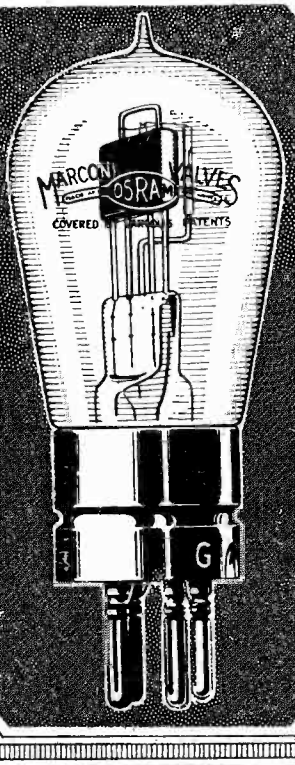

OSRAM

LEADERSHIP

THE design of the Valve in the Purple Box is directed from the leading laboratories in the science of Wireless —those of the great Marconi and Osram organisations.

It is made at the factory with the greatest experience in valve manufacture in the British Empire—the Osram Works.

The characteristics of each type of valve have been decided on as the result of the unrivalled experience of experts, not only in valve design, but also in the design of wireless sets.

MARCONI VALVES
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¶ *Read the authoritative wireless book, The Book of M O V. Get a copy from your dealer, or write direct to The M.O. Valve Co., Ltd., Hammersmith, London, W.6.*

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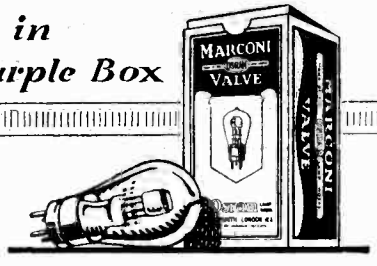
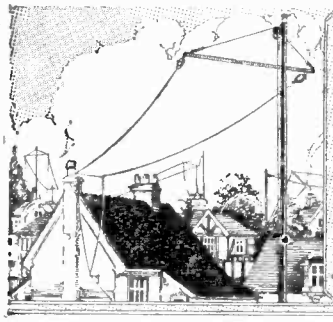
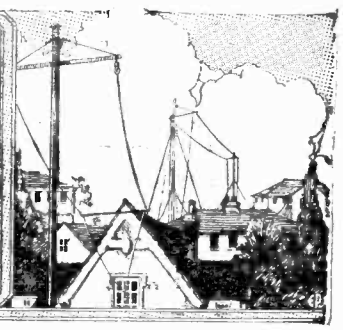


ANNOUNCEMENT OF THE M.O.VALVE CO. LTD



An Efficient Receiving Station

Results with the Tuner described by Mr. Kendall in Vol. 3, No. 4, are here given.



SIR,—I am sending you on a photograph of my wireless receiving station. Although the receiver is not of a design that has appeared in MODERN WIRELESS or *Wireless Weekly*, several features contained in the set have been copied from your publications, most noticeably the experimental tuner by Mr. Kendall, for with this tuner I am able to completely eliminate our local station, 5PY, a quarter of a mile or so distant.

The amplifier is a five-valve set, all B.T.H. valves being used, 2 H.F. crystal or leaky grid rectification, 2 L.F.

The best class of material was used throughout in building up this apparatus, and it has amply repaid me by results that I am able to get, for I can receive all stations easily on three valves and at quite good strength, whilst on numerous occasions I have received several American stations just after midnight.

To my mind Mr. Kendall's tuner is absolutely the best for the serious amateur.

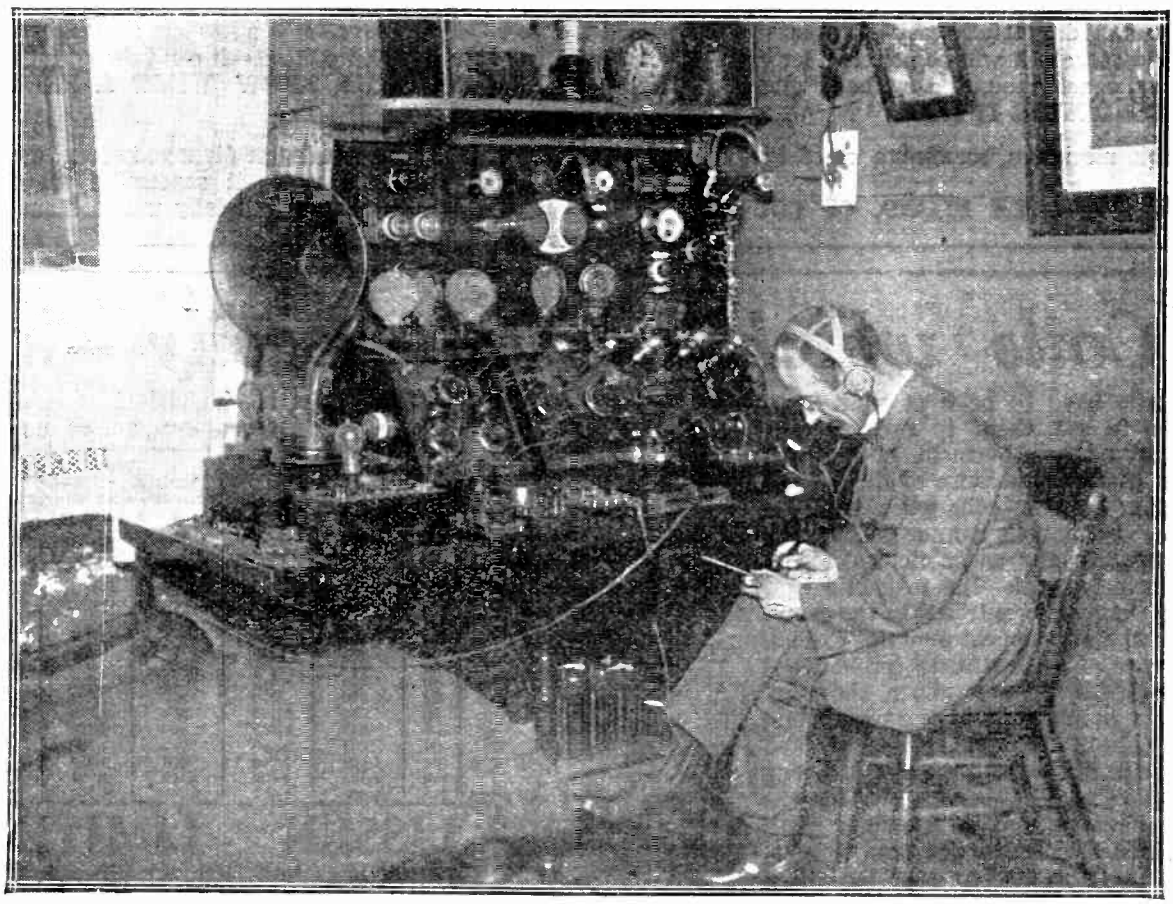
The various instruments on the switchboard are all of the moving coil measuring type, and are always in circuit with any number of valves.

On the table in front of the Brown L.S. is a single valve reflex set, and is a little gem of a set, for I can get most stations easily with my P.O. aerial.

The equipment also contains a Morse recording apparatus.

Trusting these few remarks may interest readers of your publications, and wishing your periodicals success.—Yours truly,

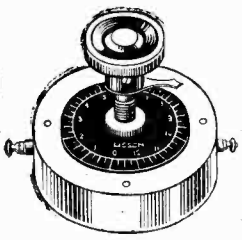
Plymouth. S. W. HEATH.



Mr. Heath is here seen with his station described above.

LISSENIUM

The Condenser and the Coil—



This new LISSEN Mark 2 MICA VARIABLE CONDENSER and LISSENAGON (pronounced LISSEN-AGON) Coils.

two LISSEN things which together make the finest tuning combination there is.

THE LISSEN CONDENSER, with its open scale and delightful tuning characteristics—the condenser which it is safe to prophesy will achieve a great use **because it fills a great need.**

On short wave work, where tuning is so critical, its open scale results in small changes of capacity for a given movement of the pointer. On long wave work you have immediately available with the same knob control the great advantage of being able to put a comparatively high capacity (the condenser is **conservatively** rated at .001 maximum) across the inductance without any H.F. losses through the extra shunted capacity. The inductance is thus made to cover an extremely wide range without any decrease of signal strength.

With ordinary condensers every receiver really needs two condensers—one for short wave work, and one of high capacity for long wave work. This LISSEN condenser performs the functions of both such condensers, and with greater efficiency and convenience. Its open scale and perfect capacity curve make tuning delightfully easy—it tunes along a straight line wave-length curve—it is a low loss condenser—it is dustproof—it will be noiseless for ever—it is immune from stray capacity effect—it can be used for table or panel mounting without alteration—**BUY IT, AND YOU WILL KNOW WHAT A PERFECT CONDENSER IS LIKE.**

Negligible minimum, maximum rated at .001.

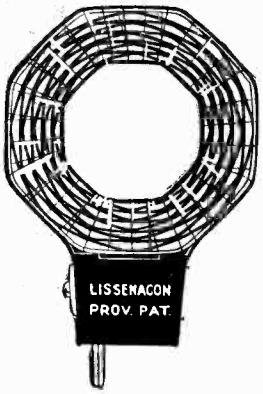
LISSEN ONE HOLE FIXING, OF COURSE.

17/6

This LISSEN Condenser gives you every capacity you will ever need—it supersedes all other Condensers—and it is totally unlike them.

Coils which oscillate easily—

Some coils have to be kept right close together to get them to oscillate. In that case every movement of one coil detunes the other because of the mutual interaction between coils when they are so close. Some coils cannot be kept far apart because the magnetic linkage is comparatively weak—the magnetic field may be closely concentrated in the centre of the coil, and the field may not extend. In the case of **LISSENAGON** (pronounced **LISSEN-AGON**) coils, however, the magnetic field, in addition to being very strong in the centre of the field, is also distributed on each side of the coil—**the field is strong along the edges.** This accounts for the strong magnetic linkage obtained with **LISSENAGON** coils in reaction circuits, so that the coils can be kept far apart. **LISSENAGON COILS ARE COILS WITH PECULIAR EFFICIENCY.**



IF YOU EVER WANT COILS WHICH INTENSIFY TUNING — USE LISSENAGON COILS.

LISSENAGON TUNING CHART.

Note the Intermediate coils, 30, 40 and 60.

TABLE I. Wave-length range when used as Primary Coils with Standard P.M.G. Aerial and ·001 mfd. condenser in parallel.			TABLE II. Wave-length range when used as Secondary Coils with ·001 mfd. condenser in parallel.		
No. of Coil.	Minimum Wave-length.	Maximum Wave-length.	Minimum Wave-length.	Maximum Wave-length.	PRICE.
25	185	350	100	325	4/10
30	**235**	**449**	**130**	**425**	**4/10**
35	285	530	160	490	4/10
40	**360**	**675**	**200**	**635**	**4/10**
50	480	850	250	800	5/–
60	**500**	**950**	**295**	**900**	**5/4**
75	600	1,300	360	1,100	5/4
100	820	1,700	500	1,550	6/6
150	965	2,300	700	2,150	7/7
200	1,885	3,200	925	3,000	8/5
250	2,300	3,800	1,100	3,600	8/9
300	2,500	4,600	1,400	4,300	9/2

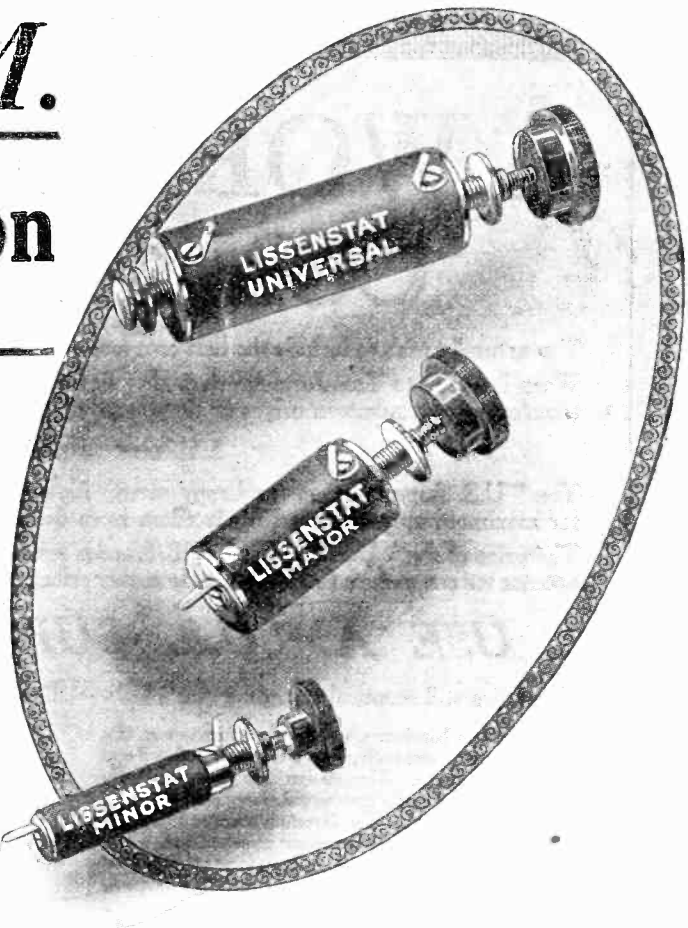
LISSEN LIMITED,
20-24, Woodger Rd., Goldhawk Rd., LONDON, W.12.

DON'T MIX YOUR PARTS—there is a LISSEN Part for every vital place.

LISSENIUM.

Put a fine edge on your tuning——

The advantages of LISSENSTAT control are so great that those who want fine detection and know how to get it will have nothing else but LISSENSTAT control for the filament current of the valve. Not only does it keep valves quiet, pass a steady, unvarying current, remain noiseless from the first turn to the last, but by its critical control of electronic flow it gives the valve a capacity to detect as no other rheostat can. LISSENSTAT control adds range to a receiver because you can feel for the point of critical detection and unerringly find it.



Sold in three models :—

LISSENSTAT MINOR (patents pending) is replacing many thousands of inefficient rheostats—provides **LISSENSTAT** control at a popular price **3/6**

LISSENSTAT MAJOR (patents pending) gives the most acute tuning possible **7/6**

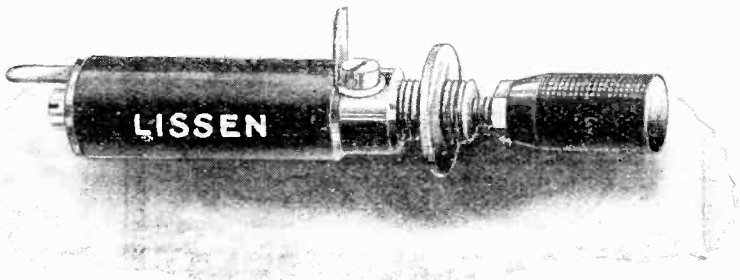
LISSENSTAT UNIVERSAL (patents pending)—with its protective device for dull emitters **10/6**

TO THOSE WHO THINK LISSENSTAT CONTROL IS THE SAME THING AS AN ORDINARY RHEOSTAT—LET THEM TRY THE DIFFERENCE

Minute Grid Currents

The leak which gives you the necessary control over the minute currents flowing in the grid of your valve is the LISSEN Variable Grid Leak (patents pending). See that you get the one with the nickel fittings. This is the latest type, and it represents a very high degree of efficiency in the control of grid potential. Its fitting in a receiver is very necessary if the operator is keen on getting that extra sensitivity which results in clear, strong signals when otherwise they would be weak and obscure. Every resistance value required of a leak is covered. **LISSEN ONE-HOLE FIXING, OF COURSE** **2/6**

LISSEN Variable Anode Resistance, 20,000 to 250,000 ohms, same outward appearance as the LISSEN Variable Grid Leak **2/6**



SMOOTH OUT YOUR LOUD-SPEAKER DISTORTION BY PUTTING THE LISSEN VARIABLE GRID LEAK ACROSS THE SECONDARY OF THE LAST TRANSFORMER, OR ACROSS THE LOUD-SPEAKER ITSELF—first position is the better.

Parts which pull together——

when you know that every part in your receiver is pulling strongly with each other, you know you have a receiver which is the best you can ever get.

BUILD—WITH ALL LISSEN PARTS—
there is one for every vital place.

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BUILD—WITH YOUR OWN HANDS—WITH ALL LISSEN PARTS.

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Regular Programmes from American Broadcasting Stations

Telephony only. Corrected up to December 10th.

Edited by Captain L. F. PLUGGE, B.Sc., F.R.Ae.S., F.R.Met.S. *Copyright.*

WEEKDAYS.

Ref. No.	Greenwich Mean Time.	Local Time prevailing.	Name of Company owning Station.	Call Sign and Wave-length.	Situation.	Nature of Transmission.	Approx. duration of Trans-mission.
A. 1	11. 0 p.m.	6. 0 p.m.	Willard Storage Battery Co.	WTAM 390 m.	Cleveland, Ohio.	Dance Music, Concert, Orchestra.	1 hr.
A. 2	11. 0 p.m.	6. 0 p.m.	Westinghouse Electric & Mfg. Co.	WBZ 337 m.	Springfield, Mass.	Dinner Concert.	—
A. 3	11.15 p.m.	6.15 p.m.	L. Bamberger & Co.	WOR 405 m.	Newark, New Jersey.	Orchestra.	—
A. 4	11.30 p.m.	6.30 p.m.	Westinghouse Electric & Mfg. Co.	KDKA 326 m.	Pittsburg.	Dinner Concert or Organ Recital.	—
A. 5	11.50 p.m.	5.50 p.m.	"Kansas City Star"	WDAF 411 m.	Kansas City, Mo.	Market, Weather Report, Time Signal, Road Report.	10. 0 p.m.
A. 6	midnight	6. 0 p.m.	"Kansas City Star"	WDAF 411 m.	Kansas City, Mo.	Talks, Story, Music.	1 hr.
A. 7	midnight	7. 0 p.m.	Westinghouse Electric & Mfg. Co.	WBZ 337 m.	Springfield, Mass.	Market Report, Talks, Children's Stories.	15 min.
A. 8	12. 2 a.m.	6. 2 p.m.	Westinghouse Electric & Mfg. Co.	KYW 536 m.	Chicago, Ill.	News, Financial Markets.	16 min.
A. 9	12.15 a.m.	7.15 p.m.	L. Bamberger & Co.	WOR 405 m.	Newark, New Jersey.	Sports News.	—
A. 10	12.15 a.m.	7.15 p.m.	Westinghouse Electric & Mfg. Co.	KDKA 326 m.	Pittsburgh, Pa.	Children's Period.	—
A. 11	12.15 a.m.	7.15 p.m.	Westinghouse Electric & Mfg. Co.	WBZ 337 m.	Springfield, Mass.	Talks followed by Concert or other Musical Programme.	—
A. 12	12.30 a.m.	6.30 p.m.	Woodmen of the World.	WOAW 526 m.	Omaha, Nebraska.	Concert or Orchestra.	—
A. 13	12.30 a.m.	7.30 p.m.	Westinghouse Electric & Mfg. Co.	KDKA 326 m.	Pittsburgh, Pa.	News, Talks, Market Reports, Talks or Concert.	45 min.
A. 14	12.35 a.m.	6.35 p.m.	Westinghouse Electric & Mfg. Co.	KYW 536 m.	Chicago, Ill.	Children's Period.	25 min.
A. 15	12.45 a.m.	7.45 p.m.	General Electric Co.	WGY 380 m.	Schenectady, New York	Musical Programme and/or talks (except Wed. and Sat.).	—
A. 16	1. 0 a.m.	7. 0 p.m.	Westinghouse Electric & Mfg. Co.	KYW 536 m.	Chicago, Ill.	Talks, Dinners, Concerts, Musical Programmes (Mondays excepted).	2½ hrs.
A. 17	1. 0 a.m.	7. 0 p.m.	Sears-Roebuck & Co.	WLS 345 m.	Chicago, Ill.	Children's Period.	45 min.
A. 18	1.30 a.m.	8.30 p.m.	Westinghouse Electric & Mfg. Co.	KDKA 326 m.	Pittsburgh, Pa.	Concert and Musical Programme.	—
A. 19	1.30 a.m.	7.30 p.m.	"Fort Worth Star Telegram."	WBAP 476 m.	Fort Worth, Texas.	Musical Programme (except Saturday).	1 hr.
A. 20	2.0 a.m.	8.0 p.m.	"Kansas City Star."	WDAF 411 m.	Kansas City, Mo.	Musical Programme.	1½ hrs.

WEEKDAYS—continued.

Ref. No.	Greenwich Mean Time.	Local Time prevailing.	Name of Company owning Station.	Call Sign and Wave-length.	Situation.	Nature of Transmission.	Approx. duration of Transmission.
A. 21	2.55 a.m.	9.55 p.m.	John Wanamaker	WOO 509 m.	Philadephia, Pa.	U.S. Naval Observatory Time Signal followed by U.S. Weather forecast.	—
A. 22	2.55 a.m.	9.55 p.m.	Westinghouse Electric & Mfg. Co.	KDKA 326 m.	Pittsburg, Pa.	Do. do.	—
A. 23	2.55 a.m.	9.55 p.m.	Westinghouse Electric & Mfg. Co.	WBZ 337 m.	Springfield, Mass.	Do. do.	—
A. 24	3. 0 a.m.	9. 0 p.m.	Woodmen of the World.	WOAW 526 m.	Omaha, Nebraska.	Concert (except Wednesdays).	—
A. 25	3. 0 a.m.	10. 0 p.m.	Westinghouse Electric & Mfg. Co.	WBZ 337 m.	Springfield, Mass.	Musical Programme (except Tuesdays)	1 hr. or 2 hrs.
A. 26	3.15 a.m.	7.15 p.m.	" Morning Oregonian."	KGW 492 m.	Portland, Oregon.	Markets, Weather Report, News, Police Reports (Saturdays excepted)	—
A. 27	3.30 a.m.	9.30 p.m.	" Fort Worth Star Telegram."	WBAP 476 m.	Fort Worth, Texas.	Musical Programme (except Saturday).	1¼ hr.
A. 28	4. 0 a.m.	10. 0 p.m.	Westinghouse Electric & Mfg. Co.	KYW 536 m.	Chicago, Ill.	Musical Entertainment (except Mondays). Sometimes begins 9.30 p.m.	1 hr. or 2 hrs.
A. 29	5.45 a.m.	11.45 p.m.	"Kansas City Star"	WDAF 411 m.	Kansas City, Mo.	Musical Entertainment.	1¼ hr.

SUNDAYS.

Ref. No.	Greenwich Mean Time.	Local Time prevailing.	Name of Company owning Station.	Call Sign and Wave-Length.	Situation.	Nature of Transmission.	Approx. Duration of Transmission.
A. 30	11.30 p.m.	6.30 p.m.	Westinghouse Electric & Mfg. Co.	KDKA 326 m.	Pittsburg, Pa.	Dinner Concert	—
A. 31	midnight.	6. 0 p.m.	Woodmen of the World.	WOAW 526 m.	Omaha, Nebraska.	Bible Study Hour	1 hr.
A. 32	12.30 a.m.	7.30 p.m.	Strawbridge and Clothier.	WFI 395 m.	Philadelphia, Pa.	Church Service	—
A. 33	12.30 a.m.	7.30 p.m.	General Electric Co.	WGY 380 m.	Schenectady, New York.	Church Service	—
A. 34	12.30 a.m.	7.30 p.m.	Westinghouse Electric & Mfg. Co.	KDKA 326 m.	Pittsburgh, Pa.	Church Service	—
A. 35	12.45 a.m.	7.45 p.m.	John Wanamaker	WOO 509 m.	Philadelphia, Pa.	Church Service (occasionally at 10.45 p.m. instead).	—
A. 36	1. 0 a.m.	7. 0 p.m.	Westinghouse Electric & Mfg. Co.	KYW 536 m.	Chicago, Ill.	Service & Musical programme.	—
A. 37	1.30 a.m.	8.30 p.m.	Westinghouse Electric & Mfg. Co.	WBZ 337 m.	Springfield, Mass.	Concert or Music, etc.	—
A. 38	2. 0 a.m.	6. 0 p.m.	" Morning Oregonian."	KGW 492 m.	Portland, Oregon	Church Service	—
A. 39	2. 0 a.m.	9. 0 p.m.	General Electric Co.	WGY 380 m.	Schenectady, New York.	Hotel Orchestra, relayed.	—
A. 40	2.30 a.m.	9.30 p.m.	Westinghouse Electric & Mfg. Co.	WBZ 337 m.	Springfield, Mass.	Concert or Music, etc.	—
A. 41	3. 0 a.m.	7. 0 p.m.	" Morning Oregonian."	KGW 492 m.	Portland, Oregon.	Hotel Orchestra, relayed.	—
A. 42	3. 0 a.m.	9. 0 p.m.	Woodmen of the World.	WOAW 526 m.	Omaha, Nebraska.	Church Service	—
A. 43	7. 0 a.m.	11. 0 p.m.	" Fort Worth Star Telegram."	WBAP 476 m.	" Fort Worth, Texas."	Dance Orchestra	1 hr.

ELECTRON WIRE
THE PERFECT AERIAL

DOES BROADCASTING OWE ITS POPULARITY TO ELECTRON WIRE?

YES! VERY LARGELY BECAUSE ELECTRON WIRE SOLVED THE AERIAL PROBLEM.

IT BROUGHT WIRELESS WITHIN THE REACH OF *ALL*

Until the advent of "Electron Wire," thousands of people were unable to insta even a simple crystal set because of the aerial difficulties. They had heard so much about the efficiency of a set depending upon the aerial that they really imagined it absolutely necessary to fit up an elaborate affair with masts, stays, insulators, lead-in tubes and also to make holes in the walls or windows, etc., an expensive item generally. Many landlords of flats positively refuse to allow such an aerial. Then we offered "ELECTRON WIRE," and instantly masts, insulators, lead-in tubes, and costly bills were absolutely abolished, and everybody can fix an efficient aerial indoors or out of doors for the total outlay of 1s. 8d. for 100 ft., sufficient for Complete Aerial, Lead-in, and Earth.

ABOUT OURSELVES.—Manufacturers and Wireless Dealers throughout the world should consider what we have done for them and will continue to do. Although **"ELECTRON WIRE"** is cheap and MAY mean the loss of an order for an elaborate and more profitable aerial because of its simplicity and inexpensiveness, "Electron Wire" has created a demand for hundreds of thousands of receiving sets which otherwise would not have been bought—and it is a well-known fact that once a wireless enthusiast instals his first set, he is a permanent enthusiast, striving for better and better reception and therefore a permanent customer.

The Aerial you will eventually use. But be sure it is Electron Wire in our distinctive boxes only (see illustration—printed in blue).

PUBLIC WARNING.

Buy Electron Wire in BOXES ONLY. Take no substitute. Some dealers try to deceive you. They make coils to look like Electron. They know that the way to sell you another wire is to make it seem like Electron. Buy Electron Wire in our distinctive BOXES ONLY. AVOID DECEPTION. Don't buy another wire made to look or o sound like Electron. LOOK AT THE NAME AND THE BOX.

The CHEAPEST AERIAL and the Best in the World. 1/8

POSTAGE 6d.

Also laid double for extending 'Phones, Loud Speakers, etc.

Two 150 feet lengths twisted. 300 ft.	Two 250 feet lengths twisted. 500 ft.	Two 500 ft. lengths twisted. 1,000 ft.
5/-	8/-	15/-

Carriage Paid.

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BUSES Nos. 15, 23, 40. *1d. from Aldgate. (Nr. East Stepney Stn., L.N.E.R.)*

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An ingenious yet simple device which is interposed in your house lighting or heating circuit by a single connection, enables Batteries to be charged without an atom of cost. The "Ulinkin" House Battery Charger operates whenever lamps, heaters, electric iron, or vacuum cleaner are in use. It is automatic, requires no attention, has no moving or wearing parts, and cannot go wrong.

List No. RA52/5. **Each £2 2s. 0d.**

Please order from your wireless dealer.

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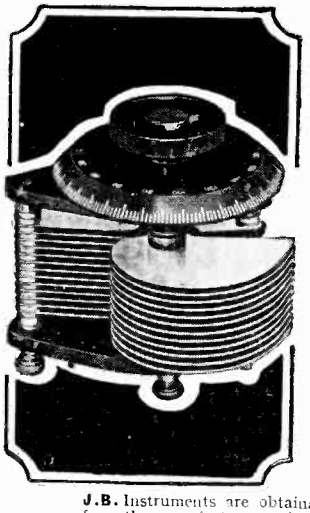
Wholesale only: **GREAT EASTERN ST., LONDON, E.C. 2.** Head Offices and Warehouses: **118, George St., Edinburgh, and Branches.**

LOOK TO YOUR TUNERS——*for dielectric losses*



Whether your present condensers are Metal or Ebonite End Plates and your receiver unaccountably lacking power—be sure your trouble lies in the bad insulating properties of the insulation between the two sets of plates. High dielectric losses cause leakages, absorptions, inability to oscillate on the lower degrees of the scale. These signal-weakening losses follow the use of poor quality End Plates or insulating bushes. *Your only safeguard against condensers in this category is simplicity itself.* Always purchase Condensers bearing our monogram—it is the insignia of low dielectric loss—actually J.B. are recorded (N.P.L.) 0·05 ohms — a negligible quantity.

Incorporation of J.B. Condensers gives you the highest tuner efficiency. Fit them—preferably the J.B. Square Law.

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

As Condenser Manufacturers we have long realised the vital electrical duty of variable condensers. J.B. Condensers represent both high mechanical and electrical design.

J.B. Instruments are obtainable from all dealers or direct from the manufacturers: Post, one, 6d.; two, 9d.; three, 1s.

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Telephone:— GERRARD 7414

Barclays 400

SPECIAL DAYS.

Ref. No.	Greenwich Mean Time.	Local Time prevailing.	Name of Company owning station.	Call Sign and Wave-length.	Situation.	Nature of Transmission and day of week on which occurring.	Approx. duration of Transmission.
A. 44	11.30 p.m.	6.30 p.m.	General Electric Co.	WGY 380 m.	Schenectady, New York.	Tues. & Thurs.—Hotel Music relayed. Wed.—Children's story.	—
A. 45	11.30 p.m.	6.30 p.m.	Strawbridge and Clothier.	WFI 395 m.	Philadelphia, Pa.	Mon. & Sat.—Hotel Concert Orchestra followed by Children's period at 7.0 p.m.	—
A. 46	midnight	6. 0 p.m.	Woodmen of the World.	WOAW 526 m.	Omaha, Nebraska. Pa.	Mon. & Tues.—Lecture. Thurs. & Fri.—Children's Hour. Sat.—Concert.	—
A. 47	12.30 a.m.	7.30 p.m.	John Wanamaker.	WOO 509 m.	Philadelphia, Pa.	Mon., Wed., Fri.—Organ or Orchestral Concerts, Talks.	3½ hrs.
A. 48	1. 0 a.m.	8. 0 p.m.	Strawbridge and Clothier.	WFI 395 m.	Philadelphia, Pa.	Thurs.—Boy Scout Programme, followed by Concert at 8.30 p.m.	2½ hrs.
						Tues. and Sat.—Concert.	2½ hrs.
A. 49	1. 0 a.m.	8. 0 p.m.	L. Bamberger & Co	WOR 405 m.	Newark, New Jersey.	Mon., Wed., Sat.—Musical Programme, Talks.	3 or 4 hrs.
A. 50	1. 0 a.m.	8. 0 p.m.	Willard Storage Battery Co.	WTAM 390 m.	Cleveland, Ohio.	Mon. & Wed.—Concert.	2 hrs.
A. 51	2. 0 a.m.	9. 0 p.m.	Willard Storage Battery Co.	WTAM 390 m. or 361 m.	Cleveland, Ohio.	Sat.—Dance Programme.	3 hrs.
A. 52	2.30 a.m.	9.30 p.m.	General Electric Co.	WGY 380 m.	Schenectady, New York.	Sat.—Dance Music.	—
A. 53	3. 0 a.m.	8. 0 p.m.	"Morning Oregonian."	KGW 492 m.	Portland, Oregon.	Mon. & Wed.—Concert. Tues. & Fri.—Talk.	—
A. 54	3.30 a.m.	10.30 p.m.	Willard Storage Battery Co.	WTAM 390 m.	Cleveland, Ohio.	Mon.—Dance Programme.	2½ hrs.
A. 55	3.30 a.m.	10.30 p.m.	General Electric Co.	WGY 380 m.	Schenectady, New York.	Fri.—Musical programme.	—
A. 56	4.30 a.m.	11.30 p.m.	General Electric Co.	WGY 380 m.	Schenectady, New York.	Tues. & Thurs. Organ Recital.	
A. 57	4.30 a.m.	10.30 p.m.	Woodmen of the World.	WOAW 526 m.	Omaha, Nebraska.	Tues. or Thurs.—Entertainment. Fri.—Relayed Orchestra.	
A. 58	4.30 a.m.	11.30 p.m.	Westinghouse Electric & Mfg. Co.	WBZ 337 m.	Springfield, Mass.	Tues.—Organ Recital.	
A. 59	5.15 a.m.	11.15 p.m.	Woodmen of the World.	WOAW 526 m.	Omaha, Nebraska.	Sat.—Entertainment.	
A. 59a	6.0 a.m.	10. 0 p.m.	"Morning Oregonian."	KGW 492 m.	Portland, Oregon.	Wed. & Sat.—Dance Music.	
A. 60	6.0 a.m.	midnight.	Westinghouse Electric & Mfg. Co.	KYW 536 m.	Chicago, Ill.	Sat.—Hotel Band Relayed.	2 hrs.

Duodyne

A Genuine Long Range
LOUD SPEAKER RECEIVER
TWO Stages High Frequency Amplification

AUTOMATIC TUNING

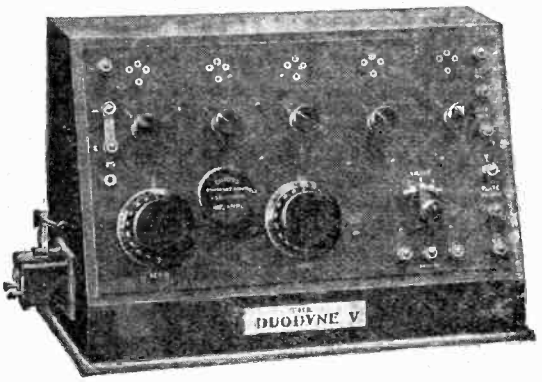
GUARANTEED RANGE
under average conditions

DUODYNE III. Headphones	..	3/4,000 miles.
DUODYNE V. Headphones	..	4/5,000 miles.
LOUD-SPEAKER ..	..	1/1,200 miles.

THE DUODYNE Long Range Receivers will discriminate between Radiola, Paris and 5XX Chelmsford, or used in conjunction with a CURTIS EJECTOR will tune in any Broadcasting Station at will, while operating 1½ miles from local Station or 200 yards from Relay Station.

The extraordinary range and simplicity of operation of these receivers makes an irresistible appeal in Imperial and Continental markets.

A CHILD CAN TUNE IT.



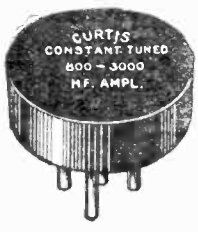
The DUODYNE III. (Instrument only) Panel Type **£10 0 0**
The DUODYNE V. (Instrument only) Panel Type **£18 18 0**

The DUODYNE CABINET.—The Duodyne V. is also supplied in French Polished Oak Cabinet with folding doors, enclosed valves and tuning coils. Self-contained batteries. Instrument only .. **£27**

CURTIS

CONSTANT - TUNED H.F. AMPLIFIER

The Curtis "Constant-Tuned" High-Frequency Amplifier is the only automatic high-frequency amplifier which, when connected in circuit, guarantees high efficiency for two stages of radio amplification on any wavelengths between 300 and 3,000 metres, and requires no additional controls, NOR MORE EFFORT, SKILL OR PATIENCE IN TUNING, THAN IS REQUIRED FOR THE OPERATION OF THE USUAL ORTHODOX SINGLE STAGE TUNED ANODE CIRCUIT.



THE CURTIS CONSTANT-TUNED HIGH-FREQUENCY AMPLIFIER CHANGES THE WHOLE CHARACTER AND QUALITY OF WIRELESS REPRODUCTION.

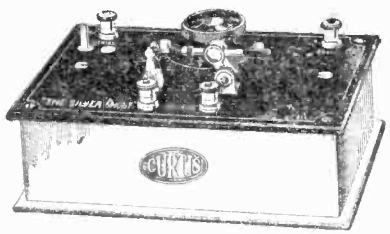
And with its automatic simplicity, combined with increased selectivity and power, is destined to make two stages of high-frequency amplifications a sine qua non of every Wireless Receiver for the Experimenter and Home Constructor, or the purchaser who prefers to buy a professionally constructed instrument.

For the greater convenience of the constructor, and so as to conform with existing panel design, the Curtis Constant-Tuned High-Frequency Amplifier is designed with the orthodox 4-pin plug for panel mounting and must be connected up in accordance with the circuit diagram supplied.

Type A 300 to 800 Metres. Price 15/-
Type B 800 to 3,000 Metres. Price 17/6
Postage 6d.

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

THE SILVER GHOST
CRYSTAL RECEIVER



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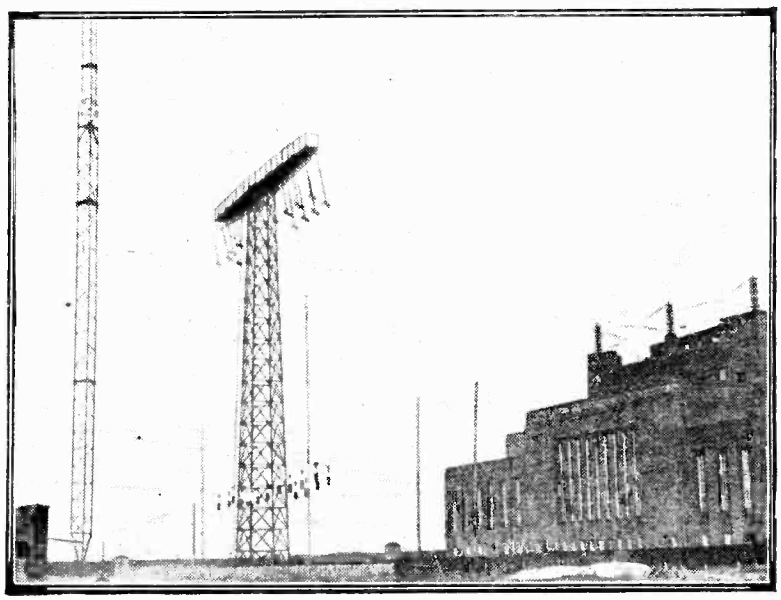
particular piece or pieces of "furniture" which sometimes gives it its name, the Bridal Chamber, for instance, having the most wonderful four-poster bedstead formed of glistening stalactites and stalagmites, which gleam white in the brilliant light turned on to them. One can hardly credit that a perfect statuette of the late Queen Victoria, situated high up in a niche in one of the chambers, is not the work of man. There are many such "formations," Moses on the Mountain, the Madonna and her Child, etc., with a tolerably good drawing on one of the walls of a motor-car and a steam-boat, both, strange to say, side by side, but undoubtedly produced by Nature long before man ever thought of a steam engine, to say nothing of the motor-car depicted on this underground wall.

I said the journey to King Solomon's Mine was somewhat difficult. With a six-valve Marconiphone wireless set and its attendant paraphernalia it would be not only difficult, but dangerous —for the six valve set. The footway is slippery, Tunnels just admitting a fairly stout individual have to be negotiated on all fours, there is a slide down a sloping flat rock into the dark unknown, and also a "chimney" to be climbed. It will therefore be readily understood why, when I took a wireless receiving set into the Cango Caves recently, I called a halt in Van Zyl's Hall, a chamber about five hundred feet from the entrance to the caves. When I say that in this chamber I erected a regulation size single-wire aerial, one hundred feet, across a *segment* of the hall, which is almost circular, readers will realise its size. The height, I may say, is proportionate to the width.

The Journey

Let me now briefly state how the caves are reached so far as the visitor from Cape Town is concerned. There is a train journey of about four hundred miles before Oudtshoorn is reached, the train passing through two ranges of high mountains. From Oudtshoorn the trip to the caves is by motor-car, one of the most beautiful rides any traveller could wish for. More mountains are met with, then out into the open valley-land again, past the Cango Hotel, and once again into the mountains, this time rising in the car to a height of about eight hundred feet up the face of one of them, to the very entrance to the caves.

I was on a brief visit to Oudtshoorn, and had brought with me from Cape Town a Marconiphone six-valve set (five high-frequency), and a Marconiphone two-stage amplifier, having set out to privately experiment on the train journey. Whilst in Oudtshoorn I suddenly conceived the idea of attempting reception in the Cango Caves of wireless telephony, broadcast from Cape Town, about four hundred miles away, and from Johannesburg, about eight hundred miles away. So far as the general public and the broadcasting stations were concerned, I kept my intended visit quiet, feeling sure that I was on a wild goose chase, having regard to the nature of the country to be negotiated, not to speak of the fact that I was diving into the heart of a mountain.



The huge aerial of the Nauen Station is now used for broadcasting.

Erecting the Aerial

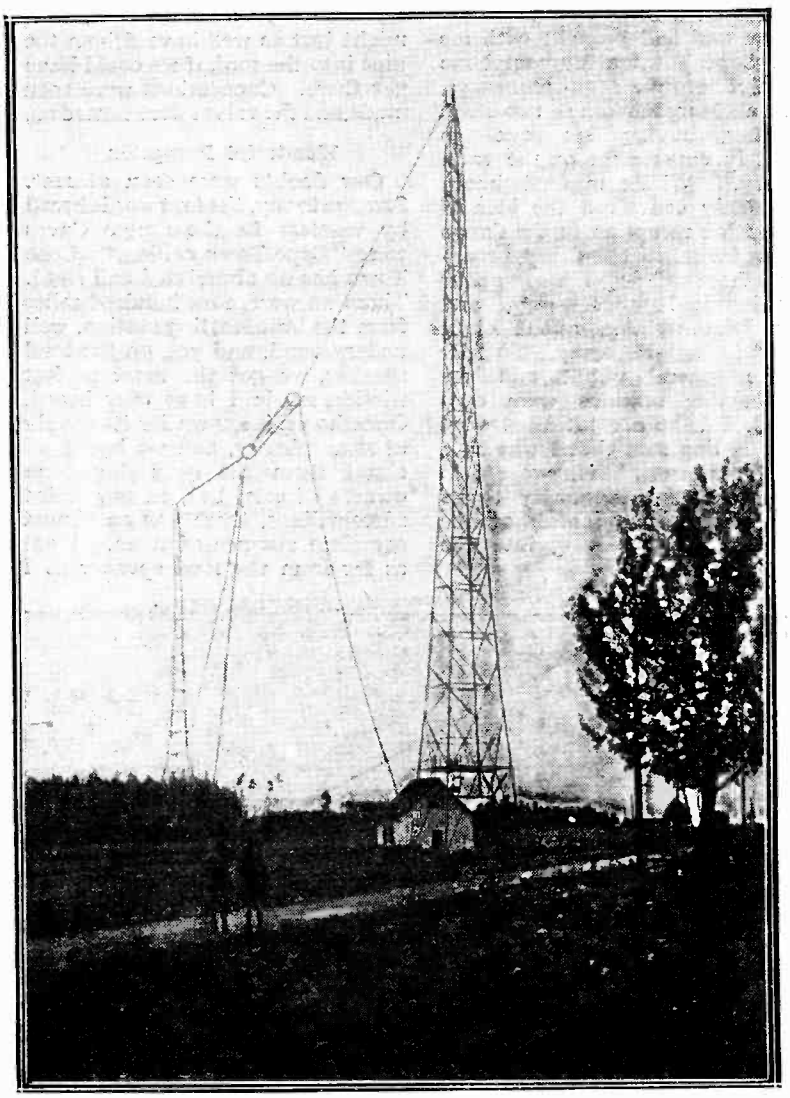
My little party, in two motor-cars, arrived at the caves a few minutes after eight o'clock at night. Each member of the party was given something to carry, and the long narrow passage, with the steps down to the floor of Van Zyl's Hall, were quickly left behind, and we crossed over to the far side of the Hall. The erection of the aerial was the easiest thing I have ever done in that line, one end being secured to a stalactite on one side of the chamber, and the other to a rope fastened to a similar ready-made mast on the other side. A piece of water piping was driven into the ever moist floor, and the earth wire conected to that. We might just as well have driven the pipe into the roof, if we could have got there. Connections were soon made, and the valves were turned on.

Wonderful Reception

Our doubts were soon at rest. Strange to say, the first words heard by wireless in the Cango Caves were "Cape Town calling," (Cape Town has no abreviated call sign). There we were, four hundred miles from the broadcasting station, well underground, and yet, on the loud speaker, we got the most perfect wireless music I have ever heard. Oudtshoorn is known for its supply of atmospherics, and we heard all about them the next day from owners of sets, but, in our weird surroundings, there was an almost complete absence of them. I got as far from the loud speaker as I could, that is, just about the length of the aerial, and every word of a talk on "Angling" could be heard distinctly. The old guide told me that many European singers have tried their voices in this same hall, and have remarked on its wonderful acoustic properties. Johannesburg, eight hundred miles distant, was next tuned in, again with unlooked for success. It was all too wonderful, almost too wonderful to be true. "J.B." came through with good, healthy, loud-speaker strength though a station of weaker power than Cape Town, and there was no mistake about it, we could help ourselves to whichever station we wanted.

Continental Methods of Calling

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



The aerial of the Zurich Station, which is becoming one of the "regulars" heard in this country.

FOR listeners who are unfamiliar with foreign languages there is no doubt a certain difficulty, despite the information I have already given, in recognising Stations abroad. Unfortunately, Continental Stations for some reason have not adopted our method of allotting call signs to all their Stations. In addition those which do possess call signs do not appear to make use of them for identification purposes whilst transmitting. It may appear to readers, in view of these facts, that the giving of call signs in Continental Broadcasting Tables is of little use. I would suggest, however, that this is not entirely the case, as these call signs allow readers to identify with certainty the Station mentioned, in reference to particular transmissions, when there are several Stations in the same town or the same locality.

It will be my endeavour in this short article to help readers to identify the Stations to which they may be listening, and for the benefit of those who are not familiar with foreign languages I propose giving some of the methods of calling in a phonetic manner.

German Stations appear to be coming in rather well at present, and are frequently received by listeners trying for the distant B.B.C. Stations, as often the same set of coils is used in both cases.

The German Stations

The numerous German Stations are very close together on the wave band used. The nine main Stations have their wavelengths distributed between 395 and 505 metres.

All these Stations have no call signs allotted to them, but when the announcer calls out the name he invariably gives also the wavelength on which the Station is working, and listeners should try to make use of this number representative of the wavelength in metres as the call sign of the Station, and in this manner identify it by the tables.

In order to help listeners to do this, I would add that the number representing the wavelength is preceded by the word "welle," which means "wave" in German, and which is phonetically pronounced "vella"; this number is not followed by the word "metres," but generally forms the last words of the calling sentence. For example, Münster would announce as follows:—"Hier Münster auf Welle vier hundert zehn." The last three words of this sentence mean 410.

Methods of Announcing

This manner of giving out the wavelength is common to all German Stations, and I think that listeners will find it easier to recognise them in this manner than by the name of the Station.

Another reason for this is that there is no consistent manner in which the German Stations have received their names. Some of them use as names that of the town in which they are situated, others the full name of the company which owns the Station, others a coined word generally made up of the initials of the words forming this name. These coined words are quite difficult to catch. They invariably terminate with the syllable "a.g.," pronounced "arg," these two letters standing for "aktien gesellschaft," meaning "limited company," and generally form the last two words of the description of the company owning the Station. As an example, the Hamburg Station is run by the

In this special article the author of our Continental Broadcasting Tables, to which the numbers given refer, gives some interesting particulars as to how these Stations may be recognised.

"Nordische Rundfunk A.G.," and styles itself "Norag." The Leipzig Station, run by the "Mitteldeutsche Rundfunk A.G.," calls out "Hier Mirag."

On the other hand, the Berlin Station Voxhaus calls "Hier Berlin," and the Munich Station "Hier der Deutsche Stunde in Bayern," which means the German hour in Bavaria, and is the name of the company running the Munich Station.

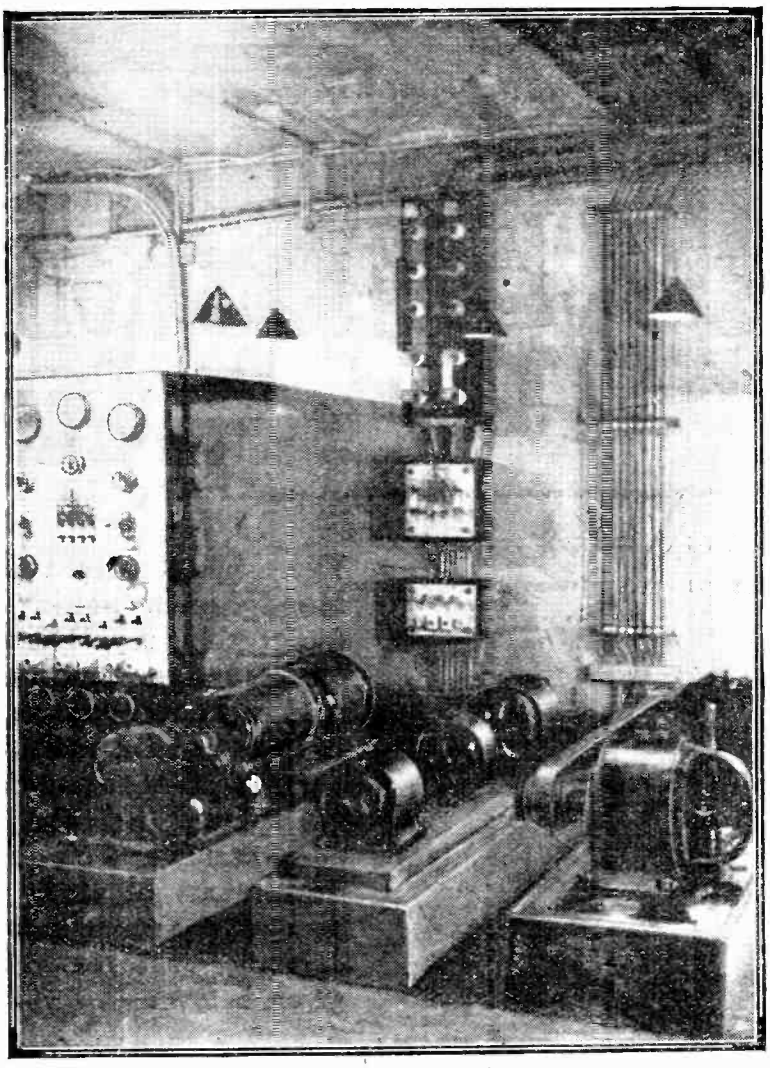
A Summary

Summarising what I have said for this series of short wave German Stations, the best way for listeners is to identify them by means of the number representing the wavelength and to try to confirm this by trying to notice the name used by the Station in each case.

For those using sets capable of tuning to the high wavelengths there will be no difficulty in receiving and identifying the high-powered German Station of Königswusterhausen, which works on 2,800 metres with a power of 5 kilowatts. The only transmission sent out by this Station on that wave takes place every Sunday at 10.50 a.m. punctually, the announcer invariably calling out, "Hier Königswusterhausen auf Welle zwei tausend acht hundert," sixty seconds after the last dot (10.49 a.m.) of the Eiffel Tower time signal of 10.44 a.m., which can also be usually heard on the same coil—Ref. Nos. 96 and 95.

Zurich and Vienna

There are, however, other Stations than the German Stations that use the German language, these being Vienna and Zurich, the latter transmitting on 515 metres and the Austrian on 530 metres. Close to these two stations in wavelength we have Berlin on 505 metres. The Zurich Station is, however, by far the best to receive and the most powerful; this says a lot for this Station, as its power is small,



The generators used at the French Station of Postes and Telegraphes are seen in this photograph.

being 500 watts. The efficiency of its transmitting gear evidently makes up for the smallness of power.

The announcing of the Vienna Station is rather poor, and it is best recognised by its wavelength position relative to the two other Stations mentioned.

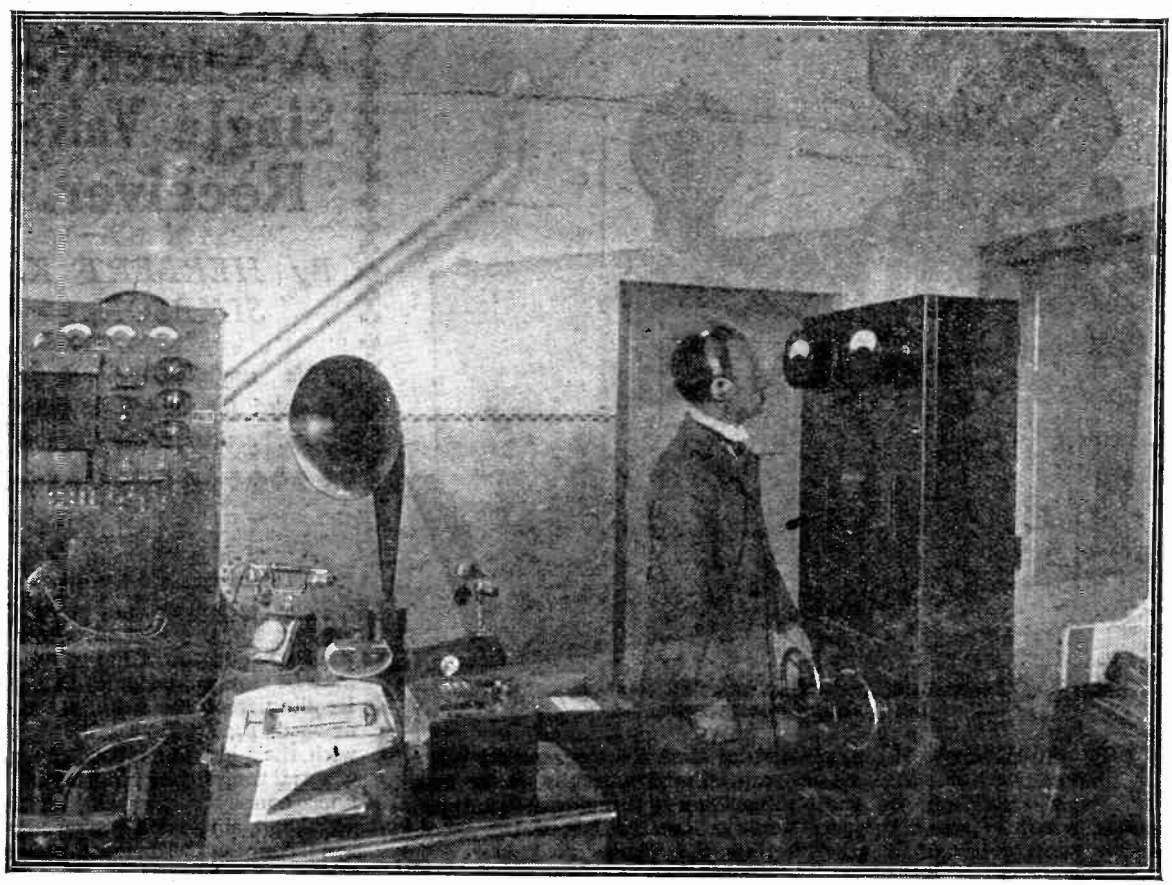
It is unfortunate, in this respect, that Continental Stations do not as a rule call out their identification names often enough, and one sometimes has to wait as long as half an hour (sometimes much longer) before it is given out. There is one exception to this, however, and that is the French Station of the "Petit Parisien," Paris.

The Petit Parisien.

This Station, which is owned by the important Paris daily paper, *Le Petit Parisien*, appears to be one of the most go-ahead Continental Stations. It is equipped with Western Electric transmitting gear and its modulation is excellent. The announcer never fails to give out the Station's name before and after each item.

Unfortunately, this Station does not transmit regularly, as I am sure everyone would wish. Its days of transmission are Sundays, Tuesdays and Thursdays; but the Tuesday transmissions do not take place every week.

The Station of the *Petit Parisien* is a very interesting one for British listeners, and this for many reasons. In addition to the fact that its name is called regularly between each item of the programme, these items are announced in English as well as French. It continues with its concerts, which are of a high standard, some considerable time later than the B.B.C. Stations, and the wavelength of 340 metres which it uses is well within the



The control room at the Zurich Station.

reach of receiving apparatus designed to tune-in the B.B.C. Stations.

Reviewing the other French Stations, that of the Ecole Supérieure des Postes et Télégraphes working on 450 metres has to be recognised by its wavelength and by the fact that French is spoken, as it rarely calls out its name except at the beginning and the end of a transmission—an interval of some three hours generally. This slackness in giving out the call signs is largely explained by the fact that the Station generally transmits outside broadcast and is, among all the Stations in Europe, that which does the most outside broadcast work.

The Eiffel Tower

The Eiffel Tower, which might have been mentioned at the beginning of this article, as it is one of the first stations on this side of the Atlantic to start broadcasting, is probably one of the easiest Stations to recognise, because of its high wavelength and also by its very easily distinguishable time signals, which are sent out on spark and on the same wavelength as the telephony.

Beginners wishing to tune in this Station are advised to try first for these time signals. Several are given in the tables, but I would recommend transmissions number 10, 79, 89 and 133, which take place at 10.0 a.m. and 10 p.m. every day.

These signals consist of a series of 300 dots spaced at intervals of one second (to be accurate, 49-50ths of a second interval), the sixtieth of which is replaced by a dash. These signals can even be received on a crystal set in this country. The tuning of these spark signals will enable the beginner to get his adjustments to the proper wavelength of 2,600 metres.

Telephony will be received on this same setting, and if the test is made on a week-day at the 10 p.m. time signal, the experimenter need only stand by 10 minutes to receive the weather forecast report as stated under reference number 80.

The call used by the Eiffel Tower is "Allo, Allo. Ici la Station Radiotéléphonique de la Tour Eiffel."

Concerts transmitted from the Eiffel Tower are organised by the Society "Les Amis de la Tour Eiffel," but before this Society took over the management the Station was a military one, and the announcer used to begin by "Ici le Poste Militaire de la Tour Eiffel." This manner of calling, however, has not been in use for the last year.

Many Stations could be referred to in such an article, but I cannot conclude without making some reference to the excellent Station of the Compagnie Française de Radiophonie.

Radio-Paris

This Station used to be known under the name of "Radiola," and owned by the Compagnie Française Radio-Electrique, with its studio at 79, Boulevard Haussmann. In those days the call was "Emissions Radiola de la Compagnie Française de Radiophonie," followed by the address of the studio. Since the erection of the company's high-power Station at Clichy, a suburb of Paris, its way of calling has changed to the following: "Allo. Ici Radio-Paris, Poste de Clichy."

I do not think listeners experience much difficulty in tuning-in this Station or identifying it.

Within the compass of this article it has been impossible to deal with all the Continental Stations I would like to have touched upon, but I trust the article will be of interest to readers.

the grid of the valve through the grid condenser C_2 of ·0003 μF. R_2 is the grid leak having a fixed value of 2 megohms. In the anode circuit of the valve are the reaction coil L_3, variably coupled to L_2, and the telephones T shunted by the fixed condenser C_3 of ·002 μF.

The Different Forms of Aerial Tuning

Direct coupling with constant aerial tuning is obtained by joining T_2 to T_4 by means of the flexible wire and Clix shown in Fig. 5, and T_6 to T_5 with a piece of stiff wire as in Fig. 3. The aerial is then joined to T_1 and the earth to T_5. The parallel arrangement without constant aerial tuning is obtained by disconnecting the aerial lead-in from T_1 and joining it to T_2, the other connections remaining as before.

Series tuning is brought into use by joining the aerial to T_6 and T_5 to earth, all other connections being broken.

For loose coupled aerial tuning it is necessary to join T_2 to T_3, T_5 to T_6, aerial to T_2, and earth to T_5. Constant aerial tuning will not be used, of course, with the loose coupled circuit.

Components Required

The set is not expensive to build, and the constructor is not advised to economise by purchasing components of inferior quality, for except in a few isolated cases it has been found cheapest in the end to use components of guaranteed reliability. It is not absolutely necessary, of course, to purchase articles of the same manufacture as those used in the present instance, but components of doubtful quality should be avoided.

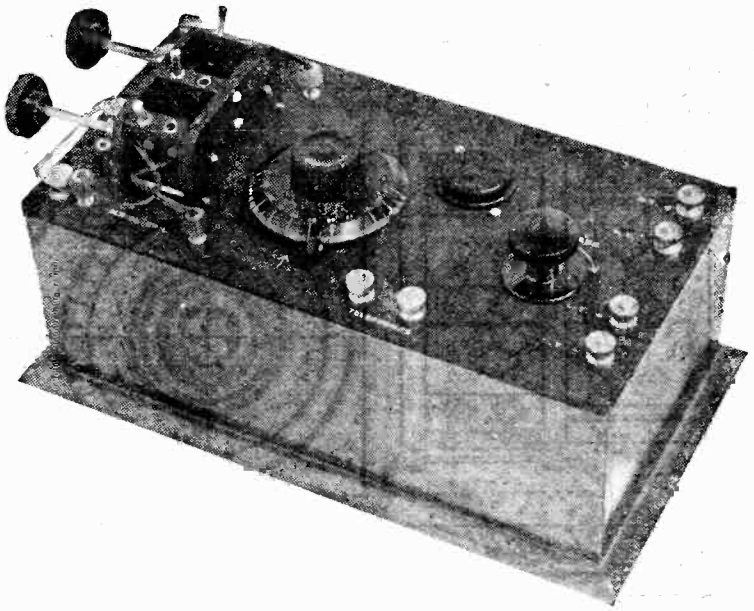


Fig. 3.—With coils and valves removed, the panel layout is clearly seen.

The components are as follows, and names of makers are given for the reader's convenience should it be desired to exactly duplicate the set :—

Ebonite Panel, 12 in. by 6 in. by ¼ in. ("Red Triangle," Peto-Scott, Ltd.).

Cabinet of suitable dimensions.

3-coil holder (Polar Vernier, Radio Communication Co., Ltd.).

·0005 μF. variable condenser with vernier ("Utility," Wilkins and Wright).

Valve holder (Burndept, Ltd., "Antiphonic").

Dual rheostat (Burndept, Ltd.).

1 ·0001 μF. fixed condenser (Dubilier).

1 ·002 μF. fixed condenser (Dubilier).

1 ·0003 μF. fixed condenser (Dubilier).

1 2 megohm grid leak (Dubilier).

10 W.O. type terminals (K. Raymond).

6 Clix sockets (Autovevors, Ltd.).

5 Clix plugs: 2 red, 2 green, 1 blue (Autoveyors, Ltd.).

Quantity of square wire for wiring up (Sparks Radio Supplies).

1 packet of Radio Press panel transfers.

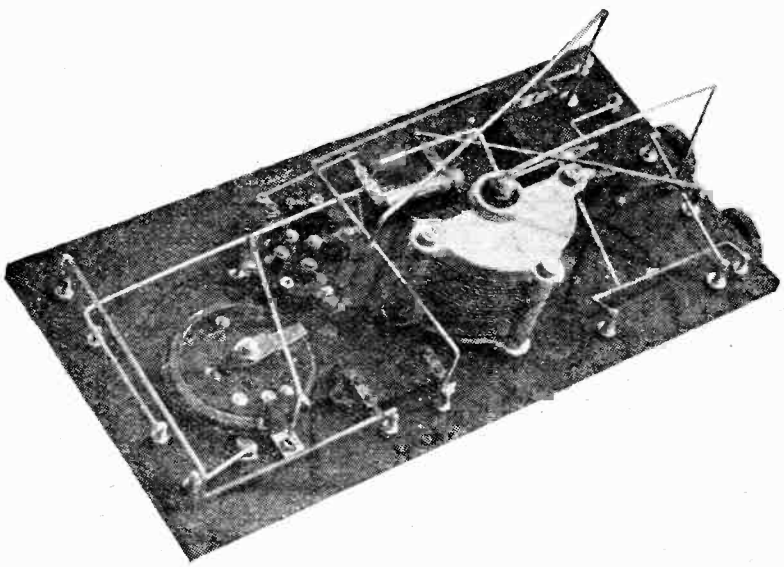


Fig. 4.—A helpful view of the wiring, showing where the fixed condensers are placed.

Drilling the Panel

It is now unnecessary to risk being troubled with the faults which arise from using poor quality ebonite (which in some cases is ebonite only in name), for a number of manufacturers now guarantee their panels to be free from any leakage. Having purchased such a panel, drilling may be carried out with ease on referring to Fig. 5, which shows the positions of all the necessary holes. The sizes of the holes should be determined when the actual component to be mounted is to hand. It is advisable to mark the panel with the transfers before assembling the components.

Mounting the Components

This is a simple stage in the construction of the set, it being necessary only to refer to the photographs and diagrams of the

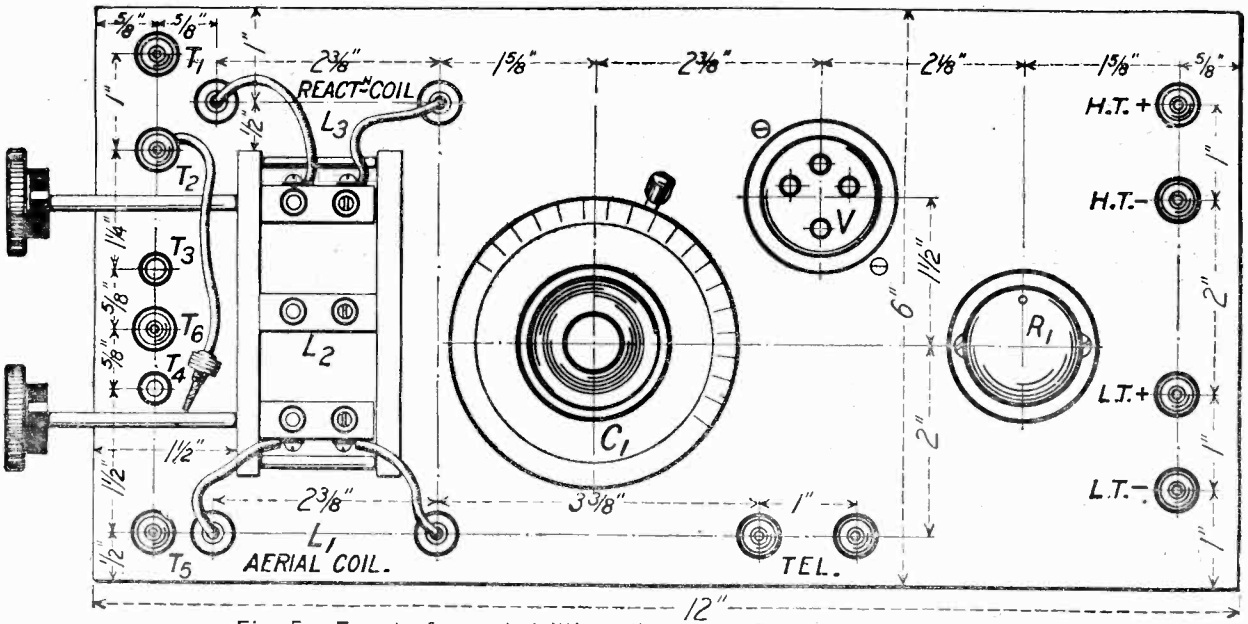


Fig. 5.—Front of panel drilling diagram. Blue print No. 82A.

receiver to ascertain the correct positions for the various components. The fixed condensers are the only components left unmounted, these being secured in position during the process of wiring.

Connecting Up

All that is needed to make a successful job of the wiring of the receiver is a careful study of the wiring diagram and the photographs of the back of the panel.

The three fixed condensers have their values clearly marked in the wiring diagram, and are secured by soldering their tags to terminals or wires. Two rubber covered flexible leads are secured to a Clix socket and a stiff wire connection as in Fig. 6, after which they are taken through two holes in the panel, and connected on the other side to the terminals of the centre socket of the three coil holder.

The remaining necessary connections are seen in the drilling diagram, Fig. 5, these being the securing of four flexible leads, each terminated by a Clix plug, to the terminals of the two outside coil sockets, and also the connections of another Clix terminated lead to T_2. The colour of the latter Clix plug is blue, while those connected to the aerial and reaction sockets are green and red respectively.

How to Use the Receiver

The set is quite simple to operate using any of the forms of tuning mentioned previously. However, it is advisable for the beginner to use direct aerial coupling with constant aerial tuning first of all. The set should therefore be arranged to work thus in accordance with the instructions already given. The low-tension battery is always connected to the terminals L.T.— and L.T.+, while the high-tension battery is connected to H.T.— and L.T.+. The correct H.T. voltage depends upon the type of valve employed, and this is always given by the maker. The telephones, of course, are connected to the two

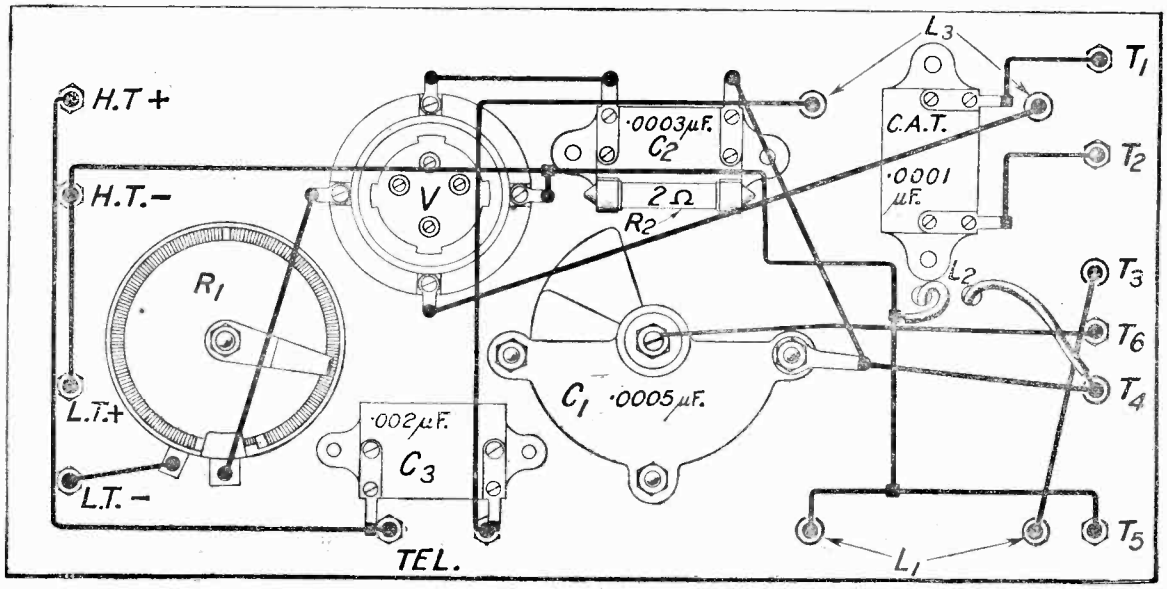


Fig. 6.—Back of panel wiring diagram. Blue print No. 82B.

terminals near the front edge of the panel.

B.B.C. Coils

For the ordinary broadcast wavelengths a No. 50 coil should be plugged into the fixed centre socket of the three-coil holder if the desired wavelength is below 420 metres, or if above 420 metres, a No. 75 coil should be used. A No. 50 or No. 75 coil should be inserted in the socket marked reaction. When first working the set the two coils should be kept as far apart as the coil holder permits, and tuning carried out by variation of the condenser dial until the required signals are heard. The reaction coil may now be brought towards the aerial coil, retuning after every small movement, on the variable condenser. If signals do not become louder as a result of this procedure, the connections to the reaction coil should be reversed by taking the two red Clix plugs from their sockets and changing them over. Care should be exercised to avoid making the set oscillate, by keeping the two coils as far apart as is consistent with good results. For distant reception, however, it is generally necessary to work fairly close to the point where oscillation begins and special care then needs to be taken.

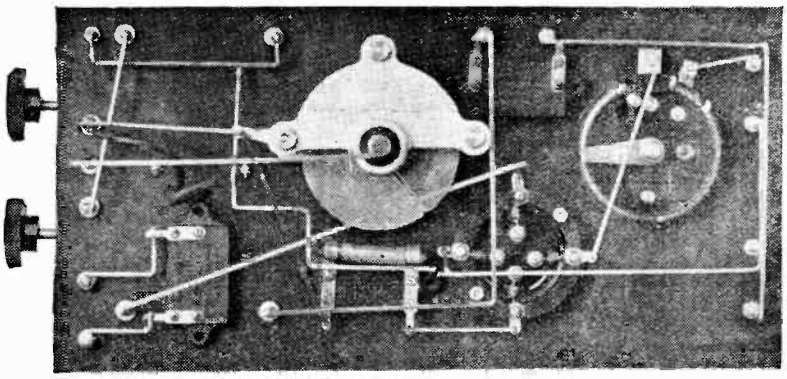


Fig. 7.—This plan view clearly shows how the connections go.

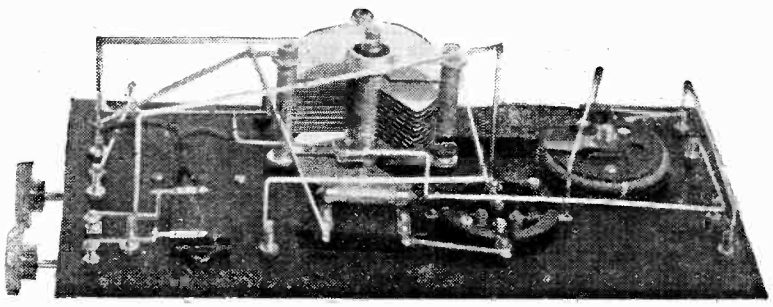


Fig. 8.—From this picture the relative elevations of the wires is made clear.

Loose Coupling

Having grasped the correct method of tuning, the arrangement in which the three coils are used may be tried. In this case the front moving socket is to hold the aerial coil L_1. The secondary coil L_2 is to be inserted in the centre socket and the reaction coil in the rear moving socket as before. Since the aerial coil is untuned, only one aerial tuning adjustment is required. This is the variation of the coupling between L_1 and L_2.

The reaction coil may again be a No. 50 or No. 75, and the secondary coil L_2 may also be a No. 50 or No. 75.

Different sizes should be tried for the aerial coil, Nos. 25, 35, and 50 generally proving suitable. As a general rule, the coupling between L_1 and L_2 should be fairly close for loudest signals, although this does not always apply.

Selectivity

Obtaining good selectivity with little loss in signal strength is an art which has to be acquired. With patience, however, it is easily possible with this form of tuning to obtain greater selectivity than with direct aerial coupling. The method of tuning in a signal to the exclusion or partial exclusion of others is to loosen the coupling between L_1 and L_2 and to retune on the condenser C_1 until a coupling is reached where maximum selectivity has been acquired and the signal desired is obtained with little or no interference.

Series Tuning

Series tuning may be tried (with direct aerial coupling) and the results compared with parallel tuning. A larger aerial coil than that used with parallel tuning without the C.A.T. condenser is generally required.

In conclusion do not be disappointed if at first you fail to get long range reception. Remember that conditions affecting reception vary from one night to another, while the skill necessary to bring in distant transmissions is only acquired by practice. Once the skill has been acquired, however, excellent results on long distance reception will be obtained.

Test Report

The receiver was tested thirteen miles east of 2LO, on an aerial of average length and height.

At the commencement direct aerial coupling was used, with constant aerial tuning. A No. 50 coil was inserted in the aerial (middle) socket, while another No. 50 coil proved suitable in the reaction socket. After careful tuning the strength of the signals from 2LO became too great for comfort with the telephones. Seven other British stations and three Continental were then tuned in with ease in quite a short time.

The loose-coupled circuit was then tried, with the following coils in use: Aerial (front moving socket) a No. 35 coil; secondary (centre socket) a No. 50, and reaction No. 50. This arrangement was very easy to work, a fairly close coupling being found suitable for both short- and long-range work. A marked improvement in selectivity was observed, and critical adjustments of the aerial coupling proved convenient for final tuning of distant stations. By replacing the aerial coil with a No. 25 or No. 50 little difference was observed.

Chelmsford was received at excellent strength using direct aerial coupling without C.A.T., a No. 150 coil being employed in the aerial socket and a No. 200 in the reaction socket. Equal strength was obtained with aperiodic coupling, the coil sizes in this case being: Aerial, No. 150; secondary, 250; and reaction 150 or 200. With the same coils Radio Paris was received at comfortable phone strength.

Your Earth Connection

By R. W. HALLOWS, M.A., Staff Editor.

A good earth means improved reception. In this interesting article many helpful hints on how to improve this important connection are given.

THERE are still large numbers of amateur wireless enthusiasts who fail to realise fully the importance of providing a thoroughly good earth connection for the receiving set. In fact the two most neglected portions of the receiving set are the high tension battery and the earth, both of which seem to be such simple and straightforward things that they can be left more or less to look after themselves. If ever a friend comes to see me with a sad tale of instability, of lack of selectivity or of poor signal strength and failure to pick up distant stations, the first thing that I want to know about is the earth. In nine out of ten of such cases examination discloses that it is defective, and after it has been set right there is a marked all-round improvement in results.

Earth Losses

Let us see first of all what effect a bad earth has upon range and signal strength. The effect of a bad earth connection is to introduce a resistance in the position occupied by R in the diagram. Hence an inefficient earth may lead to a very considerable loss of sensitiveness.

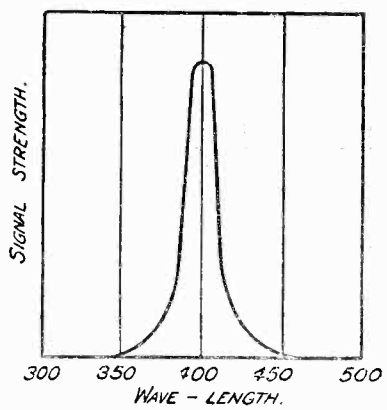


Fig. 2.—Oscillating circuits of low resistance tune sharply.

Selectivity

Now for selectivity. The addition of resistance in any high-frequency circuit has the effect of flattening the tuning. This means that instead of responding sharply to one frequency when tuned as finely as possible, the circuit will

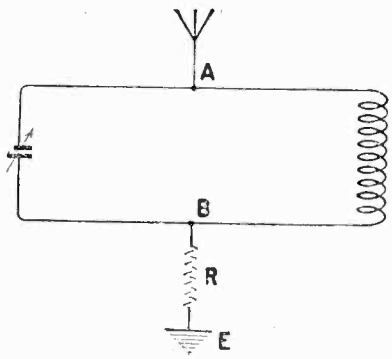


Fig. 1.—A bad earth is equivalent to a resistance in the earth lead.

be almost equally sensitive to a band of frequencies whose breadth varies according to the resistance. Figs. 2 and 3 show the effect of adding resistance to a tuned circuit. Most experimenters now realise the great advantage of winding inductances with heavy gauge wire in order to eliminate all unnecessary resistance, but it is of little use to use efficient inductances if at the bottom of the A.T.I. a large resistance is introduced by a poor earth connection.

Fig. 4 shows diagrammatically why a bad earth connection makes for instability in the set. Owing to the resistance R the negative end of the low-tension battery may be very much above earth potential, and the high-tension battery, the telephones and other large components are at a greater high-frequency potential than they should be with respect to earth. Further, you cannot bring the cores of low-frequency transformers to earth potential, whilst the lower end of the secondary of a high-frequency transformer will also be above earth potential. All these large components are, so to speak, up in the air and the set becomes difficult to handle.

Effect on Stability

Not long ago I made a series of tests with a two-valve set provided with a very efficient H.F. amplifying stage with a view to ascertaining the importance of the part played by the earth connection in reception. The aerial adopted as standard was a good unscreened one standing on high ground, and in conjunction with it a first-rate earth, consisting of a large copper plate, buried in damp soil was available. When used with this the set gave remarkably good results, bringing in all the B.B.C. main stations at good telephone strength and not being at all difficult to handle. The effect was now tried of removing the 7/22 earth lead and substituting for it a piece of No. 36 copper wire, which

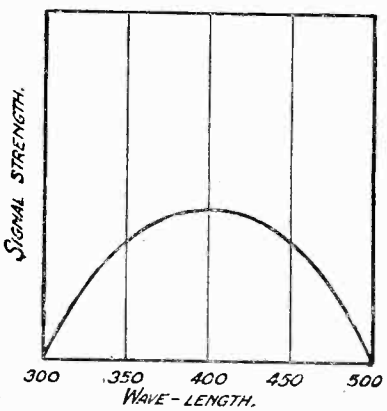
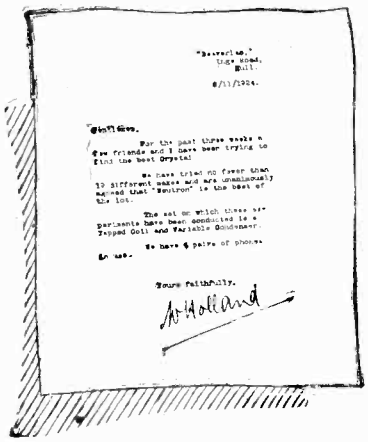


Fig. 3.—The presence of resistance flattens the tuning.

They tried 19 makes



Here is another remarkable letter of testimony, one of several received in the same mail. It is photographically r produced on the left, and reads :—

"For the past three weeks a few friends and I have been trying to find the best crystal. We have tried no fewer than 19 different makes, and are unanimously agreed that 'Neutron' is the best of the lot. The set on which these experiments have been conducted is a Tapped Coil and Variable Condenser. We have 6 pairs of phones in use." . . . and did you notice the last sentence?——

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was not soldered to the earth plate but merely threaded through a hole in it and twisted up. The difference was surprising. The more distant stations could not be picked up at all, whilst London, twenty-five miles away, was distinctly audible over a very wide band. Further, the set now became so difficult to operate that in the hands of a beginner it would have caused very serious interference.

Comparative Test Results

The set was next taken to a house where the aerial, though well insulated, is low and badly screened. The earth, however, is a thoroughly good one, consisting of a large zinc bath buried immediately below the suspended wire and connected to the set by a heavy cabled wire. Here it was found that, though range and signal strength were not so good as with the first aerial, tuning was quite sharp and instability was not noticeable. Tests were made with several other aerial-earth systems and the conclusions arrived at were as follows :—

(1) With a good aerial and a good earth first-rate results are obtained.
(2) A good aerial in conjunction with a bad earth produces poor results.
(3) With a bad aerial and a good earth the results are much more satisfactory than with No. 2 arrangement
(4) Where both aerial and earth are bad the performances of the set are very poor indeed.

From this we see that most of what is gained by erecting a first-rate aerial may be offset by an inefficient earth, and that even a poor aerial will give quite good working if the earth is made as efficient as possible. This last is a very important point, for there must be thousands of enthusiasts who through force of circumstances are quite unable to erect an aerial which approaches the ideal for receiving purposes. Sometimes it is impossible to get height owing to the presence of telephone or telegraph wires which cross the garden. Sometimes space is so limited that only a short span can be used; again high buildings or tall trees sometimes make it impossible to prevent screening. Used in conjunction with a poor or bad earth connection aerials of all these types will make for indifferent reception; but if the most careful attention is paid both to the earth itself and to the connection between it and the set good reception can be obtained from even a mediocre aerial.

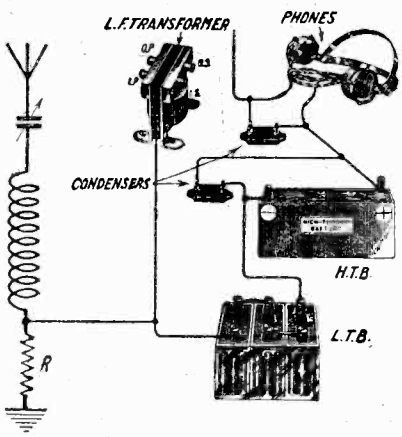

Fig. 4.—A high resistance in the earth lead may make the set unstable.

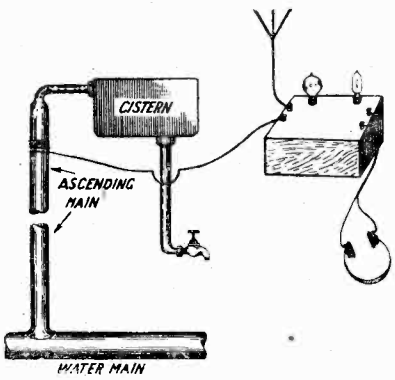

Fig. 5.—An ascending main makes a good earth.

Receiving America

The worst aerial used in the tests referred to above is 60 ft. in length and has an effective height of less than 15 ft. Crossing telephone wires make it impossible to raise either the house end or the free end. The former is attached to the top of a window frame some 15 ft. below the highest point of the roof. At the free end is a 20 ft. mast, the suspended wire passing over a high shrubbery on its way. Buildings and large trees form a screen on either side. Though it belongs to an experimenter it is probably one of the worst aerials in this country. The earth is, however, a thoroughly good one, and with this system it is possible to pick up several American broadcasting stations on any reasonably favourable night with quite a small set. There are other houses in the same neighbourhood with lofty aerials and carelessly made earths where even large sets never succeed in bringing in WGY or WJZ.

The best Earth to use

I suppose that one of the most commonly used earths is the water pipe. So long as you get hold of the right pipe this usually makes an excellent connection. Frequently however, people make use of the first convenient pipe that they come across without bothering to discover what its function is. If it is of the kind shown in Fig. 5 it will usually answer very well indeed. Here we have a pipe rising directly from the underground main and filled always with a column of water. A lead soldered to it will thus provide the receiving set with a low-resistance earth connection. In Fig. 6 is seen the kind of pipe which is of far less use, as your earth lead may be unduly long. If, therefore, you decide to use a water pipe earth make quite sure that you select an ascending main of the kind shown in Fig. 5. Usually it is quite easy to trace out the pipes, but if you are unable to do so your plumber will tell you which is which. Whilst he is there it would be as well to get him to solder a lead to the pipe, for this is a rather difficult job for the amateur to undertake for himself.

If soldering is not done a portion of the pipe must be well scraped until it is quite bright, when an earth clip should be placed upon it and well tightened up. Though this kind of connection is not quite so good as one that is soldered it answers very well as a rule, provided that it is examined from time to time, any dirt or corrosion being cleaned away. A very good home-made connection to a pipe is shown in Fig. 7. When the surface of the pipe has been thoroughly cleaned a brass plate, about 2 in. in

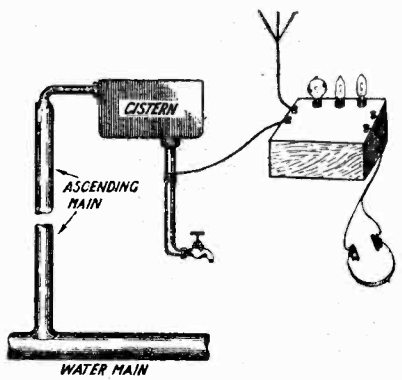

Fig. 6.—This arrangement is often poor.

length and rather less in breadth than the diameter of the pipe, is placed as shown in the drawing, the tip of a wedge of metal or of hard wood being inserted between the plate and the surface of the pipe. The wire is then wound on as tightly as possible and twisted up with pliers. The wedge may now be driven in a little way so as to increase the tightness. If later on the wire is found to have slackened a little the joint can be made good at once by giving the wedge a few taps.

A type of earth connection which is far too often seen is that shown in Fig. 8. Here instead of connecting to a water-main the earth lead is joined to a gas-pipe. This is a thoroughly bad practice. Quite apart from the question of actual danger in case the aerial should be struck by lightning

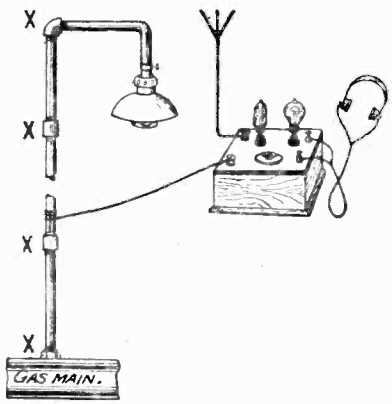

Fig. 8.—A gas-pipe provides a poor earth.

during a thunderstorm, this kind of earth is most unsatisfactory. The joints of a gas-pipe (XX, Fig. 8) are sealed in order to make them gas tight, but the compound used, besides preventing an escape of gas, also offers a very high resistance. Hence a gas-pipe is in nearly every case quite inefficient as an earth connection. I have come across cases in which it was absolutely impossible to obtain any kind of earth connection except a gas-pipe owing to the peculiar situation of the room containing the wireless set. When this kind of thing happens a good way is *not* to make shift with the pipe but to do away with the usual earth connection in a way which will be described later.

If it is possible to make use of either an indoor earth connection to a water pipe or a plate buried in the garden, which of the two is to be preferred? As a rule we may say whichever requires the shorter lead to connect it to the earth terminal of the receiving set. If there is nothing to choose in this respect I would prefer a plate of some kind buried immediately under the aerial wires to a water-main. This rule, however, is not infallible, and the best way of finding out which of the two gives better results is to make actual trial of one against the other. Fig. 9 shows the earth connection that I have used now for some considerable time.

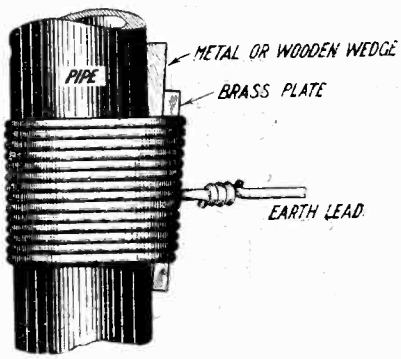

Fig. 7.—How to make a good connection to a water pipe.

An Efficient Earth

It consists of a 7-lb. biscuit tin which is buried 3 ft. or 4 ft. below the surface of the soil, immediately under the suspended aerial wires. The paper with which the tin is covered must of course be washed off first of all. The connection to the set is a length of 7/22 cable, one end of which is unstranded at the point where it enters the earth, each wire being soldered separately to a different place at the top of the tin. If the soil in which the earth is buried is of a light dry nature it is as well to insert an old piece of stove pipe as shown in the drawing. A can of water poured down the pipe every two or three days in dry weather will suffice to keep the earth connection always moist. The dampness of the surrounding soil is one of the most important factors in obtaining an efficient buried earth. If it becomes parched and dry there may be a very high resistance between the metal and the soil. Wet soil, however, makes an excellent low-resistance contact with the metal. In place of the biscuit tin contact an old scullery zinc bath may be used with equally good results. The great thing is to provide a good contact-surface, and to keep the surrounding earth moist. An improvement is to drill two or three very small holes about half-way up each side of the tin or bath. Water poured down the pipe then oozes through these holes, moistening the soil outside as well as inside the tin.

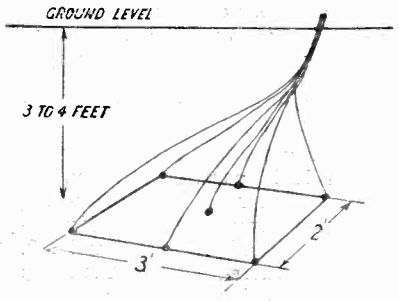

Fig. 10.—A buried earth-plate.

Fig. 10 shows a form of earth-plate which is preferred by some experimenters. This consists of a sheet of zinc about 3 ft. long by 2 ft. wide, the 7/22 connecting cable being unstranded

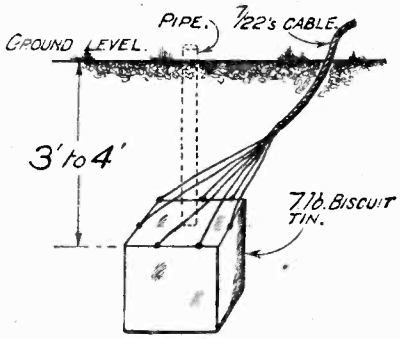

Fig. 9.—A biscuit tin as an earth.

as before and each of its wires soldered to a different portion of the plate. Such a plate should also be buried as nearly as possible below the aerial, and precautions must be taken to ensure that the ground is kept damp.

Keep your earth damp

This may be done in the way shown in Fig. 11. Immediately over the plate an oval ring is made by heaping up the soil into an edge and patting it hard with a spade. Water poured into this ring will form a large puddle which will sink into the soil immediately over the plate. A dressing of cement applied to the inner surface of the surrounding edge will prevent any water from leaking away into places where it can do no good from a wireless point of view.

Another very effective earth is shown in Fig. 12. Here we have a metal pipe 4 ft. or 5 ft. in length, the lower end of which is fitted with a plug of wood. A few small holes are drilled as shown in the drawing in the pipe which is buried so that only a few inches

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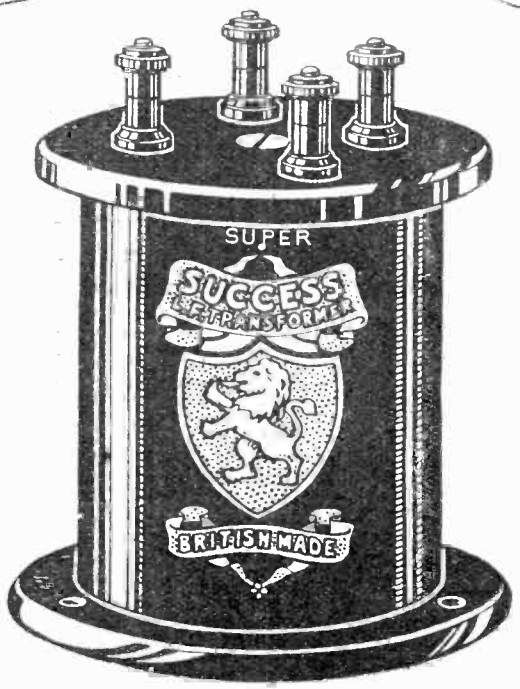

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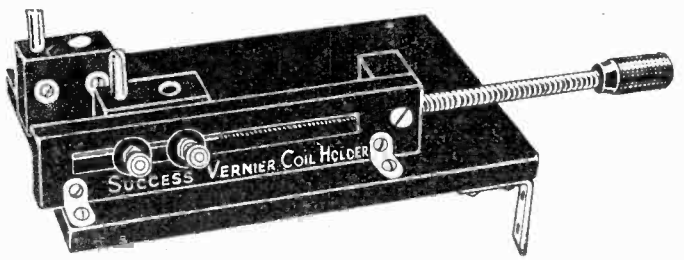

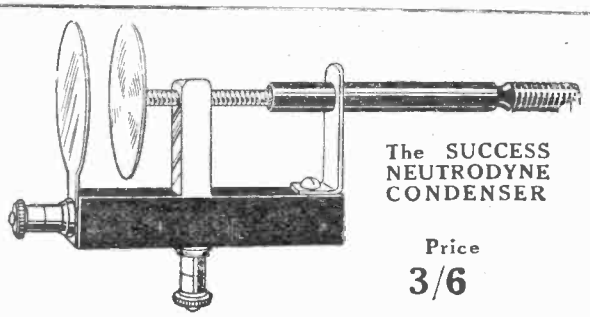

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protrude above the surface of the ground. To the top the earth lead is soldered. This form of earth

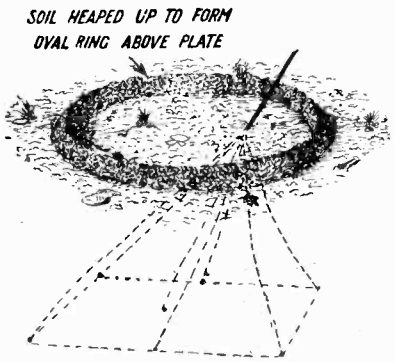


Fig. 11.—How to keep an earth-plate damp.

ensures a good moist connection, since water poured into the pipe gradually leaks away through the small holes moistening the soil all round. The pipe should be of large diameter, say 4 in. or 5 in. so as to provide ample contact surface.

The Counterpoise

I referred a little way back to a difficulty which may occasionally arise where it is quite impossible to obtain an outdoor earth, and a gas-pipe is the only indoor connection available. Should you be so situated it is better to make use of the simplest form of counterpoise, rather than press the gas-pipe into

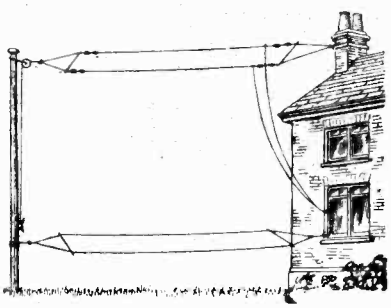


Fig. 14.—A counterpoise earth.

service. Take a coil containing a dozen yards or more of insulated wire—either single flex or bell wire answers admirably—attaching one end of it to the earth terminal and simply throwing it on to the floor below the table on which the set rests. In most cases this simple counterpoise will give good results. This is a most useful tip if one wants to rig up a receiving set quickly for some purpose. Some kind of aerial can always be obtained without much trouble by slinging a wire from the house to a tree or to another building, but the earth connection nearly always takes some time to plan out and make. By using simply a coil of wire this trouble may be eliminated with a very great saving of time. I have often made use of this handy form of counterpoise when giving demonstrations at lectures and so on.

The Aerial and Earth System

In the aerial and earth system we are actually making use of a condenser of large size, but with a small capacity, as a collector of oscillations. Fig. 13 shows this diagrammatically. With the counterpoise the plates of the condenser are formed as shown in Figs. 14 and 15. It consists simply of a

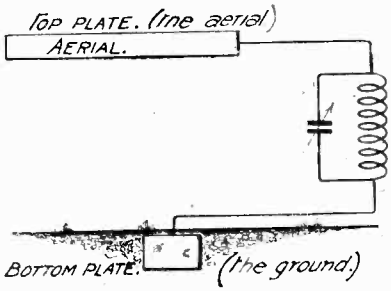


Fig. 13.—Aerial and earth respectively may be regarded as two plates of a condenser.

second set of aerial wires suspended not less than 6 ft. from the ground and insulated just as carefully as the first set. It is important that the counterpoise should contain at least as much wire as the aerial itself. Personally I have found that excellent results are obtainable by using for a counterpoise the copper ribbon which is now sold for making aerials. In Fig. 14 both aerial and counterpoise are shown with double wires. I have a strong preference for the single wire aerial and my own practice is to make use of one strand of 7/22 cable suspended as high as possible

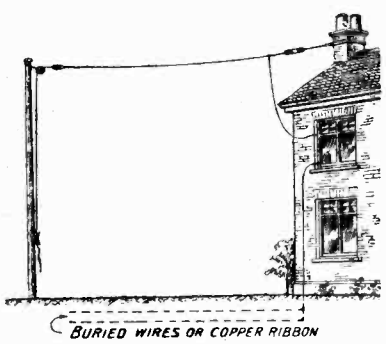


Fig. 16.—A good outdoor earth.

with two good insulators at either end. The counterpoise is formed by a length of ½ in. copper ribbon insulated in the same way. The

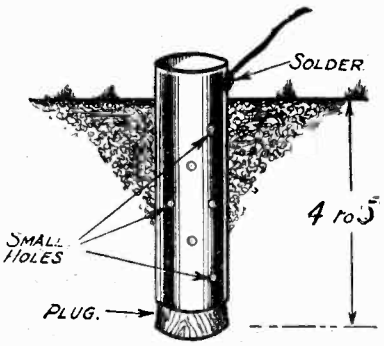


Fig. 12.—A metal pipe as an earth.

lead in from the counterpoise is brought into the house through an insulated tube similar to that used for the aerial lead in.

A good compromise between the earth and counterpoise can be made by burying lengths of wire or of copper ribbon immediately under the aerial as shown in Fig. 16. These need not be more than a few inches below the surface of the soil. In damp weather a perfect earth connection is assured, whilst should the soil dry up in summer time a counterpoise effect is obtainable. An earth of this kind is practically independent of drought or rainy weather.

In conclusion we have seen that

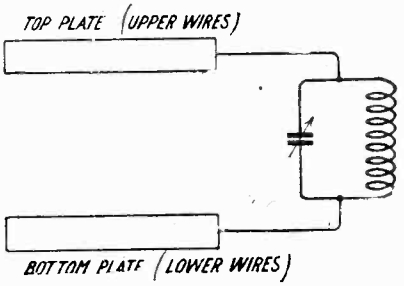
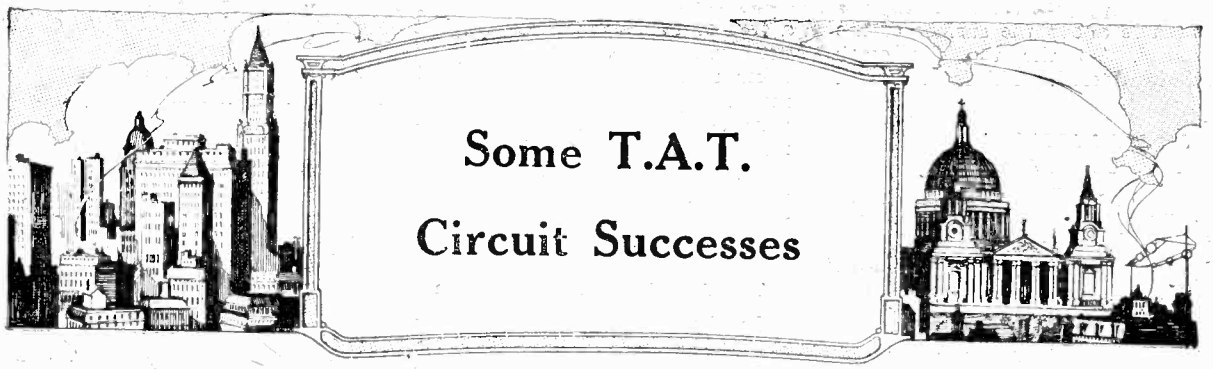


Fig. 15.—Showing how an aerial and counterpoise act as a condenser.

even the best aerial may have its efficiency ruined if it is used in conjunction with a bad earth, whilst a poor aerial may be made to give quite good results if the earth connection is made thoroughly efficient. Outdoor earths are usually rather better than connections made to a water pipe, provided that care is taken to place them beneath the suspended wires and to keep the soil in which they are situated damp. An indoor counterpoise is to be preferred to a gas-pipe connecton



Some T.A.T. Circuit Successes

Readers' results are here given with circuits advocated by the Editor in his article on the T.A.T. System in the November Issue.

No. 14 Circuit.

SIR,—I am grateful to you for such a circuit as given in November MODERN WIRELESS—namely, the T.A.T. system. Radio Press circuits are my hobby and I try a great many, but must give the T.A.T. system first place. ST 100 was very good, also the All-Concert and Grebe. Although not knowing anything about wireless when I started, the instructions and explanations were so exact that now at the first glance at a circuit I know what kind it is and I now thank you for the abundant information. The T.A.T. circuit I made up was Fig. 14 4 H.F. Det. and one stage of L.F., but instead of reaction on the aerial I applied it to the last tuned anode. I get all the B.B.C. stations at loud-speaker and the relay stations at 'phone strength, which is very good here. I have had nine Continental stations, but not understanding the language I cannot tell all of them. Now all these stations were got with a very poor aerial, about 30 ft. high and 3 ft. from roof of house. With an inside aerial in another part of the town I got most of the B.B.C. stations and Brussels, but there were several listening in on the set and I had not very much chance to try it out there.

Thanking you for your publications.—Yours truly,

A. MYLES.

Stirling.

P.S.—The nine Continental stations were received between 250–550 metres.

A T.A.T. Circuit.

SIR,—During last week I converted a five-valve set having two tuned anodes to a T.A.T., with reaction on the aerial. The set is situated close to Dublin and has a first-class aerial and earth. The performance was good. In the following, by loud-speaker strengths I mean loud enough for eight or nine people to hear comfortably in a large room. Bournemouth, Aberdeen, Belfast, Newcastle, Chelmsford and sundry German stations only required one stage of note magnification for loud-speaker strength. All the B.B.C. stations were successfully tuned in except Edinburgh and Plymouth. As I had only one evening with the set, I did not have time to try as much as I would have liked. The circuit was exceptionally easy to tune and reasonably selective.

I think that the conversion was well worth while, although the results were, perhaps, not quite so good; the simplicity of operation well made up for it. I, personally, shall never use two adjacent stages of tuned anode again. I congratulate you.—Yours truly,

A. S. C. HILL.

Woolwich.

No. 12 Circuit.

SIR,—Your articles on H.F. amplification have been very interesting to me, so much so, that I decided to alter one of my tuned anode three-valve circuits into two H.F's., Detector and one stage L.F. This I completed about three weeks ago. The set is as follows:—

No. 1.—H.F. square choke of 200 turns, 28 enamelled wire. M.O. valve 4 volts

No. 2.—H.F. tuned coil with .0003 condenser. M.O. valve 4 volts.

No. 3.—Detector with reaction. Ediswan valve 4 volts.

No. 4.—Note magnifier (L.F.), not power valve. M.O. valve 4 volts.

I may say here that I had to add reaction in order to make it oscillate, the set being so stable. When completed I connected it to my aerial and the first thing I picked up was an amateur at Newbury; after this I got down to real business, tuned in 2LO at good L.S. strength, next Bournemouth and Newcastle came in at the same strength. This surprised me very much. I then tried Cardiff and Glasgow; both of these stations could be heard at good L.S. strength. The next thing I thought I would try it on America, after trying another four-valve set of 1 H.F.—D.—2 L.F's. conditions being very bad. With set No. 2 I could not pick up a single carrier wave. Morse and atmospherics were appalling and I could not bear the telephones on. I then tried the T.A.T. set, and to my surprise I picked up quite a number of carrier waves. I eventually tuned in WGY and heard speech quite plainly.

This I think is clear evidence that two stages are better than one. I picked up two amateurs below 130 metres. It was as stable here as on 300 to 500 metres.

Wishing you every success.—Yours truly,

E. E. MORLING.

Hampton Wick.

No. 12 Circuit.

SIR,—As I stated in my last letter, I am writing to you to send you a further report on the most excellent T.A.T. receiver, circuit No. 12, with 1 L.F. added (2 HF, Det & 1 L.F.). In my last letter, I said I had not sat up for America. I have listened for America on four occasions since then and every time with great success.

The following are the stations which I received:—*KDKA (326 metres), KFKX, *KGO, KYW, *WBZ, *WEAF, WGN, *WGY, *WHAZ, WNYC, WJZ, *WOO.

Those marked * at loud speaker strength when using a L.F. amplifier added, making 2 HF. Det. and 2 LF.

In my last reports I had received six amateurs, one being French. I have now received 35 different amateur stations, including three or four French or Dutch.

Wishing T.A.T. sets and Radio Press every success.—Yours truly,

B. GRAY.

Dunadry, Co. Antrim, Ireland.

A LOUD-SPEAKER WITHOUT DISTORTION

One of the most natural tone Loud-Speakers on the market, and worked in conjunction with our "BIG BEN" 3-Valve Set the results are perfect. It has no Trumpet. It fits in any corner of the room without being noticed. The retail price in Mahogany or Oak is **£6/10/0.**

The "BIG BEN" 3-Valve Set complete with 1 B.T.H. "B6" Power Valve, 2 B.T.H. "B5" Valves, 1 100v. H.T. Battery, 1 4v. 80 amp. Accumulator, 1 pr. Siemens 'Phones, Aerial, Insulators and "CELESTION" Loud-Speaker, retail price **£28/7/0.**

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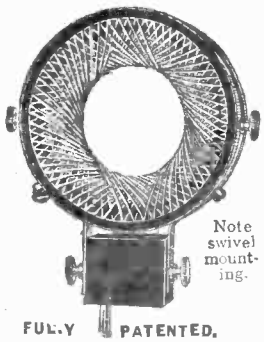
You should use with

SQUARE LAW CONDENSERS

You are all fitting Square Law Condensers to your receivsrs—but remember when purchasing your tuning coils that the efficient working of the straight wavelength curve requires a coil of extremely low self-capacity.



Note swivel mounting.

FULLY PATENTED.

Use, therefore, the **DIAMOND SUNFLOWER** coils of low self-capacity, low H.F. resistance, maximum transference of energy and consequently maximum signal strength, sharper tuning and selectivity, follow the fitting of "Diamond Sunflower" Coils.

If your receiver suffers from flat tuning, substitute Diamond Sunflower Coils and note how sharp the tuning becomes. Diamond Sunflower Coils give razor-sharp tuning.

Diamond Sunflower

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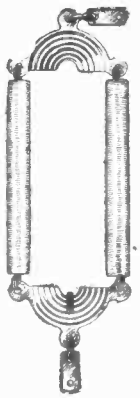

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This aerial can be erected or taken down in a few moments, and may be erected in or out of doors, on a car, on a punt, or any other desired position.
Hooks are provided for its attachment, and it is fitted with insulators and anchors, and a terminal for the lead-in wire. Minimises Static. PRICE 7/6.

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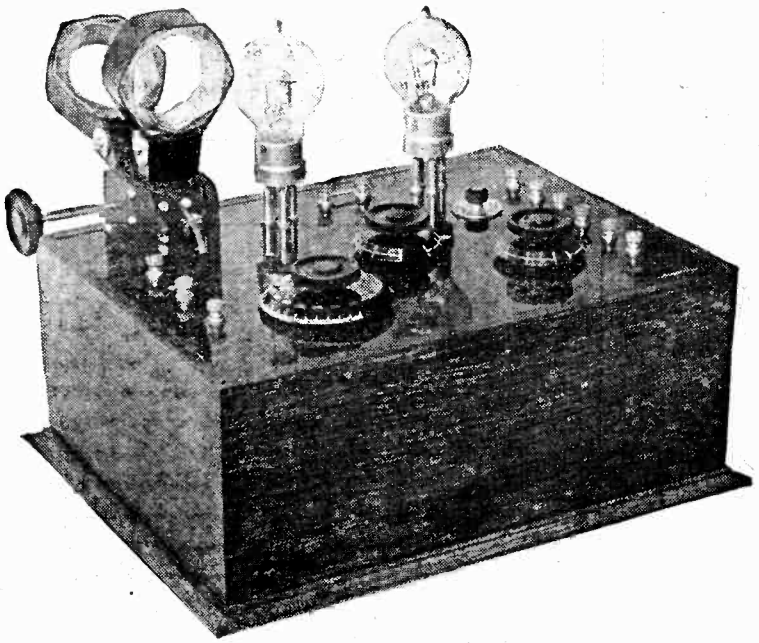


Fig. 1.—The layout gives a neat and handsome appearance.

An Improved Two-Valve Receiver

By STANLEY G. RATTEE,

Member I.R.E., Staff Editor.

THE receiver illustrated is one of extreme simplicity to construct, in that it is assembled from bought parts, no making of coils or other components being called for, thus allowing the constructor to devote the whole of his attention to the building of the receiver itself.

The circuit employed is a straight valve detector, followed by a special arrangement of low-frequency amplification similar to that incorporated in a receiver described by Mr. Herbert K. Simpson in Vol. 3, No. 18, of *Wireless Weekly*. Reaction is used in the receiver in the ordinary way by the electromagnetic coupling of two coils.

Oscillation

When using a receiver of this type care must be taken in its operation in order to avoid energising the aerial, thereby causing considerable interference to neighbours through making the receiver oscillate. These remarks apply not merely to the set under description but also to any other receiver in which reaction is applied to the aerial circuit, a point which, judging from the interference experienced in South London through oscillating receivers, is overlooked by many listeners.

A photograph of the set is given in Fig. 1 in such a position that the disposition of the components upon the panel may be seen. The three terminals on the left, reading from the top downwards, are the aerial terminal, including constant aerial tuning, a second aerial terminal excluding constant aerial tuning; and the third is the earth terminal.

On the right-hand side of the panel, reading from the top downwards, are the two telephone terminals, the H.T. terminals and L.T. terminals, whilst at the back of the panel may be seen two terminals for grid cells when required.

Considerations in Design

In designing this two-valve receiver it was intended to make the operation of tuning as easy as possible without any loss in efficiency; and with this objective in view the circuit chosen was a single-valve reaction arrangement, followed by a single stage of low-frequency amplification in order that not more than one condenser need be adjusted; switching, with the extra wiring it involves, was also eliminated to maintain the general simplicity of the receiver. To allow the use of either bright or dull-emitter valves, suitable filament resistances are incorporated, and so far as results are concerned there is nothing to choose between the two types, in that the set will give easy oscillation and purity of signals with both. In order that definite instructions may be given with regard to coil sizes, constant aerial tuning is used, but in those cases where readers prefer not to use this form of tuning, the middle terminal of the three on the left hand of the panel permits the aerial being connected directly to the coil.

Materials and Components

In conformity with the usual practice and for the guidance of those readers who wish the information, the names of manufacturers of the components incorporated in this receiver are given in the following list, and though there is, in fact, no obligation in the choice of components to obtain results similar to those possible with the receiver illustrated, the values given must be strictly adhered to, in that they have been arrived at after considerable experiment, and any departure from them may quite conceivably cause the finished receiver to give either poor results or none at all.

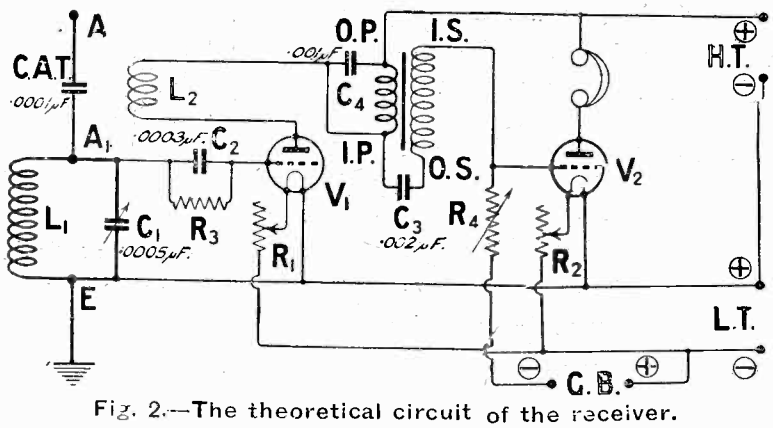


Fig. 2.—The theoretical circuit of the receiver.

A unique 2-Valve Receiver, incorporating a little used, but nevertheless excellent modification of low-frequency amplification.

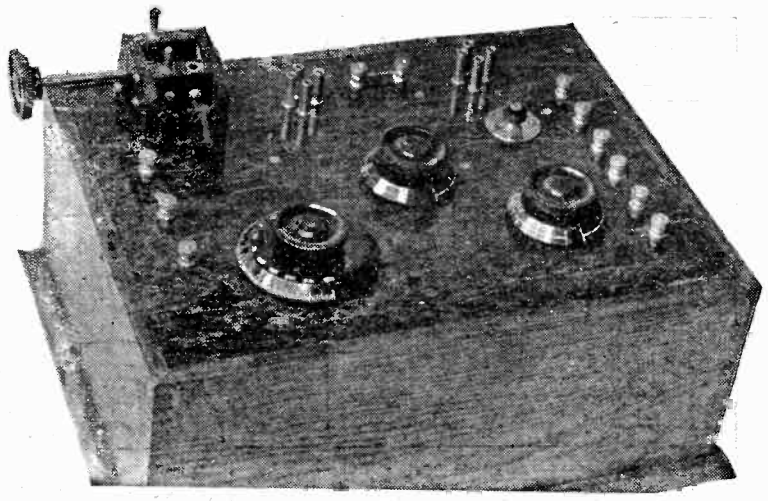


Fig. 3.—With coils and valves removed, the disposition of the components is seen.

1 Ebonite panel measuring 9 in. by 12 in. by $\frac{3}{16}$ in. (Radion).
1 Variable square-law condenser of ·0005 μF. capacity (Jackson Bros.).
1 Two-coil holder (Polar).
2 Dual rheostats (McMichael).
1 Grid condenser of ·0003 μF capacity (Dubilier).
1 Grid-leak of 2 megohms (Dubilier).
1 Fixed condenser of ·0001 μF capacity (Dubilier).
1 Similar condenser of ·001 μF capacity (Dubilier).
1 Similar condenser of ·002 μF capacity (Dubilier).
1 Low-frequency transformer (Max-Amp. Peto-Scott).
11 Brass terminals.
1 Watmel variable grid-leak ·5 to 5 megohms.
2 Valve sockets, or alternatively 8 valve pins.
Set of plug-in coils for the wavelengths desired.
Quantity of connecting wire.

Coils to Use

The coils required for this receiver are, in the case of the lower broadcast band, using constant aerial tuning, a No. 50 for aerial tuning, with a No. 75 for reaction; for the higher band a No. 75 in the aerial circuit, with a No. 75 for reaction. For the same wavelength range without constant aerial tuning coils No. 35 or 50 will be required for aerial tuning, with a No. 50 or 75 for reaction. For the reception of 5XX and Radio Paris without C.A.T., a No. 150 for the aerial, with a No. 200 as reaction coil will be necessary. The reception of the Eiffel Tower may also be tried, using a No. 250 in the aerial socket, with a No. 250 or 300 for reaction.

The Panel

In connection with ebonite, readers are reminded that there are certain manufacturers who supply guaranteed material free from surface leakage and possessing a highly polished finish. On the other hand, there are makes of ebonite which do not bear this guarantee, and in cases where this material is used, after the panel has been drilled in accordance with the panel layout, the glossy finish on both sides should be removed by means of fine emery-paper, as it is very often found that this glossy surface offers poor insulation between the different components, resulting in the set giving feeble results and a noisy background when working. The panel will, after this rubbing treatment, present a somewhat shabby appearance, but the application of a little oil rubbed in with a soft rag will soon restore the deep black the panel originally possessed. In those cases where guaranteed ebonite is used this precaution of removing the surface skin is, of course, unnecessary.

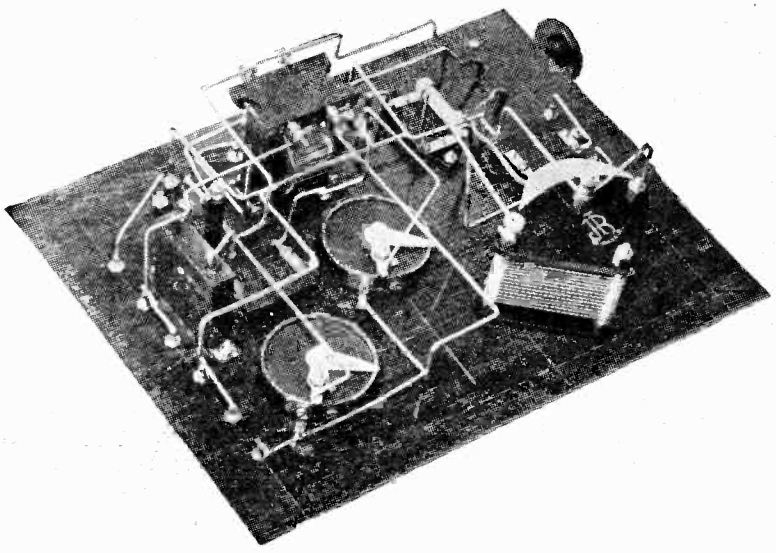


Fig. 4.—A helpful plan view of the wiring.

The Circuit

The circuit of the receiver is given in the theoretical circuit diagram, wherein will be seen the transformer connections. This arrangement with the transformer chosen gives very pure amplification, though it must not be inferred from this that the results will be as good with every make of transformer, and it is suggested that both this and the usual arrangement be tried before finally completing the receiver. Apart from the L.F. valve connections, the remainder of the circuit is perfectly straightforward.

The coil L_1 is the aerial tuning inductance across which is shunted the ·0005 μF variable condenser.

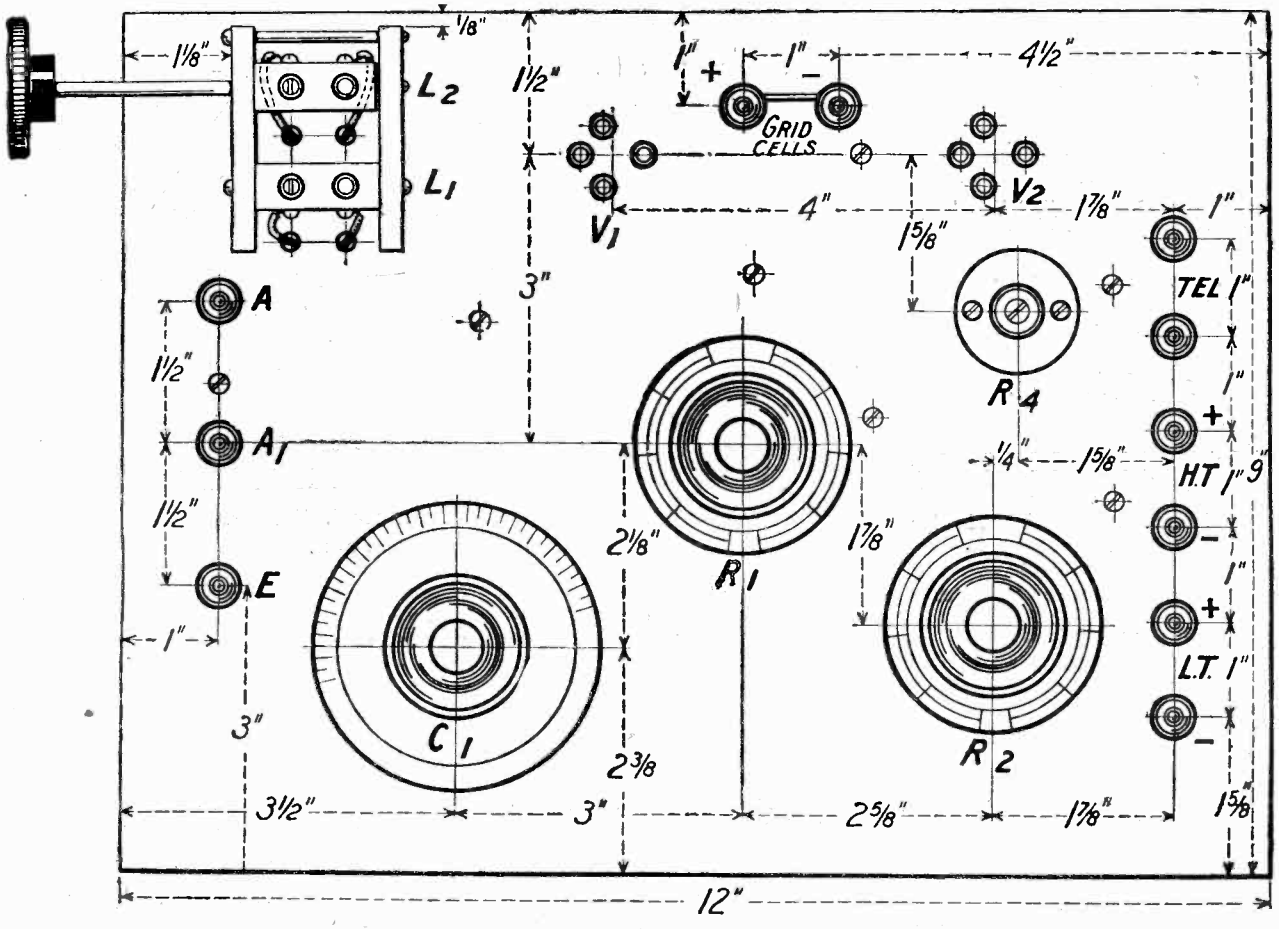


Fig. 5.—Front of panel layout and drilling diagram. Blue Print No. 86A.

C_3 and R_3 are the grid condenser and leak respectively, whilst R_1 and R_2 are the filament resistances. L_2 is the reaction coil connected between the plate of the detector valve and the primary of the low-frequency transformer. This latter it will be seen is shunted by a fixed condenser of ·001 μF capacity. It will be further observed that the secondary of the transformer is connected to the primary through a condenser of ·002 μF value, and though this arrangement works well with a number of transformers chosen, it is suggested that experimenters try various values for this condenser, such as ·001 μF and .0005 μF. The resistance R_4 is of the variable grid-leak type, giving a variation from ½ to 5 megohms, and is used in order that the electrons collecting on the grid of the low-frequency valve may leak back to the filament. This arrangement of connections gives a decided improvement in the purity of signals and is one which was recommended by Mr Scott-Taggart in his Valve Notes appearing in *Wireless Weekly*, dated April 23 of this year. The adjustment of the variable resistance varies with different makes of valves, but once the best adjustment is found for any particular valve no further variation is called for as long as the H.T. value is kept constant.

The Wiring

The system of wiring may be observed from these photographs showing the underside of the panel, whilst for working purposes the various connections may be followed from the wiring diagram. Connections should preferably be soldered and all leads kept as short as possible. Though the use of stiff bare wire is advocated, it would seem that many readers experience difficulty in handling this material, and in cases where such difficulty is anticipated soft wire and Systoflex may, of course, be used, so long as reasonable care is taken in spacing the leads and in keeping them as short as circumstances will permit.

Operating the Receiver

After the wiring has been completed, connect the accumulator to the terminals indicated in the panel layout, and after turning the filament resistances to the "off" position, insert the valves and test the lighting circuit at this stage by slowly turning the filament rheostats, noting whether the brilliancy of the valve filaments is consistent with the amount of resistance in circuit. Assuming this test to be satisfactory, connect the H.T. battery. If it is desired to test the receiver during the hours of broadcasting, then reception should be tried on wavelengths other than those upon which the majority of listeners will be concentrated (coil No. 100 in the aerial socket, with a No. 100 for reaction, for instance). After inserting the coils, the next operation is to short-circuit the grid cell terminals. Turn the coils at right angles to each other, and then light the valves to a suitable degree of brilliancy, not forgetting, of course, the aerial and earth connections.

At this stage the variable condenser should be slowly turned, at the same time bringing the moving coil nearer to the fixed, avoiding whilst so doing the point of oscillation. So long as the oscillating

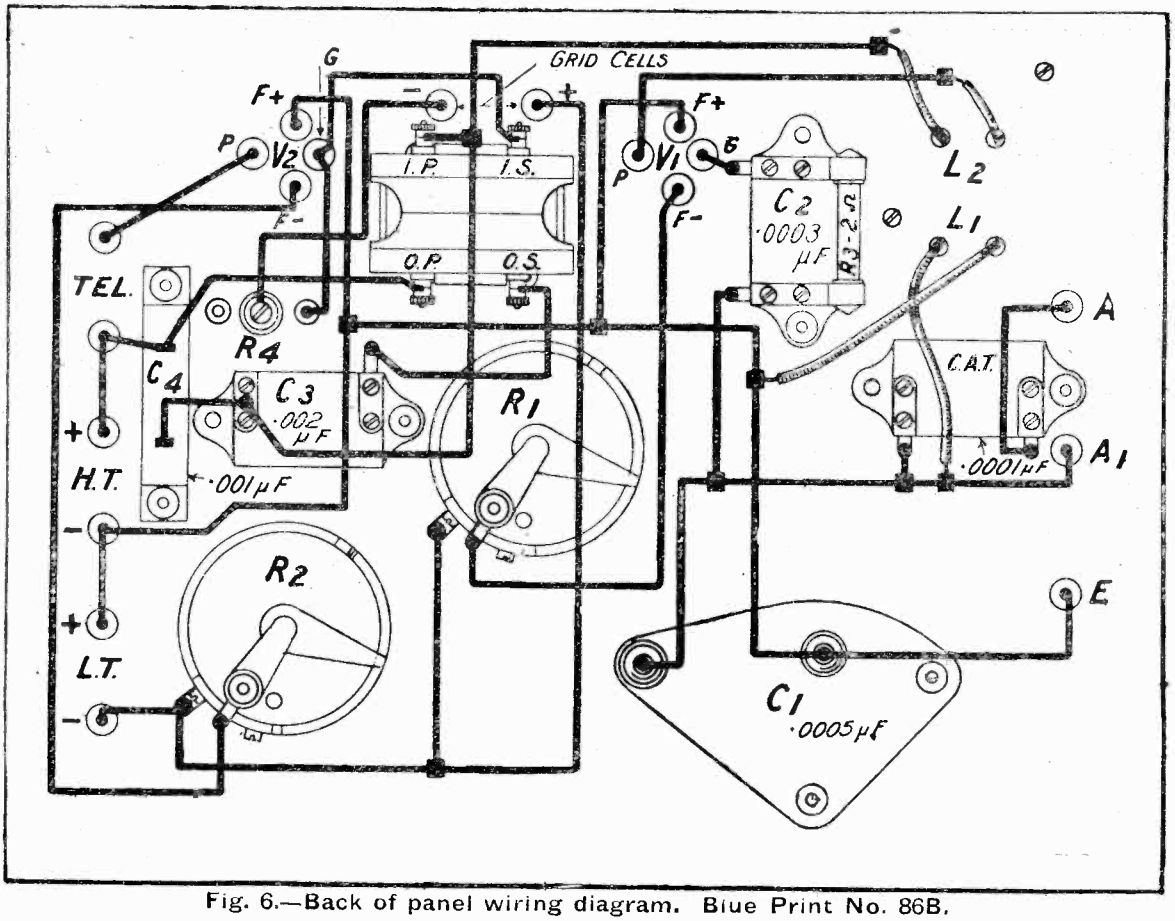


Fig. 6.—Back of panel wiring diagram. Blue Print No. 86B.

condition is approached with due care, the point of oscillation will make itself heard by a "cluck" in the telephones, upon which the moving coil should be slightly withdrawn from the fixed and the tuning condenser again adjusted.

Should the set fail to give any tendency towards oscillation, then this fact indicates that the reaction coil is coupled in a reverse manner to the aerial coil, and the connections thereto should be changed over.

B.B.C. Wavelength.

For the reception of the B.B.C. stations the same operations should be gone through, bearing in mind that any alteration in the position of the reaction coil necessitates further tuning upon the variable condenser. Care should be taken to see that the set does not oscillate.

Whilst telephony signals are being received the variable resistance, connected between the grid of the second valve and the negative of the grid cells or L.T. battery, as the case may be, should be adjusted to give the purest results, the purpose of this resistance being to prevent an accumulation of electrons on the grid of the low-frequency valve.

Grid Cells

In those cases where readers decide to use dull-emitter valves with this receiver, it is advised that a grid biassing battery be incorporated, two separate terminals being provided for this purpose. Usually a battery of 4½ volts tapped at 1½, 3 and 4½ volts made up from flash-lamp cells will be found sufficient for grid bias, depending, of course, on the value of H.T. used, the

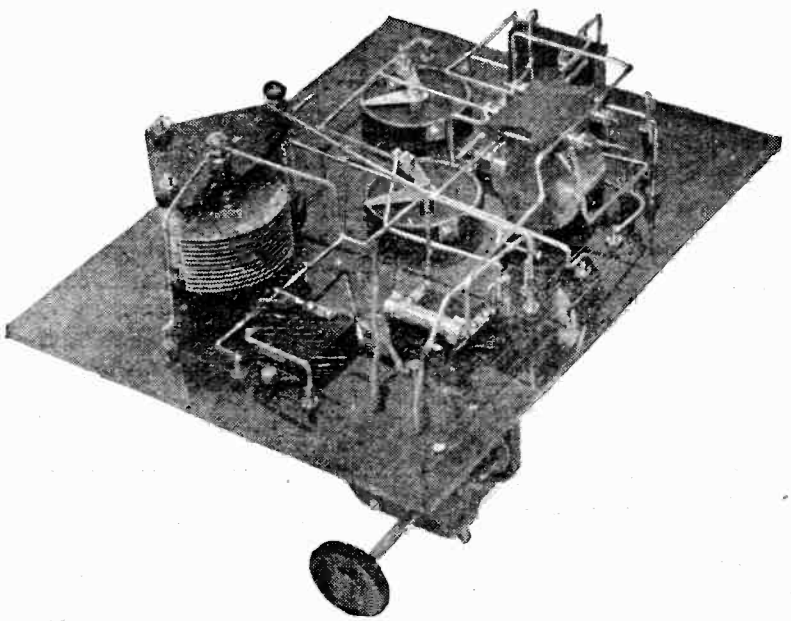


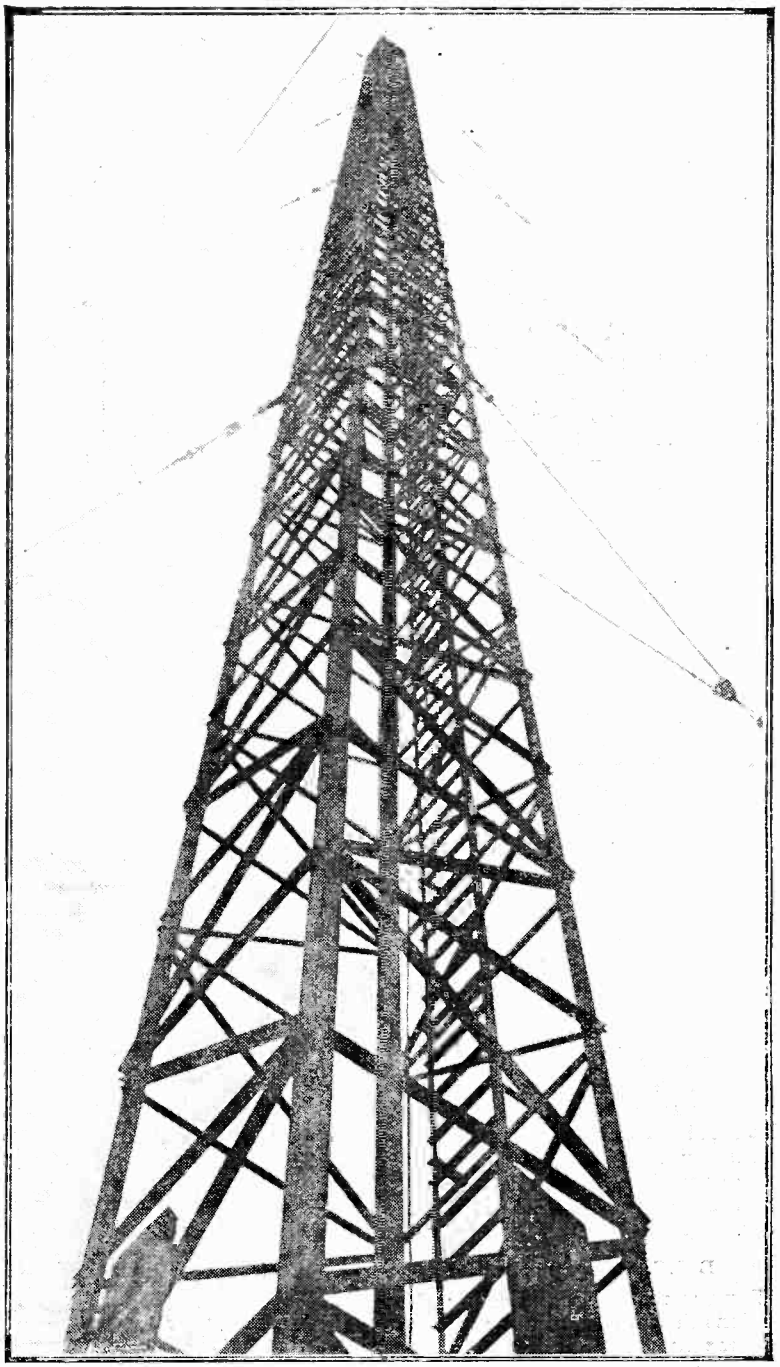
Fig. 7.—This photograph gives a good idea of the elevation of the wiring.

inclusion of which will eliminate that gruff, throaty speech which is sometimes associated with dull-emitter valves when used as low-frequency amplifiers. In the event of the battery not being used, or should the cells become exhausted through deterioration, then the two terminals across which the battery would normally be connected should be joined together by a piece of wire.

Test Report

The receiver as illustrated was tested for the first time during the afternoon of December 6, when, using both constant aerial tuning and the usual method with the aerial connected direct to the grid coil, Cardiff, Birmingham, Bournemouth, and Newcastle were received at good telephone strength during the daylight hours; Radio-Paris was also heard transmitting news during daylight. Later, tests were made during darkness, when Chelmsford and Glasgow were also received in addition to the previously-mentioned stations. London, though received at deafening strength, was not regarded as a serious test. These receptions were made in S.E. London upon an indoor aerial arranged round three sides of an average-size room; and for those readers who are desirous of building a two-valve receiver which demands neither skill in construction nor expert operation, then the set which has been described is one which such readers would do well to build.

As a matter of extreme interest, the author would be glad to hear from readers who construct this or any other of his sets, as the results obtainable in various parts of the country are a valuable indication of what a particular design of receiver is actually capable of accomplishing.



The huge mast seen in the photograph was used to support the aerial at an exhibition in Berlin.

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The present popularity of receivers employing the Neutrodyne principle finds us with a neatly designed instrument with constructional and electrical features specifically for this purpose. Similar in design to the COLVERN General Purpose Vernier which is already well-known—the COLVERN NEUTRODYNE represents utmost efficiency at a moderate price.

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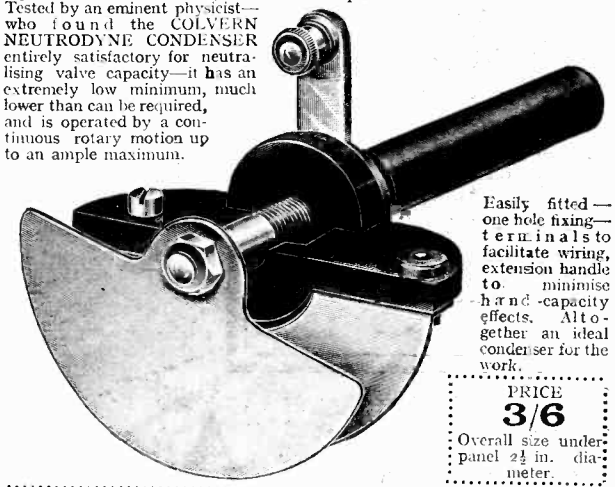

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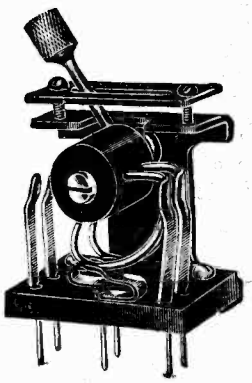

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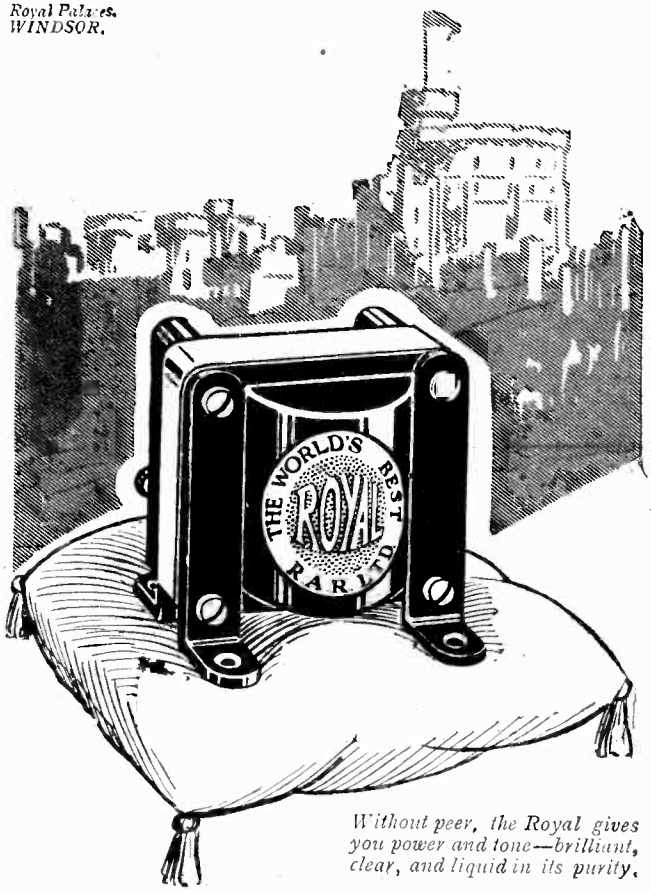

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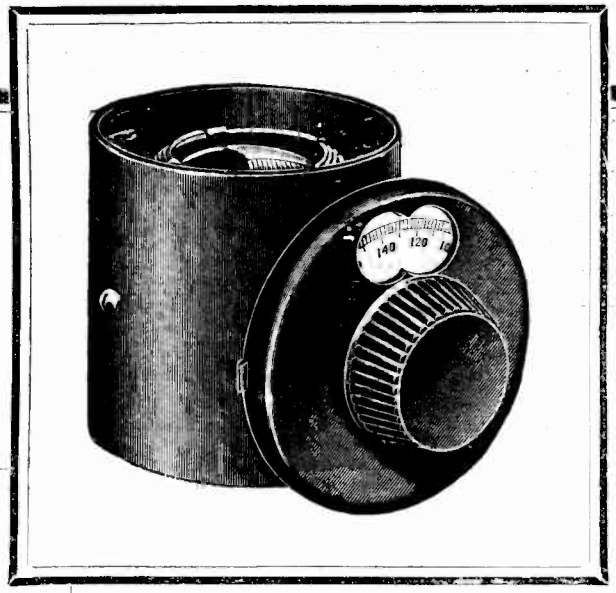

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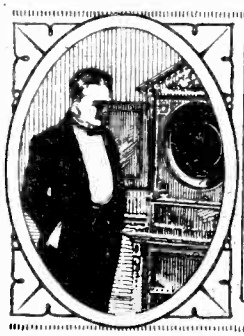


Broadcast Topics

by

R. W. HALLOWS, M.A.,
Staff Editor

Some notes of interest to broadcast listeners.

THOUGH he may speak scathingly of "broadcatchers," and so on, your genuine experimenter must admit in his heart of hearts that he himself spends far more time in listening to the programmes transmitted by broadcasting stations than in the reception of signals of any other kind. And, after all, why should he not? There are telephonic transmissions to supply nearly all his needs, and, other things being equal, it is much more entertaining to listen to speech and music than to decipher messages, usually of a most uninteresting type, sent out in Morse. It is only when he is working with amateurs in this country or in other parts of the world who use continuous wave telegraphy for their transmissions, or when he is picking up time signals from far corners of the earth, that telephony fails him. Another point is that ability to receive telephonic transmissions as they *should* be received is a far greater test of any set than the bringing in of Morse signals.

Morse Reception

With these latter a certain amount of distortion does not matter in the least—in fact, it will not be noticed—but for reproduction of telephony it is essential that distortion should be eliminated, for if it is present its effects will be devastating. In the early days of broadcasting the results that most of us obtained, though we were pleased with them then, were not very good. The reason was that we were working with apparatus designed mainly for reproducing a very limited range of notes. The note of a spark signal depends, of course, upon the transmitter in use, but a C.W. signal can be tuned by the man at the receiving set to the frequency which suits him best. This is usually somewhere between 750 and 1,000 cycles a second. Most low-frequency transformers and telephones were designed so as to respond best to frequencies of this order, with the result that when they were called upon to deal with musical transmissions, which include frequencies varying between extremely wide limits they emphasised notes towards the middle of the scale whilst almost suppressing those at either end. We saw nothing in those days of special low-frequency valves with long straight grid-volts-anode-current curves, of transformers designed to have a flattened characteristic or of grid biasing batteries. The loud-speaker was there simply to make a noise. The first one that I owned consisted simply of an ordinary telephone earpiece mounted on a stand and provided with a trumpet. It was excellent for bringing in spark or C.W. messages, but as an instrument for music it was beyond words. I did not realise how bad things used to be until the other day when I unearthed this ancient loud-speaker and the quaint set in conjunction with which it used to produce its bellowings. A five minutes' trial with the combination upon 2LO was more than enough for everyone who heard the test.

A Proper Pride

To-day the real experimenter is distinguished from the mere listener largely by the pride he takes in the quality of his reception. He wants his set to be able to reproduce broadcast transmissions, and he aims at a standard that is as near to perfection as is humanly possible. He does not desire to have a set with a single control. Rather he prefers to have as many variable values as is reasonably possible in voltages, resistances, capacities, and couplings, for he knows that he can obtain the best results by the skilful adjustment of a large number of controls.

With regard to variable grid-leaks, experience has shown that many are not very satisfactory, since in the first place they cannot easily be calibrated, and in the second some are apt to "pack," so that what was originally the minimum resistance becomes in time the maximum. In place of them I am going to substitute clips on the upper surface of the panel, into which fixed gridleaks of

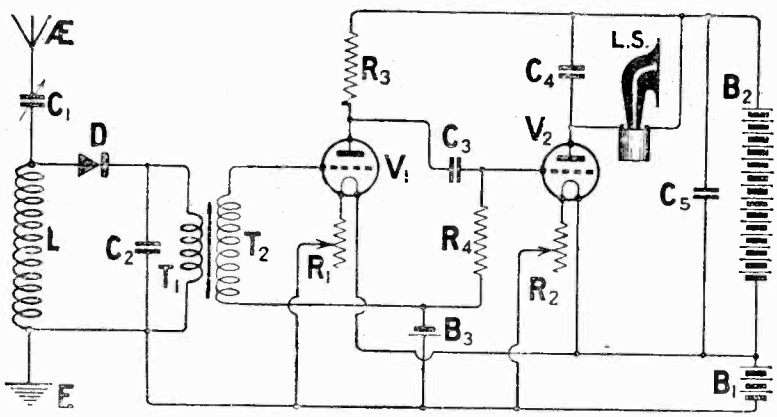


Fig. 1.—Crystal detector and 2 L.F. for distortionless reception.

various values can be clipped in a moment.

Broadcast Receiving Sets

Every experimenter, I think, should have one set designed specially for the reception of broadcasting—if he has a family they will see to that! Captain Eckersley has stated on more than one occasion that you cannot get perfect reception at a greater range than about thirty miles from any station. His point is that as soon as you exceed that distance you must either make large use of reaction or employ high-frequency amplification, both of which are liable to have the effect of bringing in mush and excessive atmospheric disturbance.

Though one *can* obtain quite good reception at much greater ranges, I think that the special broadcasting set should be designed mainly for dealing with the transmissions of the nearest main station. The experimental set can be used for the fascinating pastime of trying round for distant signals.

The Circuit to Use

If you are going to work on these lines, what is the best circuit to use for the set devoted entirely to broadcasting? This will depend mainly upon the proximity of the house in which it is used to the nearest main station as well as upon local conditions. Some places are much above the average from a wireless point of view, whilst others may be classed as blind or semi-blind spots. For the normal locality I do not think that you can beat the circuit shown in Fig. 1 up to about ten miles. Here a crystal rectifier is used, coupled by means of a low frequency intervalve transformer to the first valve. Between the first and second valves we have resistance capacity coupling whose excellence for telephonic reception is becoming more and more generally recognised. Provided that the transformer is a good one, excellent reproduction will be obtained with such a circuit, and it has the added advantage that it is simple enough for anyone to use. At rather greater distances the circuit shown in Fig. 2 will be found admirable for pure reception. Should the volume of sound not be great enough, a second note magnifying stage, resistance capacity coupled, as in Fig. 1, may be added. The high-frequency transformer may be tuned or semi-aperiodic. Where the distance is not excessive the semi-aperiodic transformer will be found satisfactory. Though not so efficient as the tuned, it has not the same tendency to produce oscillation, and since the set is always worked well away from the point of oscillation, little mush comes in. Should there be local interference from spark stations a double circuit tuner will be found to be an advantage as an addition to either the Fig. 1 or Fig. 2 circuit. If the last valve in either case is to be a power amplifier, a second high-tension tapping will be necessary, and there should be a higher grid voltage than is applied to the first valve.

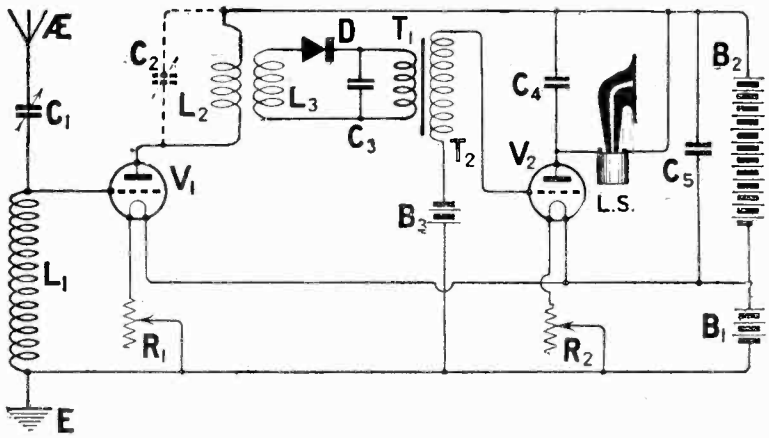


Fig. 2.—Excellent quality and greater range are obtained with the above circuit than with Fig. 1. The Condenser C_1 can be used in series or in parallel.

Transmission Quality

It should be noted that the receiving set is not always entirely to blame for slight imperfections in speech or music. Though the general standard of the broadcasting stations is excellent, the quality does vary a little from time to time, owing, one imagines, to experimental alterations in the circuits used. When 5XX first began to transmit he could not

approach the mellowness of 2LO. It was natural that considerable difficulties would be encountered when an attempt was made to modulate the huge output of the big station. Of late he has improved very greatly, and his quality is now very little inferior to that of the lower powered station. Even 2LO, whose transmissions are normally of excellent quality, varies a little. During the latter part of October, for example, a distinct roughness was noticeable on several evenings. If, therefore, you are trying out a new set, do not condemn it until you have satisfied yourself by testing it on several evenings on a transmission which is known normally to give good reproduction.

Interference

The interference due to radiation from oscillating receiving sets is, I think, distinctly less than it was some months ago. I can remember many evenings about this time last year when it was impossible to listen to the transmission of one's nearest main station with any kind of pleasure owing to the squeals, yells, howls and chirps with which the entire programme was punctuated. Many a time, in despair, I have gone over to Radio-Paris, only to find as often as not that some of the squealing band were doing the same thing. The improvement is due, I think, largely to the fact that users now understand a good deal more about their sets than they did, and that they have become much more skilled in controlling them. Then, thanks largely to the able constructional articles in MODERN WIRELESS, the home-made set of to-day is a very much more efficient and a far more stable instrument than it was in the earlier days of broadcasting. I am not going to be so bold as to say that interference has ceased to exist. It has not, for there are still some who nightly disturb the ether in their efforts to obtain just a little more volume of sound. Still, they are on the decrease, and as wireless education progresses we may expect to find that interference continues to grow less. The worst type of man now, as in the old days, is he who is never satisfied with his tuning.

Wonderful Modulation

Besides British broadcasting stations, all experimenters are now familiar with large numbers of those situated on the Continent. Some of these are remarkable for the constancy and the quality of their transmissions. The best of all, I think, is the Spanish station Radio Iberica, which, in spite of the great distance separating Madrid from this country, comes in with extraordinary strength and purity. From London to the Spanish capital is about 800 miles in a straight line. I do not think that any other transmission from anything like this distance can touch that of Radio-Iberica for excellence. The modulation is so perfect that every syllable spoken can be heard with the utmost distinctness, whilst music comes through with a beautiful tone and without distortion. Another good Continental station is L'Ecole Superieure des Postes et Télégraphes, which transmits from Paris, and some of the German stations come through very well indeed.

Fading

It is curious to notice how some of the British stations are affected by fading, whilst others, even though they are at greater distances, do not appear to suffer in this way. As received in Hertfordshire, for example, Bournemouth's signals are more given to this effect than those of any other station. On a selective set he can be separated without much difficulty from 2LO, but when you have got him you find that his strength varies, especially early in the evening. Cardiff, in the same locality, suffers to some extent from fading, but he is not nearly so bad as Bournemouth. Another rather strange phenomenon is that the stations appear to have periods of good and bad strength. Cardiff, for example, was a strong transmission here during the spring, but by midsummer he had become so weak that it was next to impossible to get him at all. At the end of August he was fairly good. Manchester, again, is a station that I can never rely upon. Sometimes for weeks on end I can get him without much difficulty; then comes a time when one finds that it is most difficult to hear him at all. Here the most consistently good British stations seem to be Newcastle, Birmingham and Aberdeen—I am not, of course, taking 2LO into account, for he is so close that, except when he varies his power a little, his transmissions are always good.

The "Simplicity" Envelope Set in Egypt

The Simplicity Set.

SIR,—Having noticed in MODERN WIRELESS that you ask for results with sets, I have pleasure in giving some obtained with your "Simplicity" set.

This circuit was chosen from the advertisement in MODERN WIRELESS solely on the "one-knob" control idea, and I find it is "simplicity" itself—practically simply turning the condenser.

I was rather sceptical of getting any long-distance results, and was greatly surprised on testing it here (on a steamship) to hear several home stations.

Manchester comes in loudest, at good strength, as does 2LO, and three others at readable strength.

All these on two valves only! With the third valve on, the atmospherics are deafening, but Manchester can be heard with 'phones on the table.

A station, I believe German, and one other come in very loud on about 600 metres, the transmitting valves humming very loudly.

I have also heard these stations at about the same strength with no earth wire connected, although the tuning was altered.

Chelmsford and Radiola come in fairly well on all valves, but I have not bothered much with these.

In this place intelligible concerts are impossible on account of atmospherics, which are continuous and loud, and to hear these stations through them is a very good performance.

No difficulty was found in building the set.

The only modifications are a variable resistance, used instead of 70,000 ohms, and 3 in. tube instead of 2¾ in. for winding the coil with extra length of wire allowed for in tapping. These were unobtainable in the short time available before leaving England, so had to do the best I could. The No. 40 gauge wire was actually sent out here by post.

In conclusion, I wish to congratulate you on turning out such a fine magazine as MODERN WIRELESS, to which I subscribe.—

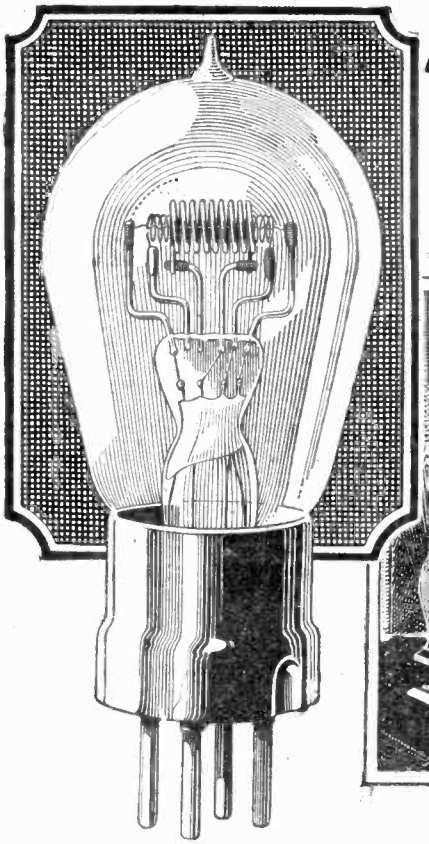
Yours truly, "BERMIN."

Alexandria, Egypt.

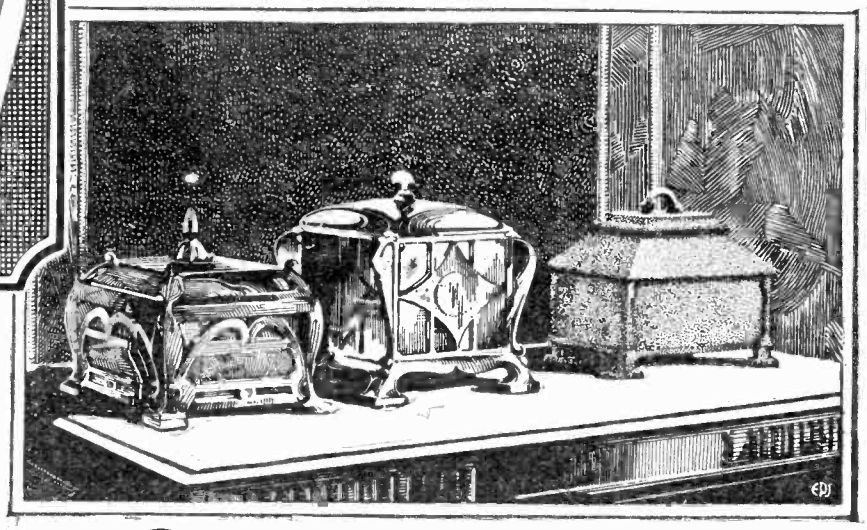
P.S.—Distance London to Alexandria is roughly 2,000 miles.

H.F. TRANSFORMER CONNECTIONS IN "TRANSATLANTIC" RECEIVERS.

IN the construction of the "Transatlantic" receivers the connections to the H.F. transformers given are those which have produced the best results. The effect of reversing either of the windings should be tried with makes of plug-in transformers other than those used in the original design. Actually, no notice has been taken of the makers' marks on these transformers, the correct scheme of connections having been arrived at by actual trial. Although McMichael transformers were originally used, these are immediately interchangeable with Bowyer-Lowe, Peto-Scott, Magnum and some others. With certain other makes it may be necessary to experiment with different connections in order to get the best results.



Louden



The three caskets

10/-

It was not the Golden Casket that contained Portia's portrait, but the lead; and so it often happens that the most expensive article is not necessarily the one most to be desired.

There are many valves more expensive than the Louden; yet there is not one of them that combines all its many advantages.

It uses considerably less current from the accumulators than is usual amongst valves of the bright filament type—a point which needs no labouring to those anxious to keep down costs.

It gives a reproduction full in volume and silver clear in quality, and it has a stout filament which is not readily broken.

Further, it only costs **10/-**.

Four months ago people had not heard of Louden Valves; to-day they are demanding them at the rate of many thousands per week—which is, perhaps, the most striking testimony of all.

See that your next valve is a Louden.

The Plain Louden for Detecting and Low Frequency Amplifying.
The Blue Louden for H.F Amplification.

Filament Volts ..	4.8-5
Filament Amps...	0.4
Anode Volts ..	40-80

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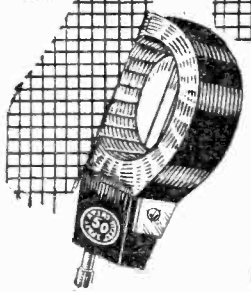

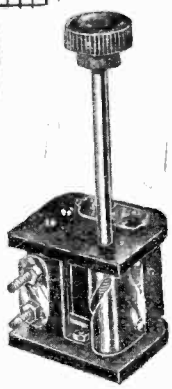

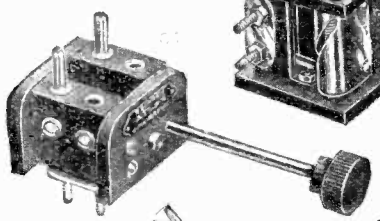

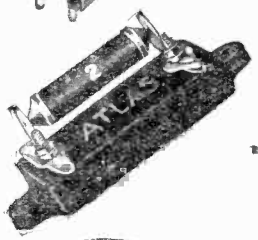

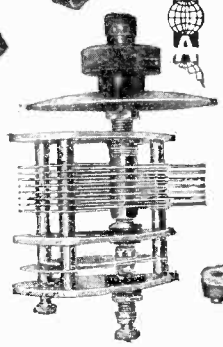

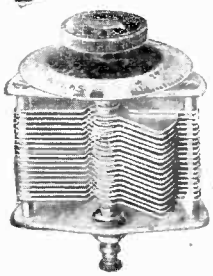

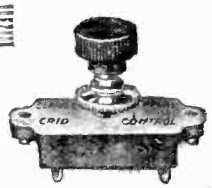

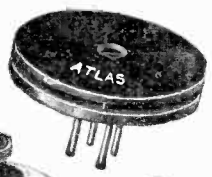

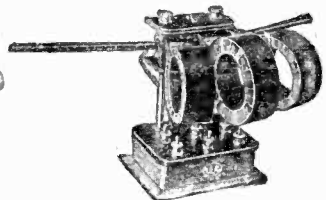

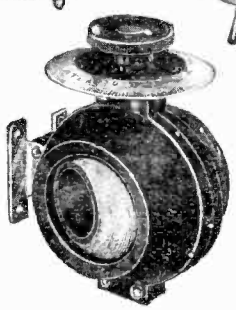

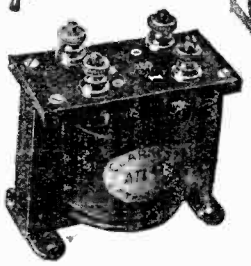

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It depends largely upon yourself. One very simple rule will make all the difference between radio success and possible failure.

Don't expect to build an A.1 set from C.3 components. Ask your dealer to show you Clarke's "ATLAS" radio specialities.

There isn't an "ordinary" component in the whole of the range. Many of the devices are patented, and in more than one instance the components are complimented by "the sincerest form of flattery."

Even if you don't as a rule believe in New Year resolutions, you will be glad you made this one "I'll always ask for

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ATLAS

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SOME THREE-VALVE REFLEX CIRCUITS.

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

This interesting article should provide ground for much useful experimenting in reflex working.

A good Three-Valve Dual Circuit

FIG. 1 shows a three-valve reflex circuit in which the first valve acts in dual capacity as a high- and low-frequency amplifier, the second valve as a detector, and the third simply as a low-frequency amplifier. The circuit L_1C_1 is tuned to the incoming oscillations, and the varying potentials are applied to the grid of the valve V_1. In the anode circuit of V_1 is connected the primary L_2 of a high-frequency transformer as shown, the secondary L_3 of which is tuned by the condenser C_2. The amplified oscillations in the anode circuit of the first valve thus cause varying potentials across the grid-filament circuit of the second valve, which acts as a detector, the usual grid condenser C_3 and gridleak R_4 being provided.

Low-frequency Amplification

In the anode circuit of the detector valve is connected the primary T_1 of a low-frequency transformer T_1T_2, the secondary T_2 of which is connected in the grid circuit of V_1 as shown. The rectified currents in the anode circuit of V_2 thus cause varying potentials to be applied to the grid of the valve V_1, and amplified currents appear in the anode circuit of V_1, in which is connected the primary T_3 of a second step-up intervalve transformer T_3T_4. The secondary T_4 is connected across grid and filament of the valve V_3, which gives the last stage of note-magnification, the loud-speaker being connected in the anode circuit of this valve.

Provision is made for adding grid bias to the amplifying valves by including a grid battery GB as shown in the circuit diagram. Reaction is provided by including a coil L_4 in the anode circuit of the valve V_2 and coupling this coil to L_1.

Suitable coil values for the broadcast wavelengths are Nos. 35 or 50 for L_1, a No. 50 or 35 for L_4, while the H.F. transformer L_2L_3 should be of suitable design for the wavelength range to be covered. The variable condenser C_1 may be a .0005 μF, and for C_2 a convenient value is .0003 μF. Note that no condenser is shunted across the primary T_1 of the L.F. transformer T_1T_2. One may be tried here, but usually the self-capacity of the primary windings is sufficient. C_6 has a value of .001 μF, but experiments should be tried to see whether smaller values, e.g., .0003 μF, work better. The anode voltage of the detector valve should be smaller than the other anode voltages. A C.A.T. condenser of .0001 μF may be tried in series with the aerial.

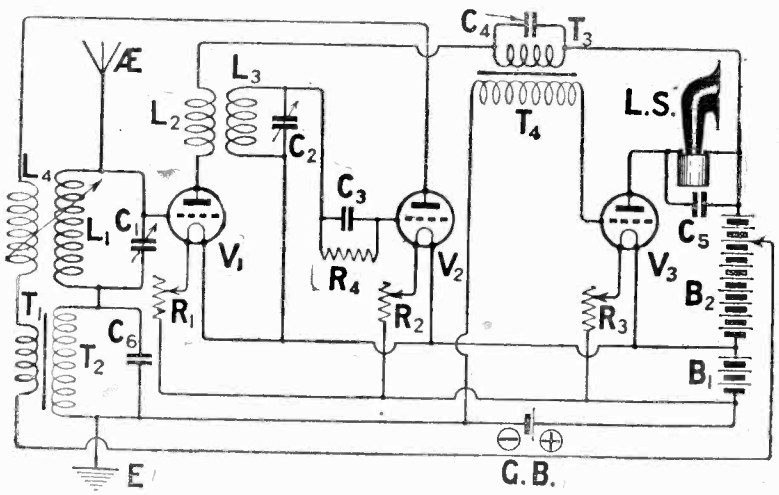

Fig. 1.—A highly efficient Three-Valve Dual Circuit.

A Three-Valve "Resistoflex" Circuit

The Fig. 2 circuit embodies the resistoflex principle, and the now well-known tri-coil coupling. It will be seen that the first valve V_1 acts as a high-frequency amplifier, the aerial circuit containing the constant aerial tuning condenser C_1 the main oscillation circuit L_1C_2, a condenser C_3, another condenser C_4, and the earth. The resistance R_1, of 100,000 ohms, which is really in the anode circuit of the second valve and the grid circuit of the first, and the high-tension battery B_2 do not form part of the actual aerial circuit. The circuit L_1C_2 is tuned to the incoming oscillations, and the coil L_1, when first tuning in, should be kept well away from the coils L_2 and L_3, which will usually be fairly close. The high-frequency potentials are communicated to the grid of the first valve V_1 through the condenser C_6, a gridleak R_5 being provided to prevent an accumulation of electrons on the grid. The condenser C_6 serves to prevent the high positive potential of the high-tension battery being communicated to the grid of V_1. Amplified high-frequency oscillations appear in the coil L_2 to which is coupled the coil L_3, tuned by the condenser C_7. High-frequency potential variations are thus set up across the grid and filament of the valve V_2 which acts as a detector, the usual grid condenser C_8 and gridleak R_6 being provided. The low-frequency impulses in the anode circuit of V_2 pass through the high-resistance R_1, through the battery B_2, and thence to the filament of the second valve. In passing through R_1, low-frequency potential variations are produced across this resistance, and these are applied to the grid of the first

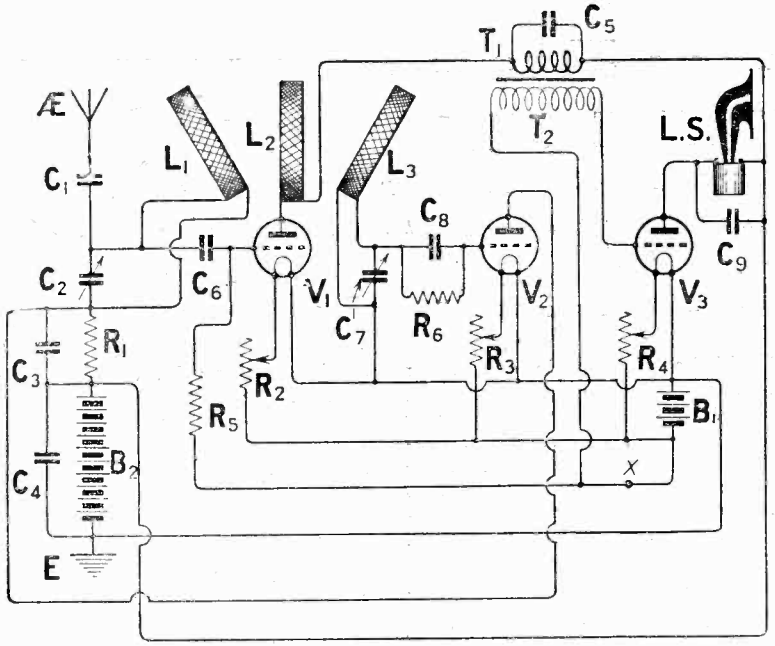

Fig. 2. A Tri-Coil Resistoflex Arrangement.

valve V_1 through the coil L_1 and the condenser C_6. The first valve thus gives both high- and low-frequency amplification. The amplified low-frequency impulses in the anode circuit pass through the primary T_1 of a low-frequency transformer T_1T_2, the secondary T_2 of which is connected across the grid of the third valve and L.T. −. This third valve therefore acts simply as a note-magnifier, and the low-frequency impulses pass through and operate the loud-speaker L.S., connected in the anode circuit of V_3 and shunted by a fixed condenser C_9. A grid battery may be connected at the point X to give negative bias to the grids of the first and third valves.

Reaction Control

A control of reaction is obtained by varying the positions of L_1 and L_3 with respect to the centre fixed coil L_2. L_2 and L_3 should usually be as close together as possible. For the broadcast wavelengths above, say, 350 metres, suitable coil values are Nos. 35 or 50 for L_1, if C_2 is of ·0005 μF, a No. 50 or 75 for the middle coil L_2, and a No. 75 for L_3, this being tuned by C_7 of ·0003 μF. Other values are ·0003 μF for C_3, 1 or 2 μF for C_4, 100,000 ohms for R_1, the gridleaks R_5 and R_6 being 2 megohms. C_6 has a value of ·0003 μF, although some experimenters have found a higher value better. If the circuit tends to oscillate unduly, reverse the leads to L_1.

The S.T. 119 Circuit

The three-valve circuit of Fig. 3 involves dual amplification in the first valve and rectification by crystal detector after two stages of high-frequency amplification, the last valve acting simply as a low-frequency amplifier. The coupling between the first two valves consists of a tuned anode circuit L_2C_2 tuned to the incoming wavelength. In the anode circuit of the second valve we have the circuit L_3C_3 also tuned to the incoming wavelength. The crystal detector D and the primary T_1 of the intervalve transformer T_1T_2 are connected in series across the anode circuit of the valve V_2. The amplified high-frequency oscillations in the anode circuit of V_2 are rectified by the crystal, and low-frequency currents are introduced into the grid circuit of the first valve which amplifies them, the amplified low-frequency currents passing through the primary T_3 of the step-up intervalve transformer T_3T_4, the secondary of which is connected across the grid and filament of the third valve as shown. The loud-speaker is connected in the anode circuit of the third valve V_3, the condenser C_7 being optional. Experiment should be made to determine the best values of the fixed condensers C_4 and C_5. For the reception of broadcasting, L_1 may be a No. 35 or 50 coil, L_2 and L_3 both No. 75. Suitable condenser values are ·0005 μF for C_1 and ·0003 μF for C_2 and C_3.

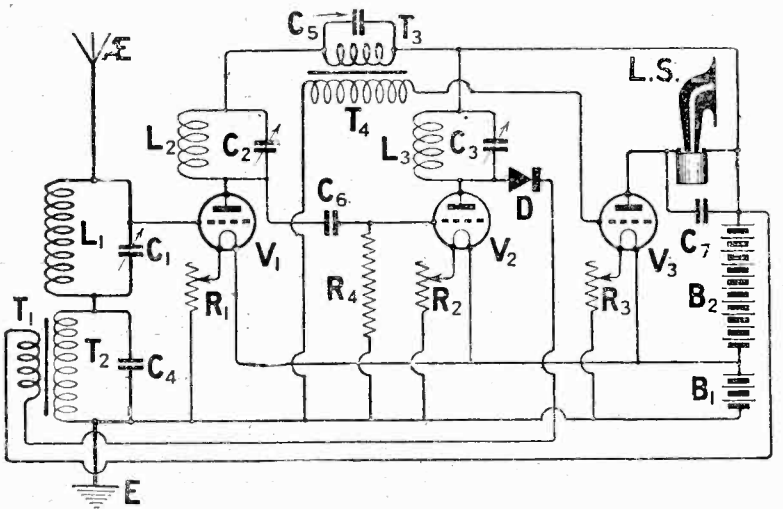

Fig. 3.—The S.T. 119 Circuit.

A 2-H.F. Reflex Circuit

Fig. 4 shows a three-valve reflex set in which there are two stages of H.F. amplification, a valve detector and one stage of low-frequency amplification. The low-frequency currents being fed into the grid circuit of the first H.F. amplifier. The circuit works as follows: The circuit L_1C_1 is tuned to the incoming frequency, and varying H.F. potentials are set up across the grid and filament of the first valve. Amplified oscillations appear in the anode circuit L_2, which is the primary of an H.F. transformer, the secondary of which, L_3, is connected across the grid of the second valve, and the slider of a potentiometer R_5 connected across the L.T. battery; potential variations are therefore applied to the grid of the second valve V_2, the anode circuit of which contains the primary L_4 of a second H.F. transformer L_4L_5. The secondary of this is connected across the grid of the detector valve V_3, and L.T. + having the usual grid condenser C_5 and gridleak R_4.

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Marconi-Osram	R. or R 5 V ,,
Mullard-Ora	,,
Cossor ..	P.1. ,,
Cossor ..	P.2. ,,
Myers-Universal	
Mullard H.F. (Red Ring)	
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Nickel Terminals ..	2d.
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.006, 1/3; .01, 1/9; .02, 1/9.	
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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.	

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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
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4·5 Batteries,	4½d., 5d.
Brass Coil Former	2/11
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Uralium	1/-
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Miniature Panel ..	10½d.
On China Base ..	1/1
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Murray Valve Holder	1/3
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Ditto ..	6d., 8d.
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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.

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8 × 6	10 × 8	12 × 12	

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The high-frequency oscillations are rectified, and the low-frequency impulses in the anode circuit of V_3 are passed through the primary T_1 of a low-frequency transformer T_1T_2, the secondary of which is connected in the combined aerial and grid circuit of the first valve. The first valve thus acts as a low-frequency amplifier, and the amplified L.F. currents in the anode circuit pass through the loud-speaker L.S., which is shunted by a ·002 μF capacity condenser C_6, to by-pass H.F. currents.

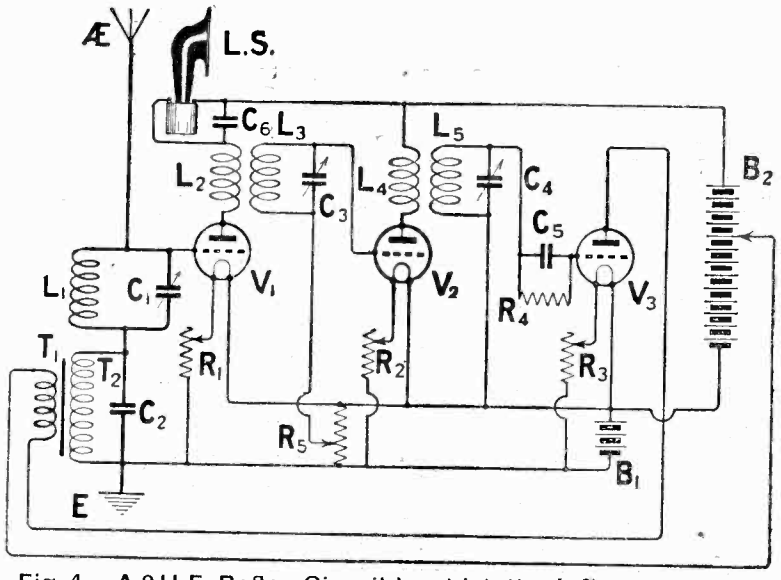


Fig. 4.—A 2 H.F. Reflex Circuit in which the L.F. currents are fed into the grid circuit of the first H.F. Valve.

Causes of Buzzing

Now a trouble which may be encountered in reflex sets, more particularly in multi-stage H.F. reflex circuits, is their liability to produce buzzing. The low-frequency currents when fed, say, into the grid circuit of the first H.F. amplifying valve, will tend to modulate the H.F. currents applied to the grid circuit of the H.F. amplifying valve. If reaction is present and the valves tend to oscillate, the L.F. currents will modulate the oscillating currents, and these modulated currents, after amplification by the H.F. amplifiers, will, on reaching the detector valve, resolve themselves into L.F. currents, which are once more fed into the grid circuit of the first valve and continue the modulation process. The result is there is a tendency for a chain of L.F. reaction, setting up L.F. oscillation, to be established.

If the high-frequency amplifier is working correctly and efficiently, the modulation of H.F. oscillation by L.F. currents will not occur, and the buzzing trouble will be absent. Note that in circuits of this kind one cannot stabilise the grid circuit of the dual amplifying valve, for the bottom of the grid circuit of the valve V_1 must be connected as shown, to give the grid a slightly negative potential. To avoid the buzzing and distortion effect, if this is present, it is not possible to stabilise the first valve by potentiometer control, although this is possible in the case of the second valve as indicated.

When there are two stages of H.F. amplification, a more stable and successful method of reflexing is given in the circuit of Fig. 5, which theoretically should give the same signal strength. Here the L.F. currents are fed into the grid circuit of the *second* high-frequency amplifying valve, and it is possible to stabilise the grid circuit of the first valve by potentiometer control as shown, whilst the grid of the second valve is given the necessary negative bias by connecting the lower end of the grid circuit to L.T.−. Consequently, if there is any distortion owing to modulation of the H.F. currents, the modulated H.F. output of V_2 is not amplified at high-frequency, thereby increasing the distortion, but is passed on immediately to the detector valve V_3. Thus the circuit is more stable than that of Fig. 4.

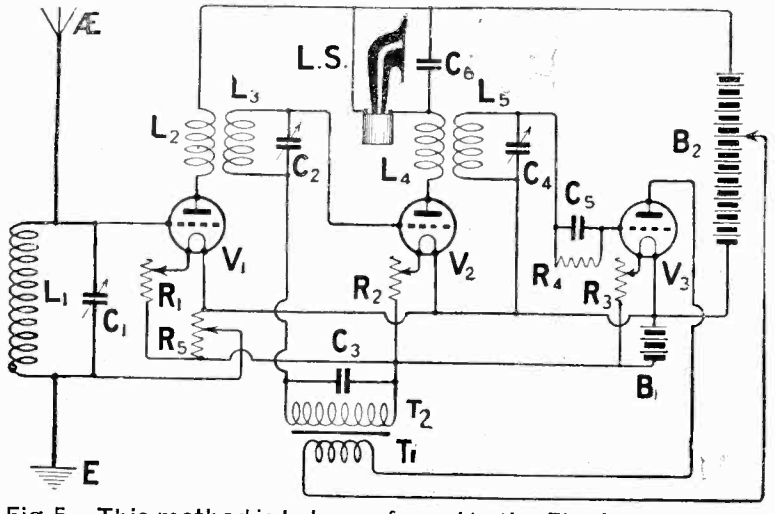


Fig. 5.—This method is to be preferred to the Fig. 4 arrangement.

Coil Values

In both the Fig. 4 and Fig. 5 circuits a separate tapping is shown to provide a lower anode voltage for the detector valve than for the other valves.

The H.F. transformers L_2L_3 and L_4L_5 should be chosen to cover the wavelength desired, and for C_1 a ·0005 μF condenser would be convenient, while C_2 and C_4 of Fig. 5 may both be ·0003 μF. For the broadcast band of wavelengths, Nos. 35 or 50 may be used for L_1.

The next issue of "The Wireless Constructor," out January 15th, contains an interesting description of a Compact Single Valve Reflex Set by

PERCY W. HARRIS.

Receiving Sets of the Future.

IT is always interesting to consider the trend in development and design of wireless apparatus, and to try to obtain an idea of what wireless receiving sets will be like in the future. Advances in both transmission and reception are being made almost daily by experimenters and research workers alike. The present tendency is towards the use of very short waves, particularly for long-distance work, and the results already achieved are remarkable. Though not yet used for broadcasting purposes, except in a few isolated cases such as the American stations KDKA and WGY, a change may possibly be expected in the future, unless these short wavelengths are monopolised for Government and commercial services. As they become increasingly popular, designers will concentrate more on suitable short-wave receivers. The Supersonic Heterodyne receiver is invaluable for use on short waves, and it is on the lines of this receiver that most sets of the future will probably be developed. Much important work has been done on Supersonic Heterodyne reception, and readers will do well to refer to the articles on this extremely interesting subject by John Scott-Taggart, F.Inst.P., A.M.I.E.E., which have appeared in *Wireless Weekly* every week since October 22.

An Efficient Short-Wave Tuner.

In the November 19 issue Mr. Percy W. Harris gives full details for the construction and operation of a simple but extremely efficient short-wave receiver under the title of "A Low Loss Tuner for Short Waves." Readers interested in this very fascinating subject will also appreciate the article on "A New 100-Metres Receiver," by Mr. A. D. Cowper, M.Sc., published on December 3. An article in the November 26 issue of *Wireless Weekly* by an American contributor describes a "Short-Wave Adaptor for Existing Sets." This should provide fruitful matter for the experimenter. This same issue contains, as part of a Special Photogravure Supplement, an exclusive illustrated description of the "Ecole Superieure" station, contributed by Capt. L. F. Plugge, B.Sc., F.R.Ae.S., F.R.Met.S. Other *Wireless Weekly* features include an article by the inventor giving further details on Oscillating Crystals, and an article, "High-Tension Supply from D.C. Mains," which will prove very useful to amateurs having direct current supply laid on at their homes. The set constructor will find in the December 3 issue a full description of a very useful and efficient Valve-Crystal Tri-coil Receiver by John W. Barber. In addition, full constructional details of a three-valve set, also employing the effective tri-coil principle, are given under the title of "A Self-Contained Three-Valve Receiver," by Herbert K. Simpson, in the issue published on November 26th.

Regular Programmes from Continental Broadcasting Stations

Telephony except when otherwise stated. Corrected up to December 18th, 1924.

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

WEEK DAYS.

Ref. No.	G. M. T.	Name of Station.	Call Sign and Wave-length.	Situation.	Nature of Transmission.	Closing Time or Approx. Duration.	Approx. Power used.
	a.m.						
1	6.25	Hamburg ..	—— 395 m. ..	Germany ..	Time Signal in C.E.T.	5 mins.	700 Watts.
2	6.40	Eiffel Tower	FL 2600 m.	Paris ..	Weather Forecast	5 mins.	5 Kw.
3	6.55	Munster ..	—— 410 m.	Westphalia	Time Signal in C.E.T.	5 mins.	1.5 Kw.
4	7.05	Lausanne ..	HB2 850 m.	Switzerland	Weather Report	5 mins.	300 Watts.
5	7.55	Persbureau Vas Dias	PCFF 2125 m.	Amsterdam	Stocks, Shares and News ..	10 mins.	2 Kw.
8	9.23	Eiffel Tower	FL 2600 m. ..	Paris ..	Time Signal in G.M.T. (Spark)	3 mins.	—
9	9.55	Persbureau Vaz Dias	PCFF 2125 m.	Amsterdam	Stocks, Shares and News ..	10 mins.	2 Kw.
10	10.00	Eiffel Tower	FL 2600 m. ..	Paris ..	Time Signal in Greenwich Sidereal Time (Spark)	5 mins.	—
156	10.00	Radio Wien ..	—— 530 m. ..	Austria ..	Concert	Noon	1 Kw.
11	10.30	Lyons ..	YN 470 m. ..	Lyons ..	Gramophone Concert	30 mins.	500 Watts.
12	10.30	Kbel ..	—— 1150 m.	Prague ..	Exchange quotations	10 mins.	1 Kw.
13	10.44	Eiffel Tower	FL 2600 m.	Paris ..	Time Signal in G.M.T. (Spark)	3 mins.	—
14	10.55	Eiffel Tower	FL 2600 m. ..	Paris ..	Fish Market Quotations—Cotton Exchange.	10 mins.	5 Kw.
15	10.55	Frankfurt ..	—— 470 m.	Frankfurt	Time Signals (spoken) followed by News (in C.E.T.)	5 mins.	1 Kw.
17	11.10	Persbureau Vaz Dias.	PCFF 2125 m.	Amsterdam	Stocks and Shares	20 mins.	2 Kw.
18	11.14	Eiffel Tower	FL 2600 m. ..	Paris ..	Time Signal in Greenwich Time (Spoken), followed by Weather Forecast.	5 mins.	5 Kw.
20	11.15	Voxhaus ..	—— 430 m.	Berlin ..	First News Bulletin and Weather Reports.	5 mins.	700 Watts.
19	11.55	Konigsberg ..	—— 463 m.	East Prussia	Time Signal in C.E.T.	5 mins.	1 Kw.
21	11.55	Voxhaus ..	—— 430 m.	Berlin ..	Time Signal in C.E.T.	5 mins.	700 Watts.
22	11.55	Leipzig ..	—— 454 m.	Germany ..	Time Signal Relayed from Baven	5 mins.	700 Watts.
23	11.57	Nauen ..	POZ 3100 m.	Berlin ..	Time Signal in G.M.T. (Spark)	8 mins.	—
157	12.00 noon	Zurich ..	—— 515 m.	Switzerland	Weather Forecast, Shares and News.	45 mins.	500 Watts.
24	12.00 p.m.	Persbureau Vaz Dias.	PCFF 2125 m.	Amsterdam	Stocks and Shares	8 mins.	2 Kw.
26	12.15	Geneva ..	HB1 1100 m.	Switzerland	Lecture	12.45 p.m.	300 Watts.
25	12.30	Kbel ..	—— 1150 m.	Prague ..	Exchange Quotations	10 mins.	1 Kw.
27	12.30	Lausanne ..	HB2 850 m.	Switzerland	Weather Reports, Time Signal in C.E.T. and News.	15 mins.	300 Watts.
32	12.30	Radio-Paris ..	SFR 1780 m.	Clichy ..	Concert followed by News ..	2 p.m.	8 Kw.
30	12.45	Stockholm ..	—— 440 m. ..	Sweden ..	Weather Forecast	5 mins.	500 Watts.
31	12.45	Persbureau Vaz Dias.	PCFF 2125 m.	Amsterdam	Stocks and Shares	10 mins.	2 Kw.
33	1.00	Haeren ..	BAV 1100 m.	Brussels ..	Weather Forecast in French and English.	8 mins.	150 Watts.
34	1.00	Munich ..	—— 485 m.	Bavaria ..	News and Weather Report ..	10 mins.	1 Kw.
36	1.00	Stockholm ..	—— 440 m.	Sweden ..	Time Signal	3 mins.	500 Watts.
37	1.15	Voxhaus ..	—— 430 m.	Berlin ..	Stock Exchange News	5 mins.	700 Watts.
35	1.15	Komarow ..	—— 1800 m.	Czecho-Slovakia.	Stock Exchange and Late News	10 mins.	1 Kw.
40	2.30	Munster ..	—— 410 m.	Westphalia	Stocks, Shares and News ..	10 mins.	1.5 Kw.
38	2.40	Persbureau Vaz Dias.	PCFF 2125 m.	Amsterdam	Stocks, Shares and News ..	10 mins.	2 Kw.
39	2.45	Eiffel Tower	FL 2600 m. ..	Paris ..	Exchange Opening Prices. (Sat. excepted.)	8 mins.	5 Kw.
158	3.00	Zurich ..	—— 515 m. ..	Switzerland	Hotel Concert, Relayed. (Fri. excepted.)	5 p.m.	500 Watts.
159	3.10	Radio-Wien ..	—— 530 m.	Vienna ..	Concert	4 p.m.	1 Kw.

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

TYPES and PRICES.

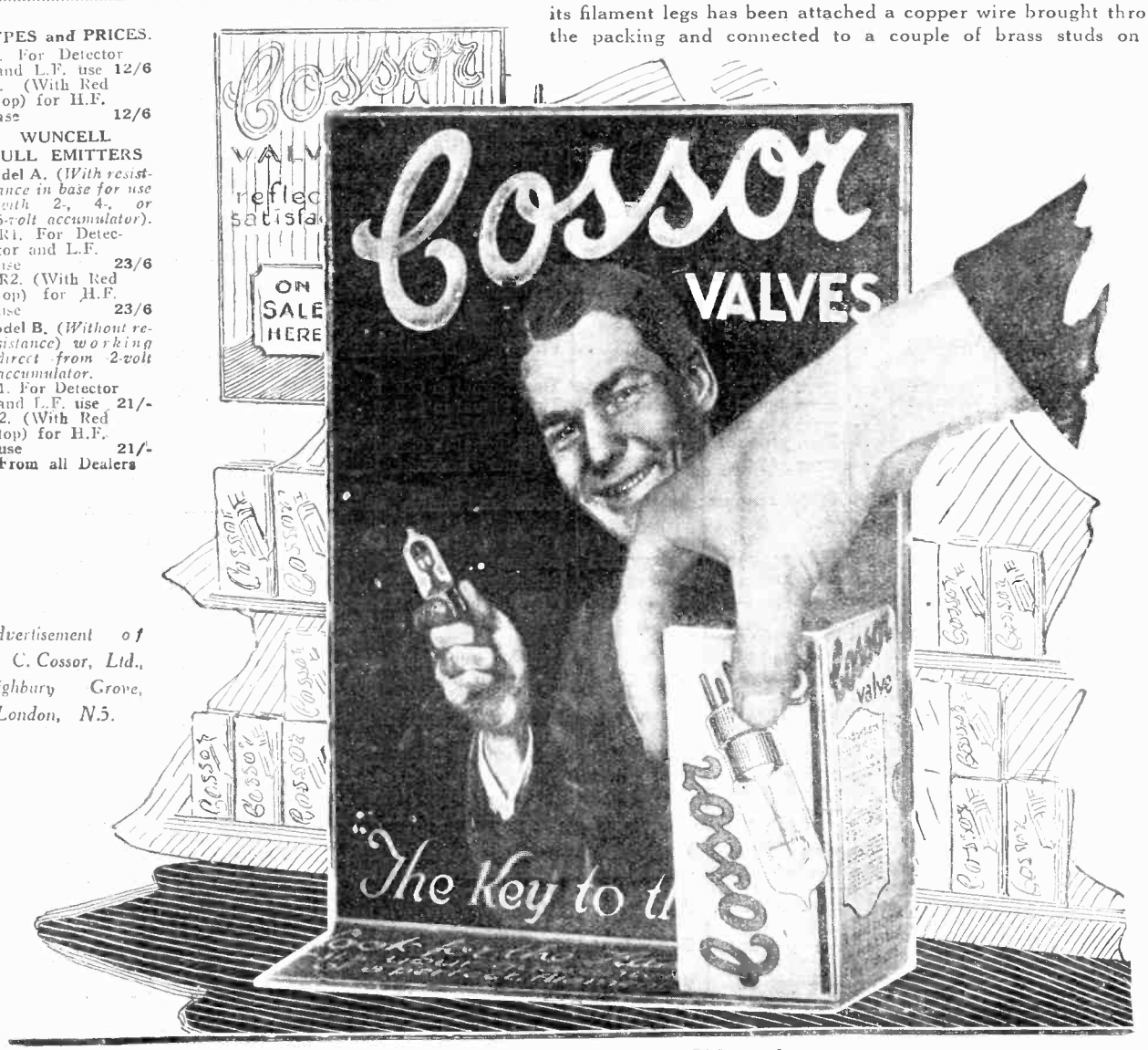
P1. For Detector and L.F. use 12/6
12. (With Red top) for H.F. use 12/6

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.

In replying to advertisers, use COUPON on last page

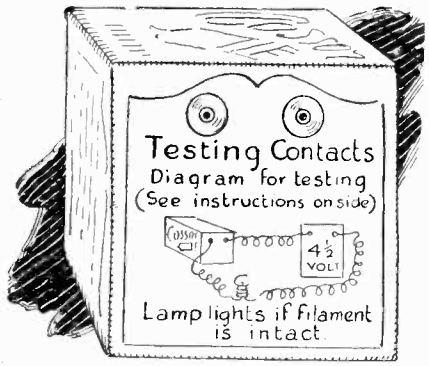
Valves

sealed cartons

exterior of the carton. It will be obvious 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 no. 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—

¶ 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 post-card brings it free.

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 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.

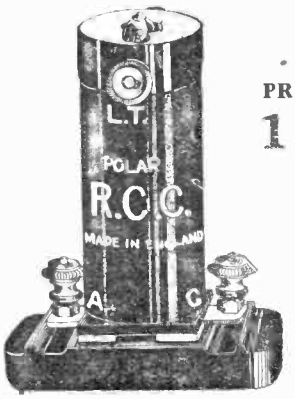
5. A unique method of testing Cossor Valves by which every Valve is given a complete and costly series of tests before being issued. This ensures that Valves which, superficially, might look correct must conform to a definite scientific standard or be rejected.

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.

Gilbert Ad. 935

POLAR RADIO COMPONENTS



PRICE
15/-

POLAR RESISTANCE CAPACITY COUPLING UNIT

Distortion in wireless reception has been a general cause of complaint in the past and is difficult to eliminate as long as the only available method of intervalve coupling is that of the iron core transformer.

Iron is the chief trouble in this connection. But, fortunately, we are no longer at the mercy of iron.

It is well known that resistance capacity coupling between stages of low-frequency amplification eliminates distortion. Perfectly pure reception can be obtained by this method.

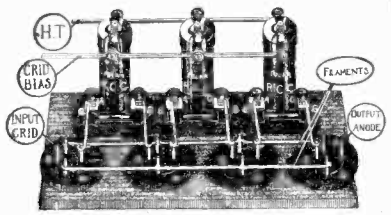
When you are buying an iron core transformer, you may be buying distortion, and paying a stiff price for it too. Why do this, when resistance capacity coupling can be as easily incorporated in your set?

The Polar Resistance Capacity Coupling Unit, which enables you to eliminate distortion, consists of an anode resistance, a grid leak and a Dubilier condenser specially built for the purpose.

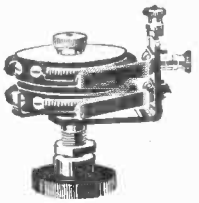
The unit is perfectly self-contained, and, having four clearly marked terminals corresponding to the four transformer terminals, it lends itself admirably to straightforward wiring, as may be seen from the illustration below.

If you wish to obtain pure music and speech, incorporate R.C.C. units in your set and give your loud-speaker a chance.

A leaflet giving wiring diagrams accompanies every unit.

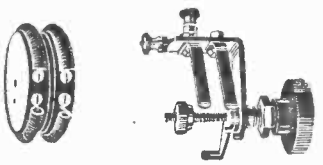


POLAR BOBBIN RHEOSTAT

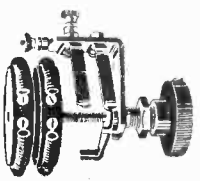


You would never dream of buying a coil-holder with permanently fixed coils. The reason is obvious. For different wave-lengths, different coils are used.

Plug-in coils can be obtained to cover a wide range of wavelengths. Hitherto, rheostats were suitable for use with only one type of valve. With the advent of the Polar Bobbin Rheostat, the entire range of receiving valves and varying voltages is efficiently covered.



In incorporating in your set a rheostat-holder you employ the same principle as in the case of a coil-holder. To receive on a different wavelength you change your coils. To receive on a different valve you change your bobbin. There is a bobbin to suit every valve and voltage.

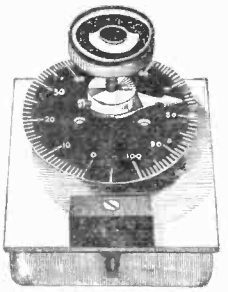


Five types of bobbins are available, designed to suit the requirements of single valves or combination of valves.

TYPE	A	5 ohms	Variable.
,,	B	10 ,,	,,
,,	C	15 ,,	,,
		5 ,,	Fixed.
,,	D	30 ,,	Variable.
		10 ,,	Fixed.
,,	E	15 ,,	Variable.

Bobbin 2s. 9d. Holder 2s. 9d.
Complete 5s. 6d.

PRICE
10/6



POLAR VARIABLE CONDENSER

A few years ago Radio Communication Company were confronted by a very important question of providing their Marine Operators with a condenser which would give a wide open scale over the lower limits of tuning, and which would not require an additional micrometer condenser in parallel.

It is well known that in a tuned oscillatory circuit one should use as much inductance and as little capacity as possible.

The ordinary vane condenser could not be utilised, as most of its capacity is cramped over the lower section of the scale, with the result that a small knob adjustment will give a large capacity change when it is not wanted.

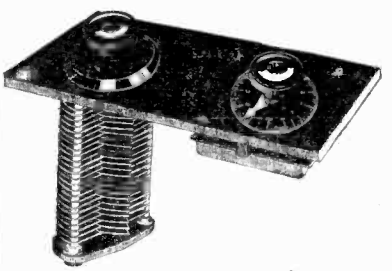
In order to obtain a high efficiency of tuning and to meet the exacting demands of marine work, a condenser had to be designed which would reverse the above effect and give the operator a wide open scale at the business end of the condenser.

After a good deal of research and numerous exacting tests, the Polar Variable Condenser was produced.

There are over a quarter of a million of Polar Condensers now in use.

The secret of its popularity lies in the fact that a wide open scale giving a uniform variation of wave frequency is combined with wide capacity limits, high insulation, complete metallic screening, robust construction and small overall dimensions (see illustration below, which shows a Polar Condenser mounted side by side with an air condenser of the same capacity).

There are five standard capacities available: .001, .0005, .0003, .00025 and .0002 microfarads.



RADIO COMMUNICATION CO., LTD., 34-35, NORFOLK STREET, STRAND, W.C.2.

Ref. No.	G. M. T.	Name of Station.	Call Sign and Wave-length.	Situation.	Nature of Transmission.	Closing Time or Approx. Duration.	Approx. Power used.
			WEEK DAYS (Contd.)				
	p.m.						
42	3.30	Frankfurt ..	—— 470 m.	Germany ..	Light Orchestra	5 p.m.	1 Kw.
43	3.30	Konigsberg ..	—— 463 m.	East Prussia	Light Orchestra	1 hour.	½ Kw.
44	3.30	Voxhaus ..	—— 430 m.	Berlin ..	Concert, followed by News ..	5.30 p.m.	700 Watts.
45	3.30	Munich ..	—— 485 m.	Bavaria ..	Concert	4.30 p.m.	½ Kw.
46	3.30	Leipzig ..	—— 454 m.	Germany ..	Concert	5 p.m.	700 Watts.
47	3.35	Eiffel Tower	FL 2600 m. ..	Paris ..	Exchange Quotations (Sat. excepted).	5 mins.	5 Kw.
48	3.55	Persbureau Vaz Dias.	PCFF 2125 m.	Amsterdam	Stock Exchange and News ..	10 mins.	2 Kw.
49	4.00	Kbel	—— 1150 m.	Prague ..	Shares and News	10 mins.	½ Kw.
160	4.00	Breslau ..	—— 418 m. ..	Silesia ..	Light Orchestra	5 p.m.	1.5 Kw.
51	4.30	Radio-Paris ..	SFR 1780 m.	Clichy ..	Concert preceded and followed by News.	5.45 p.m.	8 Kw.
52	4.30	Eiffel Tower	FL 2600 m. ..	Paris ..	Exchange Closing Prices (except Saturday).	8 mins.	5 Kw.
53	4.45	Stuttgart ..	—— 443 m.	Wurtemberg	Concert followed by Weather Report (Saturdays excepted).	6 p.m.	1 Kw.
54	5.00	Radio-Belg. ..	SBR 265 m.	Brussels ..	Concert followed by News ..	6 p.m.	2.5 Kw.
177	5.00	Barcelona ..	EAJ1. 325 m.	Spain ..	Tests ..	7.00 p.m.	650 Watts.
161	5.30	Munich ..	—— 485 m.	Bavaria ..	Light Orchestra	6.30 p.m.	1 Kw.
55	5.55	Lausanne ..	HB2 850 m.	Switzerland	Weather Report	5 mins.	300 Watts.
162	6.00	Eiffel Tower	FL 2600 m. ..	Paris ..	Concert followed by News Bulletin	6.55 p.m.	5 Kw.
57	6.30	Kbel	—— 1150 m. ..	Prague ..	Concert and News	7.30 p.m.	1 Kw.
58	7.00	Eiffel Tower	FL 2600 m. ..	Paris ..	General Weather Forecast ..	8 mins.	5 Kw.
60	7.00	Radio-Wien ..	—— 530 m.	Vienna ..	Concert	9 p.m.	1 Kw.
61	7.00	Konigsberg ..	—— 463 m.	East Prussia	Concert and News	8.30 p.m.	1 Kw.
62	7.00	Hamburg ..	—— 395 m.	Germany ..	Concert and Late News ..	9.50 p.m.	700 Watts.
63	7.00	Stuttgart ..	—— 443 m.	Wurtemberg	Concert and News	9.30 p.m.	1 Kw.
179	7.00	Radio-Iberica	RI 392 m. ..	Madrid, Spain	Concert and News	8.00 p.m.	3 Kw.
66	7.15	Lausanne ..	HB2 850 m.	Switzerland	Concert (Monday excepted) ..	9.30 p.m.	300 Watts.
64	7.15	Zurich ..	—— 515 m.	Switzerland	Concert followed by Late News	10 p.m.	500 Watts.
65	7.15	Leipzig ..	—— 454 m.	Leipzig ..	Concert and News	8.35 p.m.	700 Watts.
67	7.30	Frankfurt ..	—— 470 m.	Frankfurt	Concert and News	10 p.m.	1 Kw.
59	7.30	Munster ..	—— 410 m.	Westphalia	Concert followed by News ..	9 p.m.	1.5 Kw.
72	7.30	Voxhaus ..	—— 430 & 505	Berlin ..	Concert followed by News and Weather Report.	9.15 p.m.	0.7 and 1.5 Kw.
73	7.30	Munich ..	—— 485 m.	Bavaria ..	Concert and News	8.40 p.m.	1 Kw.
69	7.45	Breslau ..	—— 418 m.	Silesia ..	Concert	9 p.m.	1.5 Kw.
164	8.00	Radiofonica Italiana.	—— 422 m.	Rome ..	Concert followed by News ..	9.30 p.m.	4 Kw.
74	8.15	Radio-Belg. ..	SBR 265 m.	Brussels ..	Concert preceded and followed by News.	10.10 p.m.	2.5 Kw.
75	8.30	Ecole. Sup. des P.& Tg.	FPTT 450 m.	Paris ..	Concert, sometimes preceded by Lecture, usually outside broadcast.	9 p.m.	500 Watts.
76	8.30	Radio-Paris ..	SFR 1780 m.	Clichy ..	Detailed News Bulletin	9 p.m.	8 Kw.
77	9.00	Radio-Paris ..	SFR 1780 m.	Clichy ..	Time Signal followed by Concert	9.50 p.m.	8 Kw.
78	9.30	Radio-Iberica	—— 392 m.	Madrid ..	Concert, Advertisements ..	Midnight	3 Kw.
79	10.00	Eiffel Tower	FL 2600 m. ..	Paris ..	Time Signal in Greenwich Sidereal Time (Spark).	5 mins.	—
80	10.10	Eiffel Tower	FL 2600 m. ..	Paris ..	General Weather Forecast ..	5 mins.	5 Kw.
81	10.44	Eiffel Tower	FL 2600 m. ..	Paris ..	Time Signal in G.M.T. (Spark)	3 mins.	—
82	11.57	Nauen ..	POZ 3100 m.	Berlin ..	Time Signal in G.M.T. (Spark)	3 mins.	—
			SUNDAYS				
	a.m.						
83	7.00	Frankfurt ..	—— 470 m.	Germany ..	Morning Prayer	1 hour	1 Kw.
85	8.00	Leipzig ..	—— 454 m.	Germany ..	Morning Prayer	1 hour	700 Watts.
165	8.00	Konigsberg ..	—— 463 m.	E. Prussia ..	Morning Prayer	8.45 a.m.	1 Kw.
86	9.00	Komarow ..	—— 1800 m.	Czecho-Slovakia.	Sacred Concert	1 hour	1 Kw.
87	9.23	Eiffel Tower	FL 2600 m. ..	Paris ..	Time Signal in Greenwich Mean Time (Spark).	3 mins.	—
166	9.30	Munich ..	—— 485 m.	Bavaria ..	Sacred Concert	10.30 a.m.	1 Kw.
89	10.00	Eiffel Tower	FL 2600 m. ..	Paris ..	Time Signal in Greenwich Sidereal Time (Spark).	5 mins.	—
90	10.00	Kbel	—— 1150 m.	Prague ..	Classical Music	1 hour	1 Kw.
92	10.00	Radio-Wien ..	—— 530 m.	Vienna ..	Concert	2 hours	1 Kw.
93	10.30	Lyons ..	YN 470 m. ..	Lyons ..	Gramophone Records	11 a.m.	500 Watts.
94	10.30	Stuttgart ..	—— 443 m.	Wurtemberg	Classical Concert	1 hour	1 Kw.
95	10.44	Eiffel Tower	FL 2600 m. ..	Paris ..	Time Signal in G.M.T. (Spark)	3 mins.	—

Ref. No.	G. M. T.	Name of Station.	Call Sign and Wave-length.	Situation.	Nature of Transmission.	Closing Time or Approx. Duration.	Approx. Power used.
			SUNDAYS (contd.)				
	a.m.						
96	10.50	Konigswusterhausen.	LP 2800 m. ..	Berlin ..	Concert	11.45 a.m.	6 Kw.
97	10.55	Eiffel Tower	FL 2600 m. ..	Paris ..	Fish Market Quotations, followed by Weather Report.	12 mins.	5 Kw.
91	11.00	Breslau ..	—— 418 m.	Silesia ..	Concert	1 hour	1.5 Kw.
98	11.00	Stockholm ..	—— 440 m.	Sweden ..	Divine Service	12.15	500 Watts.
101	11.57	Nauen ..	POZ 3100 m.	Berlin ..	Time Signal in G.M.T. (Spark)	3 mins.	—
	p.m.						
102	12.45	Radio-Paris ..	SFR 1780 m.	Clichy ..	Concert, followed by News ..	2.00 p.m.	8 Kw.
104	3.00	Breslau ..	—— 418 m.	Silesia ..	Children's Stories	3.45 p.m.	1.5 Kw.
105	3.00	Stuttgart ..	—— 443 m.	Wurtemberg	Light Orchestra	5.00 p.m.	1 Kw.
107	3.00	Frankfurt ..	—— 470 m.	Germany ..			1 Kw.
167	3.00	Zurich ..	—— 515 m.	Switzerland	Local Hotel Concert	5.00 p.m.	500 Watts.
108	3.00	Munich ..	—— 485 m.	Bavaria ..	Concert	5.00 p.m.	1 Kw.
106	3.10	Radio-Wien ..	—— 530 m.	Vienna ..		4.00 p.m.	1 Kw.
168	3.30	Konigsberg ..	—— 463 m.	E. Prussia ..	Light Orchestra	4.30 p.m.	1 Kw.
169	3.30	Voxhaus ..	430 & 505 m. ..	Berlin ..	Light Orchestra	5.15 p.m.	1 Kw.
170	3.30	Leipzig ..	—— 454 m.	Germany ..	Light Orchestra	5.00 p.m.	700 Watts.
171	4.00	Frankfurt ..	—— 470 m.	Germany ..	Children's Corner	5.00 p.m.	1 Kw.
172	4.45	Stuttgart ..	—— 443 m.	Wurtemberg	Concert	6.00 p.m.	1 Kw.
110	4.45	Radio-Paris ..	SFR 1780 m.	Clichy ..	Concert, followed by News ..	1 hour	8 Kw.
111	5.00	Radio-Belg. ..	SBR 265 m.	Brussels ..	Concert	1 hour	2.5 Kw.
180	5.00	Barcelona ..	EAJ1 325 m.	Spain ..	Tests	7.00 p.m.	650 Watts.
112	6.00	Eiffel Tower	FL 2600 m. ..	Paris ..	Concert, followed by News ..	1 hour	5 Kw.
114	7.00	Radio-Wien ..	—— 530 m.	Vienna ..	Concert	8.30 p.m.	1 Kw.
115	7.00	Stockholm ..	—— 440 m.	Sweden ..	Concert	10.00 p.m.	500 Watts.
118	7.00	Konigsberg ..	—— 463 m.	E. Prussia ..	Concert	9.00 p.m.	1 Kw.
119	7.00	Hamburg ..	—— 395 m.	Germany ..	Concert	9.00 p.m.	700 Watts.
120	7.00	Eiffel Tower	FL 2600 m. ..	Paris ..	General Weather Forecast ..	8 mins.	5 Kw.
125	7.00	Stuttgart ..	—— 443 m.	Wurtemberg	Concert	9.15 p.m.	1 Kw.
173	7.00	Frankfurt ..	—— 470 m.	Germany ..	Entertainment provided by Frankfurter Zeitung.	10.00 p.m.	1 Kw.
121	7.15	Lausanne ..	HB2 850 m.	Switzerland	Concert	8.30 p.m.	300 Watts.
122	7.15	Zurich ..	—— 515 m.	Switzerland	Concert	10.00 p.m.	500 Watts.
123	7.15	Leipzig ..	—— 454 m.	Germany ..	Symphony Concert	8.40 p.m.	700 Watts.
116	7.00	Munster ..	—— 410 m.	Westphalia	Classical Concert	9.00 p.m.	1.5 Kw.
124	7.30	Breslau ..	—— 418 m.	Silesia ..	Light Orchestra	9.00 p.m.	1.5 Kw.
174	7.30	Munich ..	—— 485 m.	Bavaria ..	Concert	8.30 p.m.	1 Kw.
126	7.40	Ned. Seintoesl Fabriek.	NSF 1050 m.	Hilversum	Concert	10.10 p.m.	1 Kw.
176	8.00	Copenhagen ..	—— 750 m.	Denmark ..	Concert, followed by News ..	9.30 p.m.	2 Kw.
175	8.30	Radiofonica Italiana. ..	—— 422 m.	Rome ..	Concert, followed by Late News	9.30 p.m.	4 Kw.
127	8.30	Radio-Belg. ..	SBR 265 m.	Brussels ..	Concert, followed by News ..	10.10 p.m.	2.5 Kw.
128	8.30	Radio-Paris ..	SFR 1780 m.	Clichy ..	Detailed News Bulletin	9.00 p.m.	8 Kw.
129	8.30	Ecole Sup. des P.et Tgs.	FPTT 450 m.	Paris ..	Concert or Lecture. May begin 15 mins. earlier or later.	10.30 to 12 p.m.	500 Watts.
130	9.00	Radio-Paris ..	SFR 1780 m.	Clichy ..	Concert, followed by Dance Music.	10.00 p.m.	8 Kw.
131	9.30	Petit Parisien	—— 340 m.	Paris ..	Concert (Items announced in English as well as French.)	11.30 p.m.	400 Watts.
132	9.40	Radio-Iberica	—— 392 m.	Spain ..	Concert	midnight	3 Kw.
133	10.00	Eiffel Tower	FL 2600 m. ..	Paris ..	Time Signal in Greenwich Sidereal Time (Spark).	3 mins.	—
134	10.44	Eiffel Tower	FL 2600 m.	Paris ..	Time Signal in G.M.T. (Spark)	3 mins.	—
135	11.57	Nauen ..	POZ 3100 m.	Berlin ..	Time Signal in G.M.T. (Spark)	8 mins.	—
			SPECIAL DAYS.				
	p.m.						
137	4.00	Lausanne ..	HB2 850 m.	Switzerland	Mon. Children's Stories ..	1 hour	300 Watts.
180	5.30	Belgrade ..	HFF 1650 m.	Serbia ..	Tues., Thurs., Sat. Tests	1 hour	500 Watts.
140	5.15	Zurich ..	—— 515 m.	Switzerland	Mon., Wed., Fri. Children's Corner ..	5.50 p.m.	50 Watts.
141	5.15	Zurich ..	—— 515 m.	Switzerland	Thurs. Lecture	30 mins.	500 Watts.
142	5.40	Ned. Seintoesl. Fabriek.	NSF 1050 m.	Hilversum	Mon. Children's Hour ..	6.40 p.m.	1 Kw.
146	7.00	Svenska ..	—— 470 m.	Stockholm	Wed. Concert	10 p.m.	300 Watts.
147	7.00	Stockholm ..	—— 440 m.	Sweden ..	Fri., Sat. Concert	10 p.m.	500 Watts.

"Act as judgment says is proper"

THE "rule of the road" at sea calls upon the officer in charge of the ship in the foreground to "act as judgment says is proper" in avoiding collision with the approaching vessel.

To be able to form sound judgment and act on it promptly is one of the essential qualities of the sailor; and whether one is driving a car, playing billiards, or catching the morning train good judgment is equally necessary.

* * * *

Consider the components you fit to your wireless set.

Upon them depends not only the success of the whole set but also your reputation as a wireless expert.

Your judgment tells you that if you choose the products of a firm which has a long specialised experience and a reputation for "making a sound engineering job of things" you will have chosen wisely and well.

It is a mistake to suppose that one make of condenser is much the same as another, and it is a mistake to believe that your set can give the best results if your condensers and resistances are of the just-as-good variety.

Act as judgment says is proper—

Specify Dubilier.

DUBILIER CONDENSER CO LTD

Ducon Works, Victoria Rd., North Acton, London, W.3. E.P.S:39

Ref. No.	G. M. T.	Name of Station.	Call Sign and Wave length.	Situation.	Nature of Transmission.	Closing Time or Approx. Duration.	Approx. Power used.
			SPECIAL DAYS (contd.).				
148	p.m. 7.40	Smith and Hooghoudt	PA5 1050 m.	Amsterdam	Wed. Concert	9.40 p.m.	500 Watts.
149	8.10	Middelraad ..	PCMM 1050 m.	Ymuiden ..	Sat. Concert	9.40 p.m.	300 Watts.
150	8.40	Ned. Radio In.	PCGG 1070 m.	The Hague	Mon. Concert	10.10 p.m.	1.3 Kw.
151	8.40	Amsterdam ..	PX9 1050 m.	Holland ..	Tues. Concert	10.40 p.m.	600 Watts.
152	8.40	Ned. Seintoesl Fabriek	NSF 1050 m.	Hilversum	Fri. Concert	9.40 p.m.	1 Kw.
153	9.00	Le Matin ..	SFR 1780 m.	Paris ..	2nd & 4th Sat. of mth. Special Gala Concert	10.50 p.m.	10 Kw.
154	9.30	Petit Parisien	—— 340 m.	Paris ..	Tues., Thur. Concert (Items announced in English as well as French).	11.30 p.m.	400 Watts.
155	10.00	Radio-Paris ..	SFR 1780 m.	Clichy ..	Wed., Fri. Dance Music ..	10.45 p.m.	8 Kw.

WIRELESS IN THE U.S. ARMY.

The complete wireless installation for a battalion can be carried by two men.

"A Loose-Coupled Single-Valve Receiver."

SIR,—With a view to economy in current consumption, I have been lately trying several crystal one-valve reflex circuits, unfortunately in my case without any great success. Looking back to my October number of MODERN WIRELESS, I decided to try the loose-coupled single valve reaction receiver described by S. G. Rattee.

I have obtained wonderful results with this receiver, and it is to be heartily recommended to those who cannot go to more than one valve.

With outside aerial, at 40 miles south of London, I get very loud signals from London and Bournemouth broadcast. All the Paris stations, Radiola, Petit Parisien, Postes and Télégraphes, are loud and clear. Brussels is very good. Madrid is clear, but rather difficult to tune in. On Sunday evening I listened to an opera broadcast apparently from Berlin, not loud but clear. I have also heard the Italian announcer at the Rome station.

On an inside aerial, 80 ft. across ceiling, I get both London and Bournemouth without difficulty.—Yours truly,

NORMAN GUTTERIDGE.

Haslemere.

ELECTROSTATIC REACTION—AN EXPLANATION.

Owing to an unfortunate error, certain corrections in the above-named article which should have been made were not included. In column 1 line 32 and column 2 line 16 the words "audio-frequency" should have read "radio-frequency" in each case.

Tested by Ourselves

Panel Coil Holder

A TWO-COIL holder for panel mounting which will appeal to many amateur constructors has been issued by Messrs. Goswell Engineering Co., Ltd., at a very moderate price which is hardly more than that of a couple of plain coil plugs.

The sample submitted for our examination was in two parts, mounted on a card, a drilling template being also supplied. Both the fixed coil plug and the bearing-posts for the swinging coil are fixed to the panel by a couple of small bolts apiece: these bolts are also utilised for electrical connections. Thus no untidy flex is visible, to give unwanted stray capacity couplings, which we consider is a strong point in the favour of this type of mounting.

The moving coil swings on a horizontal axis in bearings in the pillars mentioned. These bearings can be tightened up by small screws, to compensate for wear, and so as to make the holder stiff enough to carry the largest sizes of plug-in coils. A 4 in. bent handle with insulating knob controls the moving coil. Since the former is connected electrically with one end of the coil, connections should be arranged so that this is near earth potential for H.F. energy, otherwise hand-capacity effects may be troublesome.

On test, the quality of the insulating material proved to be suitable, and the mechanical construction and finish generally were satisfactory.

A Finely Variable Grid Leak

We have received from J. Anderson a couple of samples of an interesting type of variable grid leak, which is of rather an unusual kind, and appears to have much promise. Superficially, this resembles closely an ordinary filament resistance, of the circular wire-spiral type, but in place of the familiar spiral of resistance-wire, there is a thin rod of black resilient material which provides the resistance element. The usual type of spring contact-finger rubs on this, and includes more or less of the resistance element in the leak circuit according to its adjustment. There are positive stops at each end of travel of the finger, and small terminals for connections. The whole is adapted for mounting behind the panel (where it occupies a space of $1\frac{3}{4}$ in. diameter by 1 in. deep to clear terminals, etc.), by two small screws, which also fix in position a circular stamped brass shield for the resistance rod. An ordinary large ebonite knob and pointer are provided outside the panel, for control.

On test, the range with the one instrument was from about 0.15 to 6 megohms; of the other from 12 to just under 0.15 megohms. The values for a given setting appeared to be strictly reproducible, and there were no signs of creep, even with a current of many microamperes passing through the rod. In actual reception, the adjustment was quite silent, and capable of very fine setting. Thus with a D.E. valve the closest control over oscillation was obtained in single-valve long-range working.

One criticism must be made as to general design: the clearance between the metal parts is extremely narrow—at one point only $\frac{1}{8}$th in.—so that the casual capacity across the leak is actually by measurement nearly two micro-microfarads, in place of the $\frac{1}{2}$ or less $\mu\mu$F of the ordinary straight fixed type of grid leak. As this represents a bypass reactance for H.F. energy of only 100,000 ohms, in parallel with the ohmic leak, on the broadcast waves, it might be advisable in some cases to reduce this by allowing greater clearance between metal parts at the two ends of the leak path. In ordinary valve reception it represents merely an inconsiderable addition to the general inevitable casual capacities.

Apart from this point, it would appear as if this instrument represents a real step in advance towards the perfect variable grid leak.

We gather that a variable anode resistance of the same general type is to be placed on the market shortly by the same makers.

A Variable Grid Leak

Messrs. Lissen, Ltd., have sent for test a sample of their latest pattern of variable grid leak. This is of the well-known single-hole-fixing type; it is about $\frac{1}{2}$ in. diameter by $1\frac{3}{4}$ in. long beneath the panel, and has soldering-tags for connections with a small knob above the panel for control. The space occupied, therefore, is but small. Appearance and finish are of a high order.

On test, this gave a range of resistances from about $\frac{1}{4}$ to 10 megohms, and the values appeared to be reproducible. The operation, in actual valve reception, was smooth and silent, so that excellent control was obtained over

oscillation and back-lash in the reception of faint telephony on the single valve. Whilst in a necessarily brief trial it cannot be determined to what extent such an instrument will retain its qualities in practical daily use, from favourable experience with an earlier, larger pattern of Lissen variable grid leak, the writer would be inclined to recommend this instrument for more extended trial.

A New Galena Crystal

A galena crystal of a somewhat unexpected type, but one which shows excellent sensitive properties on actual trial, will shortly be placed on the market by A. Hinderlich. The specimens submitted for test appeared to be merely ordinary inactive cubically crystalline galena, in large smooth-faced crystals of the type which occurs in nature, and which generally shows little or no sensitiveness when tested in the ordinary way. An odd sensitive spot may sometimes be found at a corner or fault in the crystalline structure; but in general, large cubical galena is found to be insensitive.

In this specimen, however, an exploring cat's whisker with a fine point located sensitive spots almost anywhere on the crystal surfaces, even in the middle of a large smooth crystal-face; and on breaking open a crystal further numerous and excellent spots became available.

Tested in broadcast reception, this crystal showed a sensitiveness, quantitatively measured and observed aurally, on a par with the average good galena of the finely crystalline artificial type. Excellent crystal reception was obtained at 35 miles from 2LO on a poor aerial.

"Klybro" L.F. Transformer

Messrs. Klein Bros., Ltd., have submitted for test a sample of their "Klybro" L.F. intervalve transformer.

This is a large, handsome instrument, with high finish. There is a large, vertical coil, and the iron core is also of generous dimensions, whilst no bolts pass through the laminations. The four terminals are of convenient size, and very accessible on an ebonite panel which is mounted on the top of the instrument, the connections being clearly marked. Tested on high D.C. voltage, the insulation resistance, both between windings and from windings to the frame, was excellent. The resistance of the secondary was rather unusually low, being only just over 2000 ohms. The makers did not state the nominal ratio of the windings. The resistance ratio was about 2 to 1.

On practical trial, in direct comparison with several other types of medium price and with our standard, both by aural observation of broadcasting and in quantitative measurement on a test signal, of uniform strength, the performance of this fine looking instrument was disappointing. The tone was dull and lifeless, and the actual build-up of signals, using the most suitable valves, H.T. value and grid bias, etc., fell short of even a mediocre specimen. Changing round connections effected no improvement. On testing the impedance of the primary and of the secondary windings separately, that of the primary was noticeably less than usual in standard instruments.

Taken together with the comparatively low D.C. resistance, it would appear as if the indifferent performance was due to lack of sufficient wire, as there were no signs of any particular fault.

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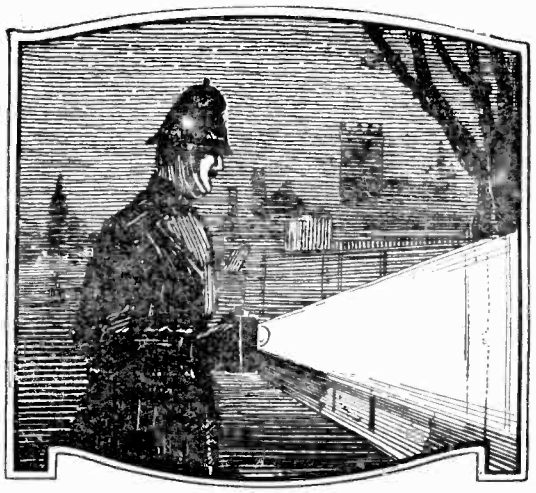


Dark Nights

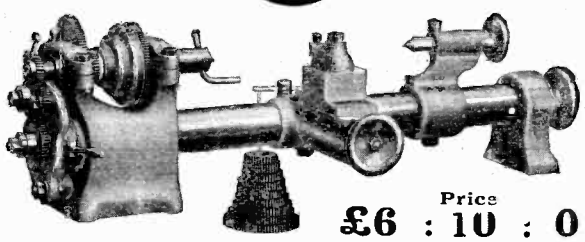
POETS have sung the praise of moonlight nights, but it is left to the burglar to sing the praise of dark ones. The average man is not a mystic—he likes to see what he is doing. It is a cynical axiom that he also likes to see what his neighbours are doing as well.

There is not much peace of possession in a Wade Lathe if one's neighbour sees it arriving, so when you order yours get it delivered on a foggy night.

Below is illustrated the Wade No. 2 Lathe It is Back Geared, Self-Acting and Screw-Cutting. It has 13 change wheels, which cut all threads, right or left hand, from 6 to 60 T.P.I., including metric pitches. It takes work up to 4-in. diameter and 12-in. in length, and the way in which it does its work of turning, boring, facing and drilling, is a source of wonder to its many users.

If you would like one of our fully descriptive catalogues post free, drop us a card to-day. Write to Dept. E.

WADE Lathes



Price **£6 : 10 : 0**

C.A.V. Small Tools, Ltd., 181, Queen Victoria Street, E.C.4.

E.P.S. 20

Lissen Variable Condenser

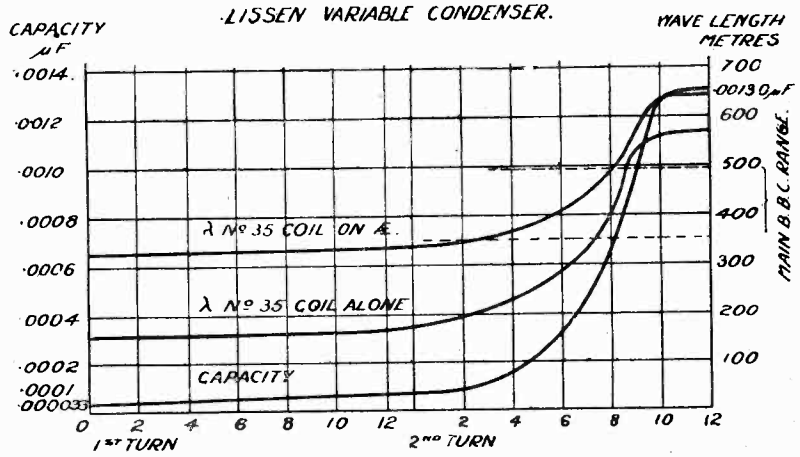
Messrs. Lissen, Ltd., have sent for our test samples of their one-hole-fixing type of variable condenser, together with a number of their "Lissenagon" tuning-coils, for trial in combination with this condenser.

The condenser is enclosed in a brass case, 3½ in. diameter by ⅝ in. thick. The case itself is earthed and carries one small terminal on one side. The other terminal is mounted on an insulating bush of small diameter at the opposite side. The customary one-hole fixing is provided, and a black circular scale, with knob and pointer, is supplied for mounting on the panel.

The knob makes almost two entire revolutions, so that the scale is divided from 0 to 12 divisions, and then repeats, giving in all 25 divisions. Positive stops operate at each end of its travel.

On measurement, the capacity range was from the appreciable minimum of 33 micro-microfarads (·000033μF) to the high maximum figure of ·0013μF. The minimum capacity is, however, quite a small percentage of the maximum. The capacity varied in a curiously irregular way with the setting, as shown in the accompanying figure, determined by the writer on the sample submitted for test. The whole of the first turn adds very little appreciably to the existing minimum capacity. Then the change is fairly rapid for four or five divisions (one-third of a revolution), and finally becomes again very slow for three divisions. With the quite appreciable minimum capacity inevitable in so totally enclosed a condenser, and small clearances involved, it is difficult to see what value the first whole revolution will have in most circuits. The minimum is too high for efficient use as a fine adjustment condenser in parallel with a larger one in most cases.

Used in conjunction with the "Lissenagon" coils, the wavelength ranges were from 160 to 568 metres with the No. 35, 170 to 600 metres with the No. 40, 210 to 800 metres with the No. 50, 240 to 940 metres with the No. 60, and 325 to 1,250 metres with the No. 75. It will be noticed that the available range on any one coil is large, when used thus with only the casual capacities of the valve panel used (some 25μμF), suggesting a low self-capacity in the coils as well as a large capacity range in the condenser. The coils have evidently been carefully designed to eliminate unnecessary H.F. resistance, by the use of a reasonably large gauge of wire in each case—being markedly superior to some other types in this respect, giving as a result noticeable ease of oscillation and sharp tuning. The inductance value appeared to be somewhat less than that customary for the particular number of coil.



The above curves show how the capacity and also wavelength with various coils vary with the Lissen condenser.

The actual wavelength obtained with the No. 35 and the Lissen variable condenser was plotted, firstly, with valve and casual capacities alone; secondly, with the 70 ft. low single wire test aerial in parallel with the rest. The figure shows, as expected, that the effective portion of the scale was between divisions Nos. 4 and 9 of the second turn, a fairly flat characteristic being obtained over this region, which in the case of the coil connected to the aerial covers approximately the main B.B.C. station wavelengths.

The reaction demands with this condenser as main tuning-capacity were just noticeably greater than with a standard type of air or mica condenser. This was more than compensated for by the low resistance of the coils. Generally a size smaller reaction coil could be used than is customary, and this coupled at such a distance that the usual annoying change of wavelength with reaction coupling was greatly diminished. There was no difficulty in going the rounds of the main B.B.C. stations (except Aberdeen, which was jammed by Morse as usual), some of the relay stations, and half-a-dozen Continental stations in daylight on an indifferent country test aerial, with the No. 35 coil and a single D.E. valve.

We can strongly recommend these excellent low-resistance inductances for use in combination with this condenser over the limited useful range of the latter, or in general with the conventional type of air condenser.

The measured crystal signal strength (at 35 miles from 2LO) with the No. 35 coil and Lissen condenser was at least as good as with any other commercial types of plug-in coils tried, and approached very close to our standard at this distance and on the same aerial.

New Pattern Watmel Grid-Leak

Messrs. Watmel have handed us for our inspection and test samples of a new pattern of their well-known variable grid-leak in which the possibility of a certain irregularity of action when the instrument has been in use for some time and is showing, perhaps, some looseness in the spindle through wear, is effectively eliminated by the provision of a spring-contact to the central spindle at the knob end of the instrument. Thus, in this latest pattern, a spring brush bears down on the spindle through a slot cut in the end bush, and makes at all times effective and silent electrical contact with the screw spindle, even when, by long use, the latter has perhaps become a little loose in its bush.

On test, the samples showed a steady variation in resistance value from about 0.6 to 4 and 0.7 to 4 megohms respectively, the values being fairly reproducible, and they were silent in operation. This small addition should prove a valuable feature in these grid-leaks.

Readers' Results with Radio Press Sets.

To the Editor of MODERN WIRELESS.

A Two-Valve Double Reaction Receiver

SIR,—Many congratulations to Mr. H. K. Simpson on designing such an excellent receiver as the "Two-Valve Double Reaction Receiver" (M.W., Vol. 3, No. 4).

I had taken my four-valve receiver to pieces to wire it up again with new wire when I decided to wire up the above two-valve set in order to listen-in.

When I switched on to test the set I was astonished to hear a foreign voice; this I found was Berlin Telefunken on 290 metres. I was so much surprised with this reception that I decided to try for other stations. The following are those received. Belfast 435 metres, Glasgow, Newcastle and all B.B.C. stations, including three relay. L'Ecole Supérieure, Radio Belgique, Radio-Paris, Breslau, Madrid, Gothenburg, Leipzig, Vienna, Frankfurt, Lyons, Hamburg, Lausanne, Stuttgart, and Vox Haus.

I think this is a good record for one night. I can tune out Belfast at about eleven miles and receive any other stations, but of course I can hear Belfast faintly when receiving Glasgow.

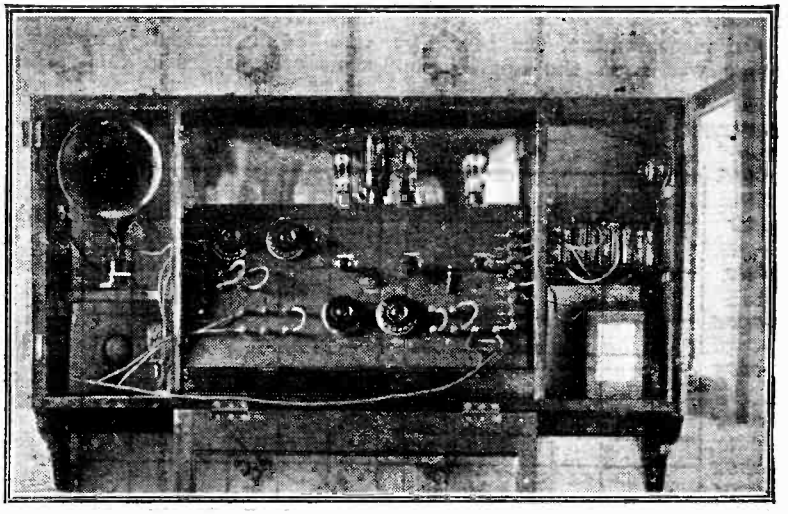
To anyone wanting a set with both great volume and purity I would advise them to use this one as it is A1 for both.—Yours truly, B.G.

Co. Antrim.

P.S.—I decided to sit up and try for America and was successful in receiving the following *loud and clear*: WJZ, WGY, WBZ, and WNAC.

A Two-Valve Cabinet Receiver.

SIR,—I have just built for a friend the two-valve receiver described by Mr. Rattee in the June number of MODERN WIRELESS, and the results with it are so surprisingly good that I feel it my duty to report them.



A handsome 3-valve dual receiver as constructed by Mr. Aitchison.

All the B.B.C. stations and seven of the relay stations were easily received. Three French stations followed, with Brussels, Madrid, an unidentified Continental station which works on nearly the Aberdeen wavelength, and, of course, Chelmsford. Then followed, to my surprise, four American stations, two of which I get any night, WBZ and WGY, the former as loud and clear as many of the B.B.C. stations. Last night I tried a coil of wire lying in a corner of the room as an aerial, and got three of the B.B.C. stations. What more could anyone want?

I feel bound to let you know of these results, and trust that many more will be encouraged to make this set.—Yours truly,

(Rev.) R. D. E. STEVENSON.
Colmonell, S. Ayrshire.

(*Continued from page* 895.)

is not done the difference in voltage between the two L.T. voltages is applied in an indirect manner to the filaments, and serves to unnecessarily run the battery down. When the same L.T. is used on all valves this does not occur and only the switch S need be switched off.

The filament circuit being found correct, plug-in transformers for the wavelength range required should be inserted in the transformer sockets, and a suitable value of H.T. applied to all the valves. To do this as a preliminary arrangement all the H.T. plus terminals may be connected together and the grid bias terminals shorted.

H.F. Transformers.

A word as to transformers is required here, since, unfortunately, different makes vary in connections. I have used McMichael type and the wiring is suitable for these and also for Burne-Jones and Bowyer-Lowe make, which are similarly connected. With other makes it may be necessary to try the effect of reversing either the neutrodyne or anode windings, whichever is most convenient. The types having separate slots for each winding are to be preferred.

If the H.T. connections appear to be correct, insert a coil (one suitable to cover the range required without an aerial, *e.g.*, a 50 or 75 Gambrell C, or equivalent coil for the broadcast range) into the fixed socket. Short sockets 4 and 5, joined A_1 to E, and also short sockets 6 and 7. Now leaving the aerial condenser set about 20 deg., vary the anode condensers simultaneously, tapping at the same time the aerial terminal. With the phones inserted in the jack, loud "plonks" should be heard over a band of condenser degrees. Now try the effect of screwing in the neutrodyne condensers, tapping the aerial terminal as before, and occasionally varying the anode condensers. If correctly connected a little practice should finally give an adjustment of the neutrodyne condensers, which gives complete stability with any combination of anode and aerial condenser positions. If this is not obtained the windings to anode or neutrodyne coils should be reversed and the process repeated. Unfortunately there is no "rule of thumb" method of neutrodyning as with a single H.F. valve, but a little practice should easily give the correct adjustment required.

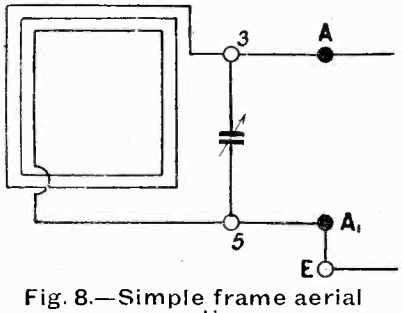


Fig. 8.—Simple frame aerial connections.

Preliminary Test Report

The set was tested for sensitivity at about 12 miles S.E. of 2LO on a Portable Utilities' frame aerial of hexagonal shape and about 4 ft. diagonally. General purpose valves and 60 volts H.T. were used. The ordinary 300- to 600-metre type of transformers were not found to go low enough to give really definite tuning on London, but on substituting specially wound ones of Magnum make London was received at good loud-speaker strength, and later Madrid on phones without the L.F. valve. Several makers are now putting on the market transformers wound with a lower minimum suitable for this type of set, which should be available by the time this appears in print. A full test report on an outside aerial and further operating details will be given next month.

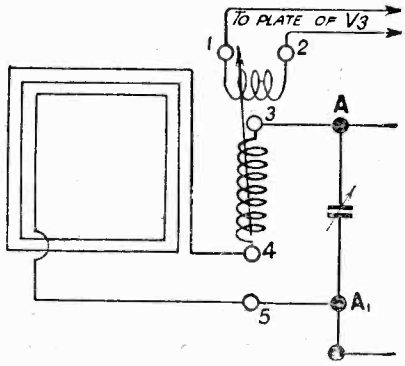
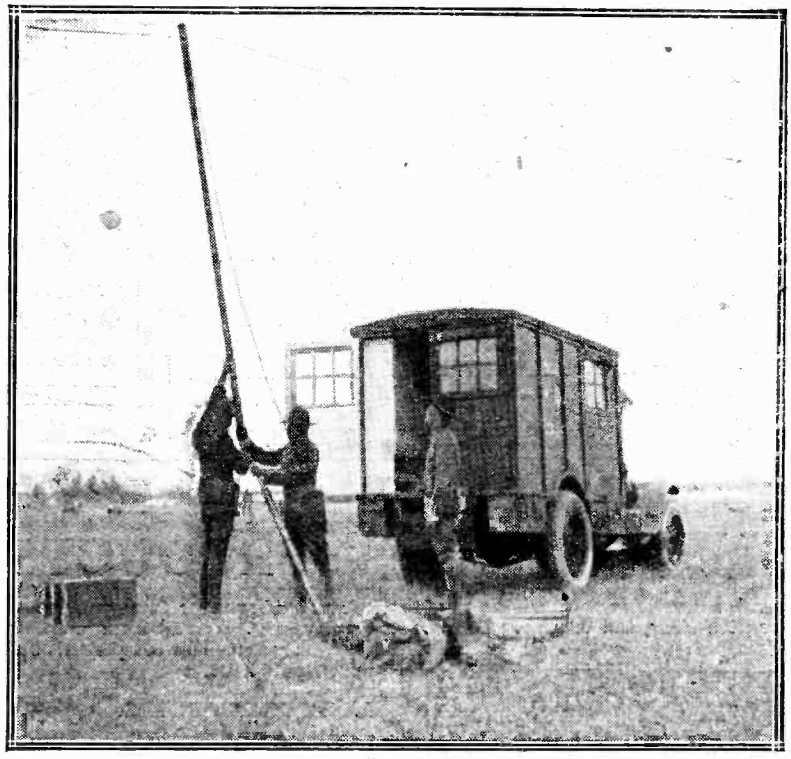


Fig. 9.—How to use reaction with the frame aerial.



Erecting the aerial of a United States Army Field Station.

Note on Wiring Diagrams

In all wiring diagrams the method of showing loops where wires pass over each other without joining has not been used, as this does not give a true impression of how the leads are taken. With the method now used, the wires are taken as in the set and joins are shown by small black squares; where there is no square, wires are not joined.

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50	25	4/3
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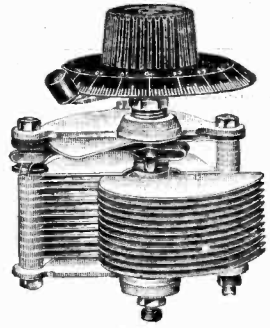

W.M. 124

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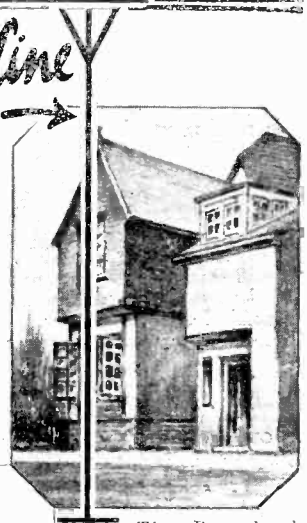
CONDENSERS

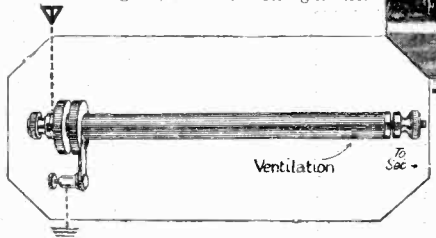
That Straight Line Protects You

When your lightning-arrester device puts the aerial lead and the earth in a *straight line*, your aerial is a definite protection to your house.

A house *with* an aerial and a Pressland Safety Lead-in, is safer than a house *without* an aerial.

It is futile just to connect aerial and earth terminals on your set, or to adopt any device that does not connect aerial to earth *outside* the house. Lightning will not follow angles; it takes a straight line.





The Pressland Safety Lead-in has a self-contained discharge-gap, and provides for an external earth-wire. It is scientifically shaped to form a petticoat insulator—free from surface leakage.

The Pressland Safety Lead-in

From your Wireless Dealer. Sizes: 6-in., 3/-; 9-in., 3/3; 12-in., 3/6. Manufactured by

PRESSLAND ELECTRIC SUPPLIES, LTD.,
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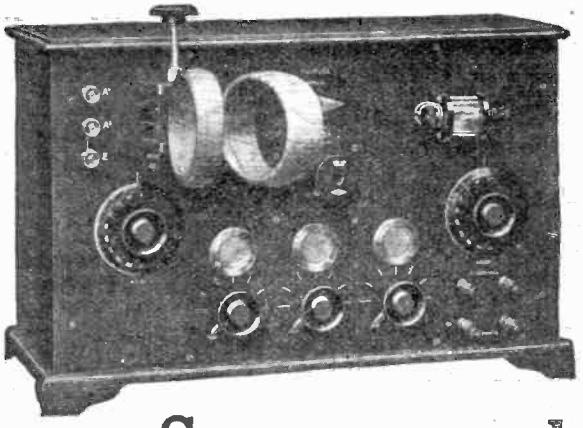
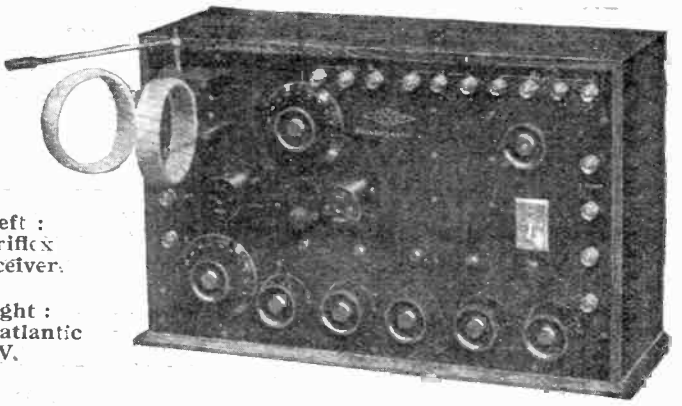


Left : Purilex Receiver.

Right : Transatlantic V.



Save pounds by building any guaranteed Pilot Set yourself

THE Pilot System has solved the problem of the home built Set for thousands of Home Constructors. It has provided the only satisfactory method of getting an excellent Receiver which possesses the appearance of a ready-built Set costing five times the price at the cost of only the components. And anyone can build one of these Pilot Sets without previous experience. All parts are so carefully made that they fit together like a charm. The only tools required are screw-driver and a pair of pliers. Even soldering can be dispensed with if necessary.

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Send at once for our large Pilot Folder showing illustrations of all principal "Modern Wireless" Sets and their descriptions. A postcard brings it by return free. Comparison of prices will prove that you can save pounds by getting all your parts from one source of supply.

Choose your Pilot Set from this Chart :

Name of Receiver.	Price of Panel drilled and engraved.	Kit of Components	Oak Cabinet with baseboard.	Finished Instrument with coils, Royalties paid.
All Concert-de-luxe	13 6	£4 17 6	17 0	£13 10 0
S.T. 100	7 0	£4 16 0	£1 10 0	£ 9 12 6
Purilex	12 6	£4 5 0	17 0	£11 11 0
All-Britain	13 0	£4 9 0	17 0	£14 14 0
4-Valve Family ..	19 6	£5 15 6	17 0	£17 10 0
Transatlantic V. ..	13 6	£5 4 6	17 0	£18 18 0
Anglo-American 6	£1 8 6	£9 5 0	£3 0 0	£30 0 0
	£1 5 0 (Without engraving)	(Type B.)	(Mahogany 3/- extra.	
Transatlantic 4 ..	16 6 (including terminal board)	£6 15 0 (Type A.)	£1 7 6 (Mohagany)	£20 0 0
3-Valve Neutrodyne (Valve panel)	10 6	£4 10 2 (Type A.)	£1 13 6 to take both panels.	On application.
3-Valve Neutrodyne (Tuner Panel)	10 0	£4 2 3 (Type A.)		On application.
T.A.T. 4-Valve Receiver	£1 5 0	£5 15 0 (Type A.)	£1 0 0 (Mahogany)	On application.

¶ SPECIAL NOTE: Where all components and panel are purchased together a Marconi Royalty of 12s. 6d. per valve holder must be paid.

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FOR your Ebonite Panel be sure you use Red Triangle Ebonite. Every sheet fully guaranteed free from surface leakage. Tested by Professor A. M. Lowe and certified by him to have passed the most stringent tests. All edges squarely cut and surface finished smooth matt. Sold in the following 12 stock sizes all ¼ in. thick.

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PRICES OF "MODERN WIRELESS" PANELS

All Concert-de-Luxe	16 × 8	× ¼	8-0
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All Britain	16 × 9	× ¼	9-0
S.T. 100	12½ × 9½	× ¼	7-0
Purilex	14 × 10½	× ¼	9-2
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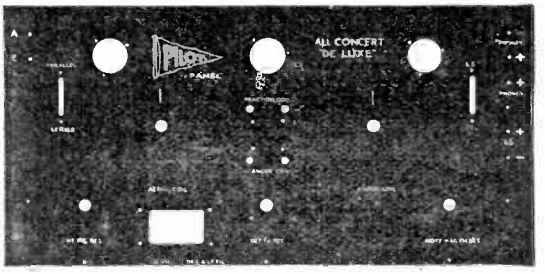

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—the extra few shillings that will give you a de-luxe Receiver

WITH perhaps a mistaken idea of economising, numbers of wireless enthusiasts when building their first Set have selected their components with praiseworthy care and ignored the importance of the panel. How absurd this is, will be apparent to all seasoned experimenters. They know perfectly well that even the most expensive components can only give a fraction of their effective results if the panel is permitting high frequency currents to leak in all directions.

So pay great attention to the panel and remember that even radio experts cannot tell the difference between various qualities of ebonite by merely looking at it. Your best safeguard, therefore, is to select Radion—every panel of which is guaranteed leakproof. Its beautiful polished surface (whether in black or Mahoganite) should not be removed. It will help to resist dust and moisture, both of which are enemies of clear reception.

Radion is the highest grade of insulation material in the world and has been specially developed for wireless use. Its use has been advocated by all the principal Magazines—indeed, you will find that Radion is recommended very extensively in most of the constructional articles recently published.

If an expert, therefore, uses and recommends Radion in preference to ordinary ebonite, you may be sure that it is exceptionally good.

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	12/9	9"×14"	10/6	12/9
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	6/6	7"×26"	15/-	18/6	12"×21"	19/9	24/3
7"×10"	5/9	7/3	7"×30"	17/9	21/6	14"×18"	19/9	24/3
7"×12"	7/-	8/6	7"×48"	28/-	34/6	20"×24"	39/6	48/-

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

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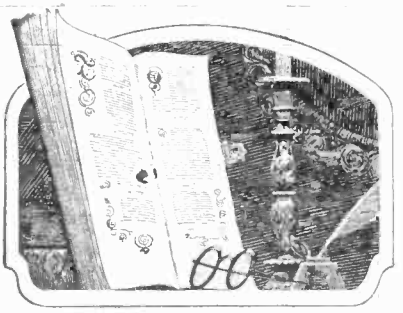

BOOKS

WITHOUT a doubt the very remarkable growth in the number of home-built Receiving Sets can be attributed to the exceptional Books and Magazines published by Radio Press, Ltd. This organisation—the largest of its kind in the world—has risen from quite modest beginnings because it was the first to realise that the crying need then, as now, was for dependable literature.

The moment a man gets really interested in Radio he is so fascinated that he immediately wants to learn more about it. Naturally he buys books and magazines—but let those books or magazines be too technical that he cannot understand and appreciate them, or let them contain inaccuracies or mis-statements and Radio loses another promising recruit.

Radio Press, Ltd., pursues a definite policy in its book publishing which can be summed up as follows :—

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(b) Each Book selected for publication must fill a definite niche in the Radio Press Series. Just as there are many grades of wireless enthusiasts from novices to experienced experimenters so there must be various types of Radio Press Books. At the same time, however, every phase of the Science is covered so thoroughly that anyone can build up a complete library as his knowledge increases.

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Consult your Bookseller

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The simplest way of enjoying Loud Speaker pleasures

If your receiver gives really good signals in the headphones, it's a perfectly simple matter to add the comfort of a Loud Speaker. All you need to do is connect the "Sparta" Amplifier to your present set, slip leads to the Little "Sparta" Loud Speaker—and the result is Loud Speaker reception as only "Sparta" products can provide it. Rich, pure reproduction—ample volume—and absolute reliability.

The "Sparta" Amplifier.

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A small brother of the famous "Sparta." Made in three types, 120, 2,000 or 4,000 ohms resistance, adjustable diaphragm control, **55s.**

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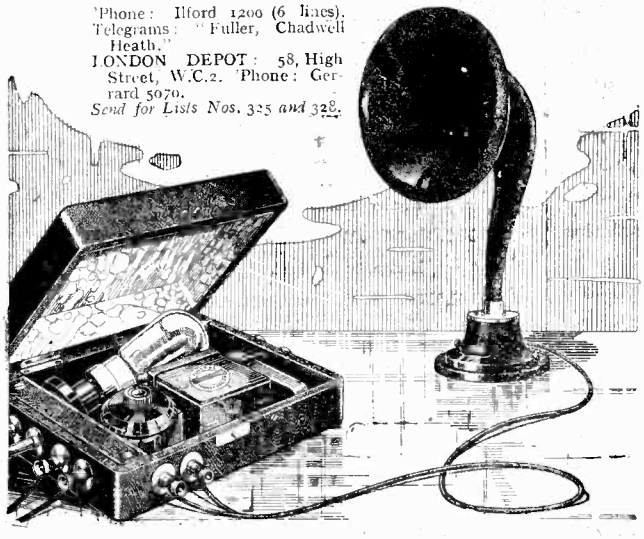

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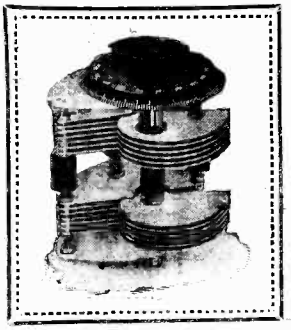
Our standard receiving apparatus is used in every quarter of the Globe, and our components are in demand everywhere. We have a set or component for every requirement. For efficiency insist on M. H. Products.



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Dual Condensers are essential for the perfect handling of sets in which two stages of High Frequency Amplification are employed. M.H. Dual Condensers are, of course, up to the high efficiency standard of all M.H. products, and embody the refinements quoted below under the heading Square Law Condensers. M.H. Dual Condensers are specially suitable for using with 2 M.H. Plug-in Transformers in tandem.

Capacity 0.0003. *Price 19/-*

SQUARE LAW CONDENSERS

With or without a single plate vernier attachment. The advantages of the Square Law type of condenser are, of course, well known, the variation of capacity being even over the whole range of the dial.

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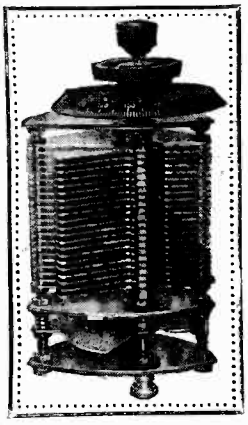

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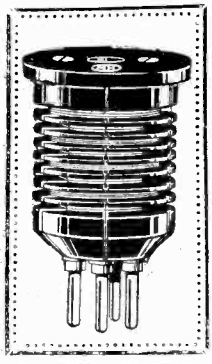

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A series of H.F. plug-in transformers in six ranges of wavelength. They are made of our highly-polished non-loss ebonite. The windings are carried in staggered slots, well protected, ensuring low self-capacity and high efficiency. Each and every transformer is tested to a standard oscillation and any not coming within very narrow limits are rejected. Perfect matching is thus ensured.

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The Complete Set (Nos. 00 to 4.)		.. .. ..	55/-

Can be supplied in matched pairs at NO extra charge if requested at time of ordering.

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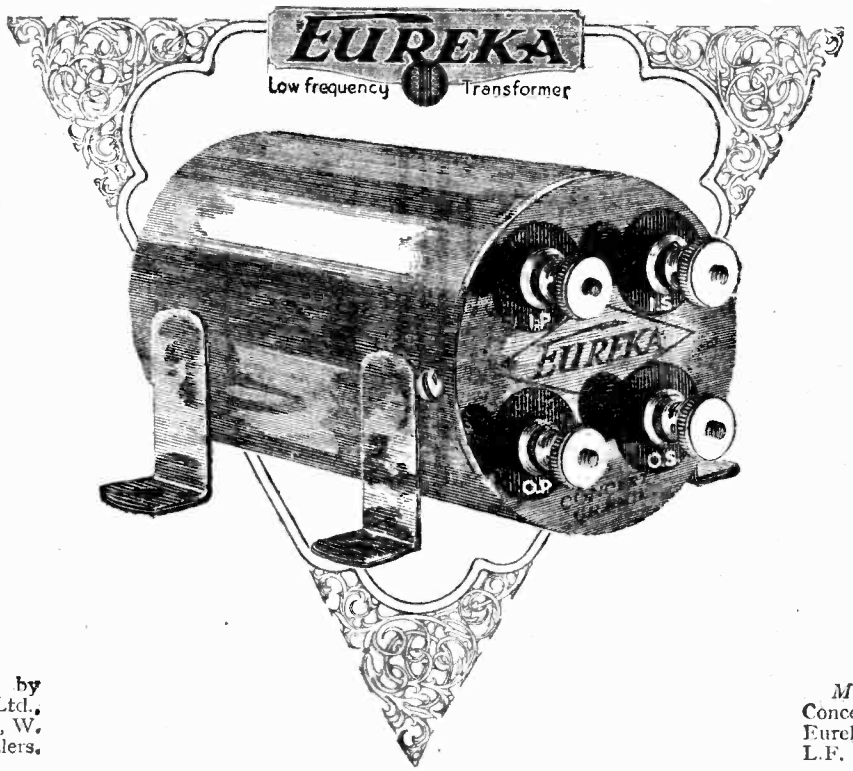

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The wealthy man owns his Rolls Royce because the whole world knows that it is the finest car. Perhaps it is only a bicycle—a watch—or a fountain pen . . . but a time comes when we say "when I can afford it I shall buy a —— because everyone knows there is no better." And wireless enthusiasts are looking upon the Eureka in much the same way. We know that to many the outlay of 30/- is an appreciable sum. To them we express our regrets. The superior quality of all the materials used in a Eureka, and the more costly methods of manufacture, precludes any idea of producing it at a lower price.

Indeed, we know that no Eureka user would wish to see the price reduced if it meant sacrificing even one of its many exclusive advantages. If wireless enthusiasts could but see the extravagant care taken during every stage of manufacture—if they could but see the tests that each individual Transformer has to undergo successfully—they would well understand why we are able to guarantee every Eureka to give *years* of service.

No better Transformer made than a Eureka

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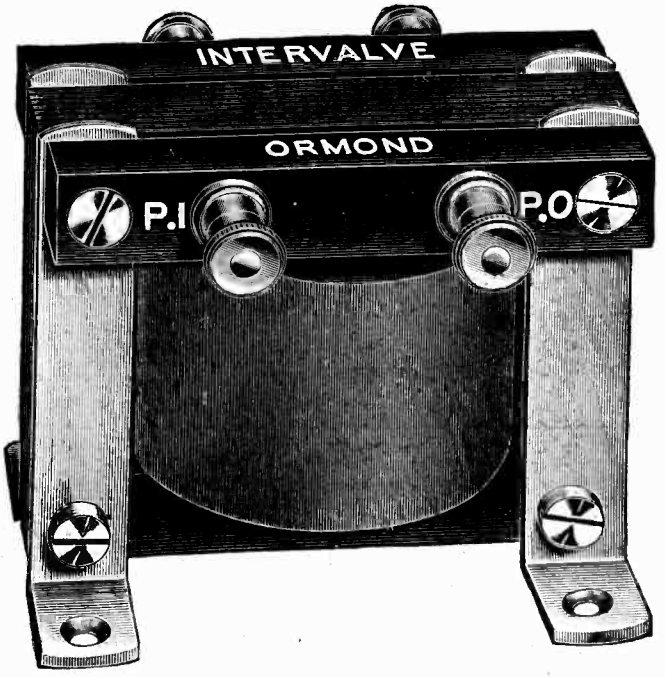

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RATIO 5 to 1 or to order. Suitable for general low frequency and power amplifying work.

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PRIMARY. It is recommended that the primary winding be shunted with a fixed condenser; a suitable value is:—

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SECONDARY. S.I. to Grid. S.O. to negative side of grid cells. Positive side of grid cells to negative low tension. A two or three-cell dry battery will suffice in most cases. For special valves, consult data supplied by the Manufacturer.

Write for our New (1925) Catalogue. TRADE TERMS ON REQUEST.

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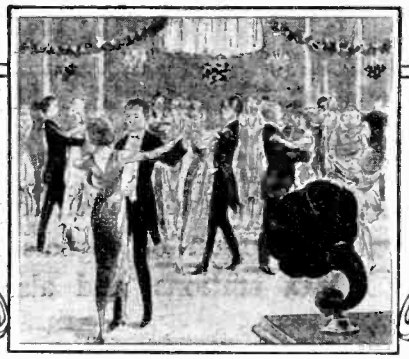
Was yours an Amplion Christmas



Happy Hours

THROUGH the unique "personality" of the Amplion Loud Speaker—a characteristic product of the House of Graham—scores of thousands of homes enjoyed "an Amplion Christmas"—in other words—the full delights of *Better Radio Reproduction.*

Was yours an AMPLION Christmas, too? If not, there are still many happy hours in store for you in the New Year, because the AMPLION, whenever it is associated with a reasonably good and properly-tuned receiving set, makes wireless reception an entertainment that all may enjoy without the least evidence of mechanical "harshness."

Exclusive patented features, such as the improved non-resonating Sound Conduit and the "floating" diaphragm, have made the AMPLION definitely and finally recognised as the *Loud Speaker Supreme*—the world's standard by which all others are judged.

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THE WORLD'S STANDARD WIRELESS LOUD-SPEAKER.

AMPLION

1009

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To every newcomer and many "old hands" this book will make all the difference between poor and first-rate reception. Mr. Mittell is a professional radio engineer, and he has had many years' experience of aerial erecting and knows just those points where beginners go wrong. Incidentally, he took a prominent part in the erection of the huge aerials at Northolt and elsewhere. This is a useful volume which should be found on every wireless bookshelf.

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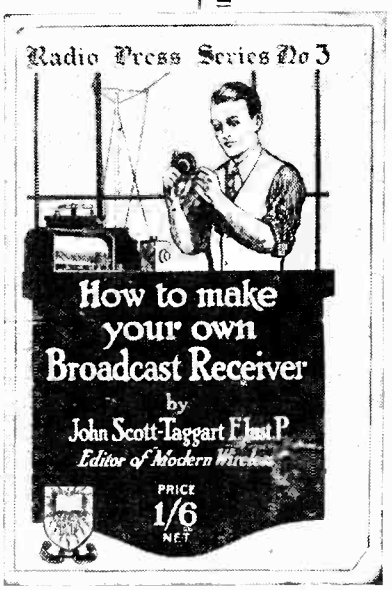

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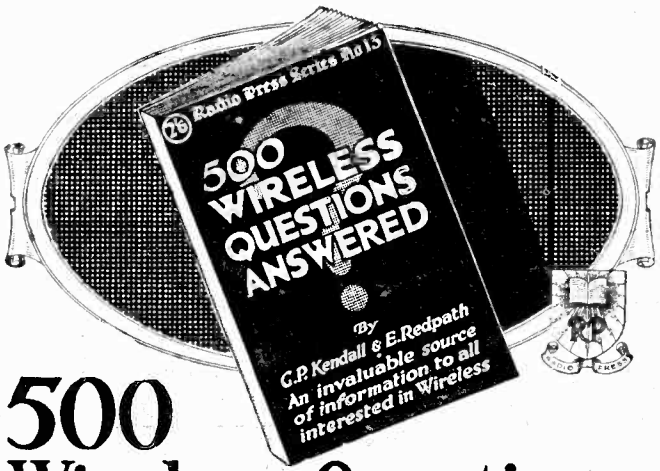

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NO other Wireless Book sold at half-a-crown can approach this work in its general utility and scope. Keep it handy for ready reference, you'll need it many times in the course of a week. Its index enables information on any of the following subjects to be turned up in a moment:

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Some of the Questions fully Answered in this Book:

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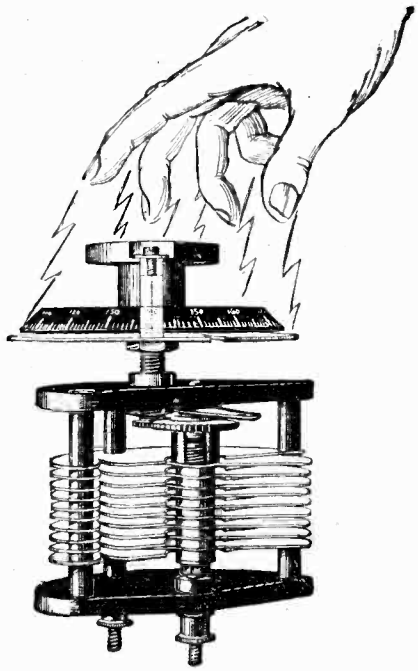

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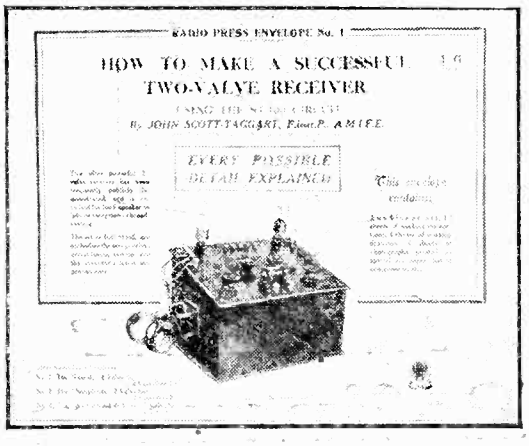

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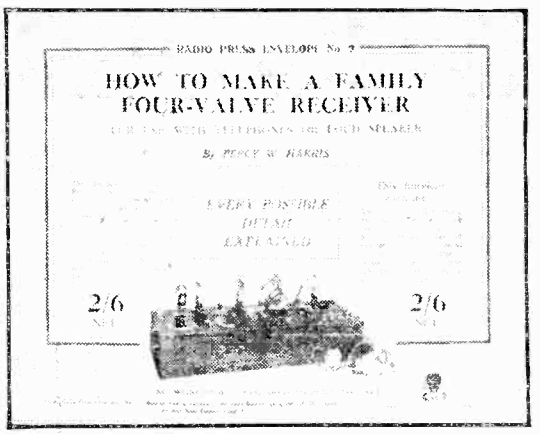

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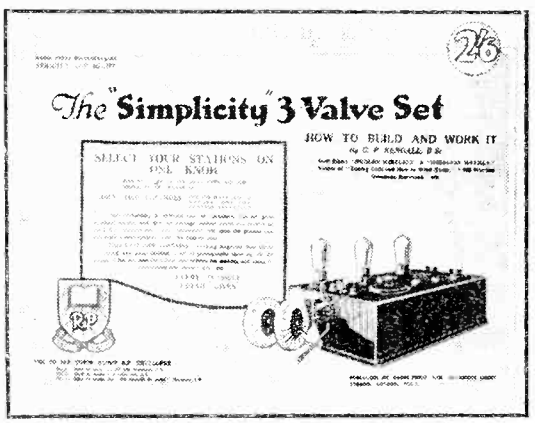

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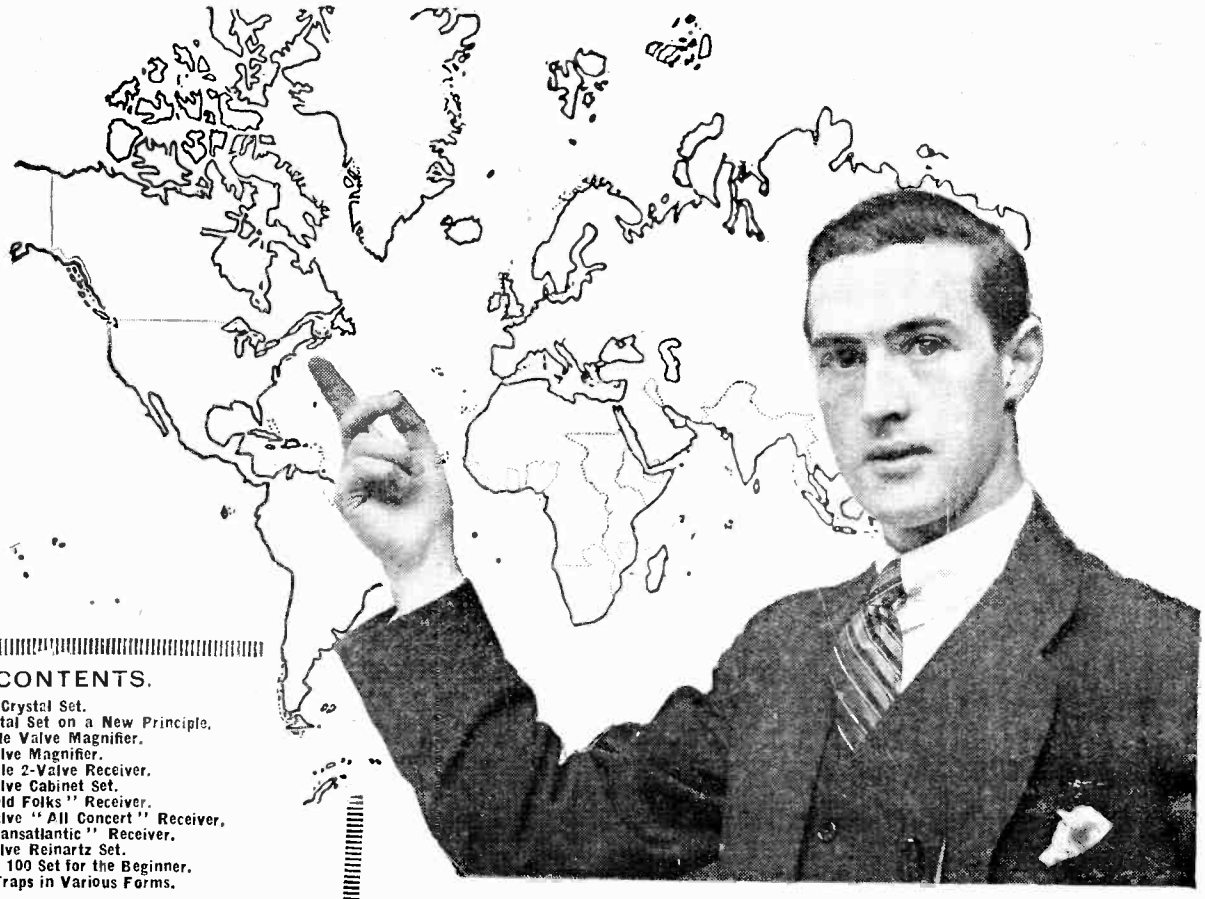

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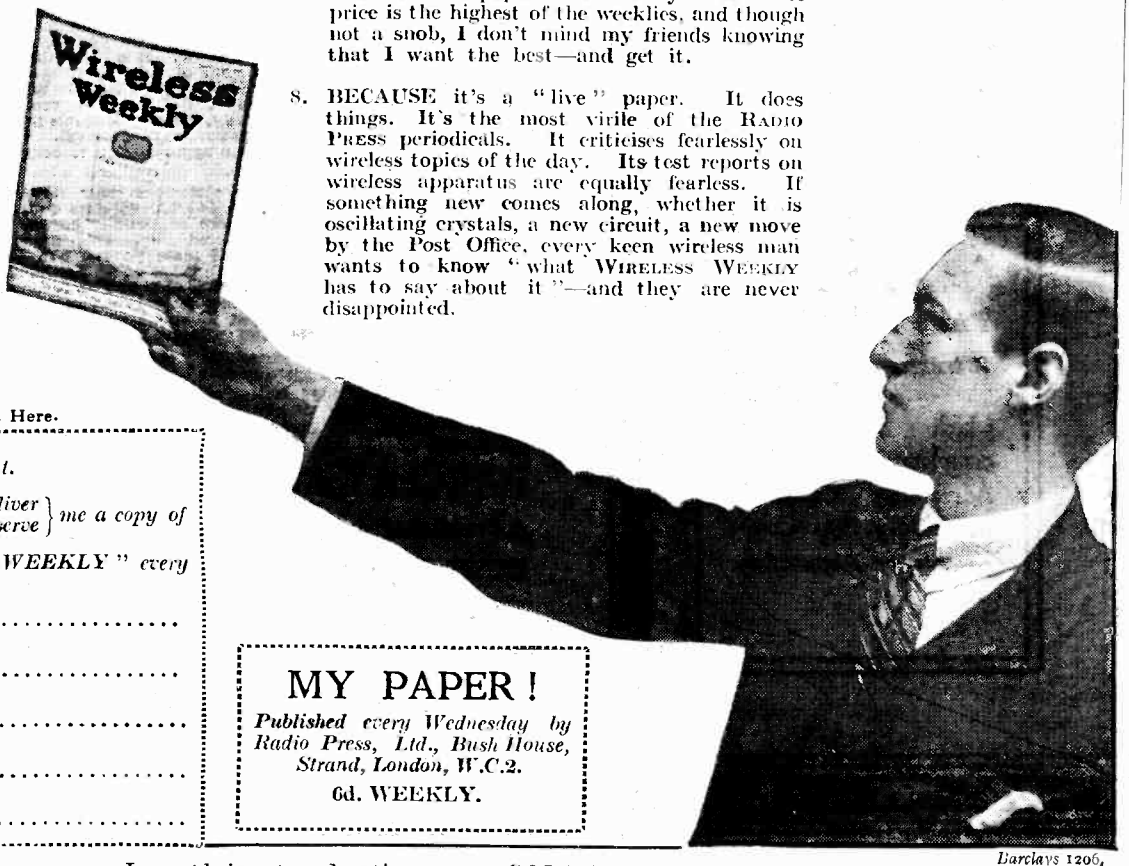

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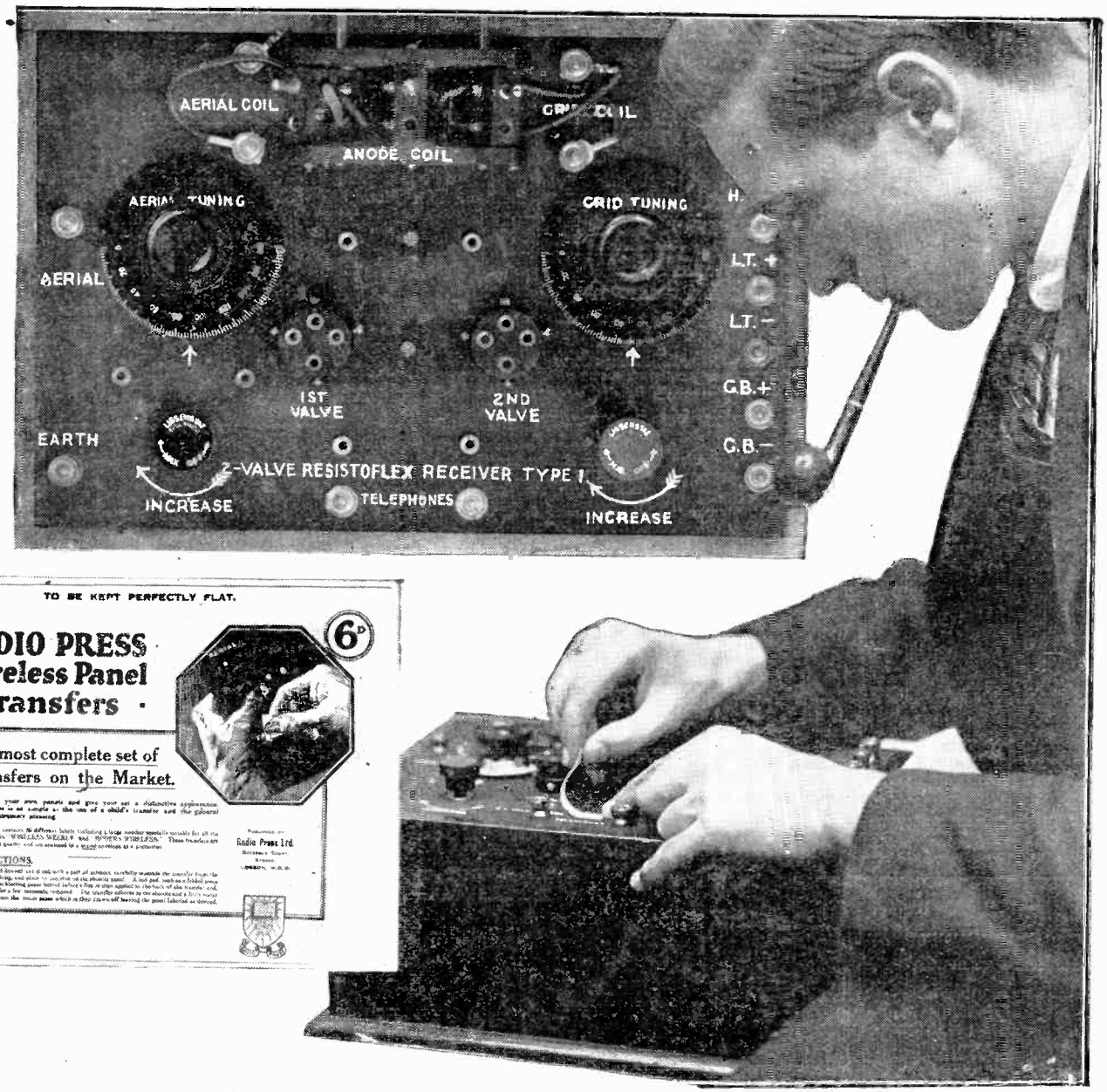

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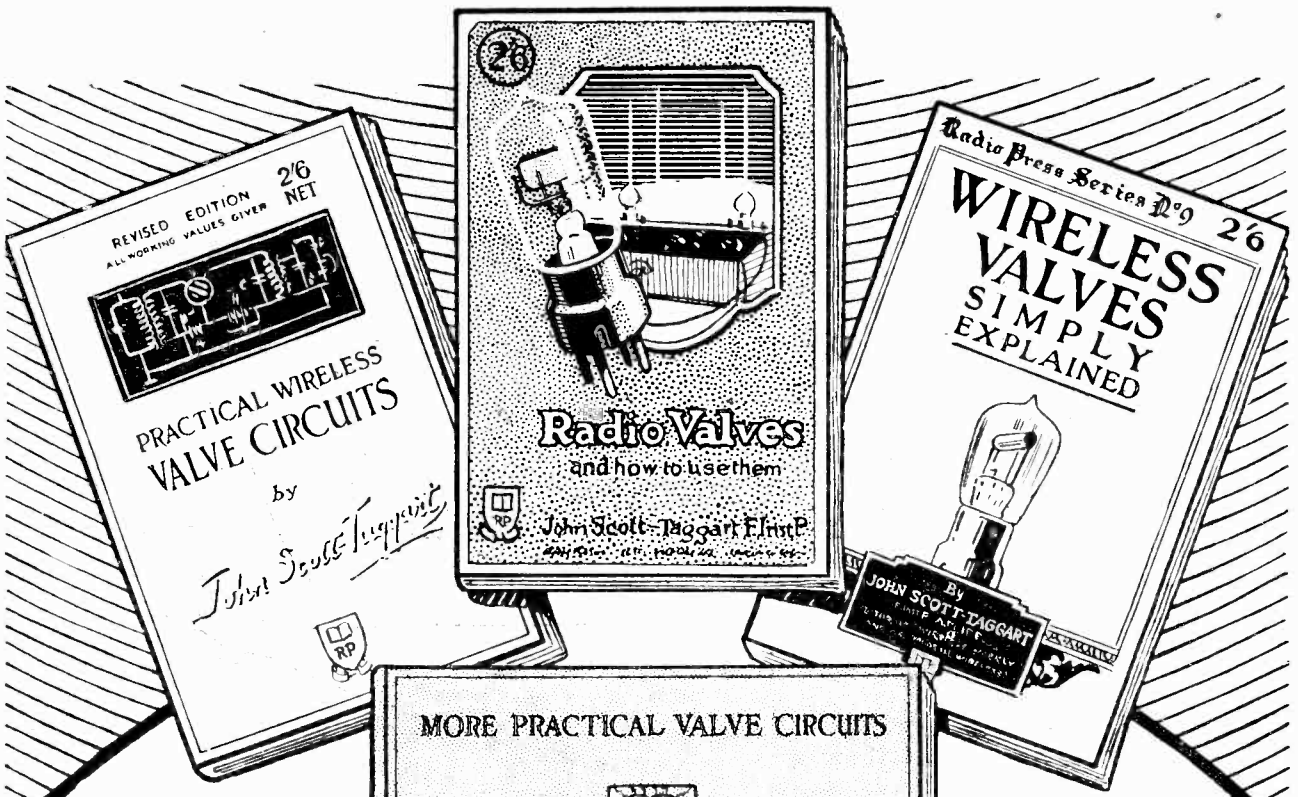

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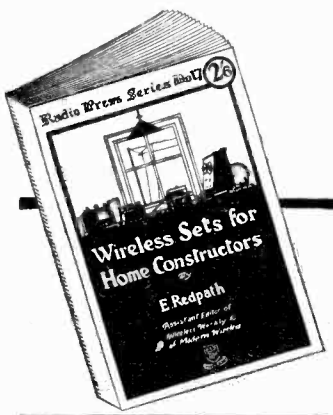

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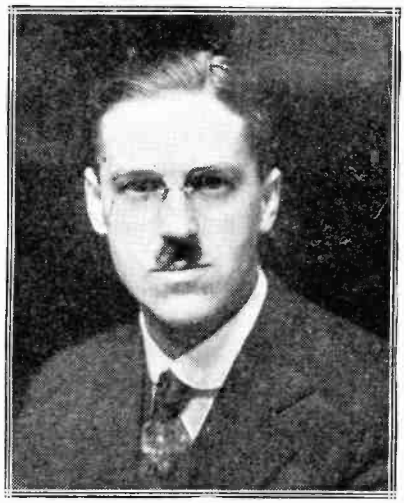

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BY

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Mr. Harris has two envelopes to his credit, Nos. 2 and 4 of the Radio Press Envelope series, each containing pages of photographs on art paper, sheets of instructions, wiring and panel blue prints, lists of components, and, in fact, all the features which have made Radio Press Envelopes the last word in guides to the constructor. He has also written a standard constructional work, "Twelve Tested Wireless Sets," which has had an enormous sale and which will strongly appeal to readers of "Modern Wireless" as all kinds of sets, from a crystal to a "Transatlantic," are fully described.

Read this letter from the South-West of Africa.

SIR,—I suppose you will be surprised at hearing from someone in the outskirts of the Empire, but I am only writing you a few words of appreciation of the Family four-valve set described in Radio Press Envelope No. 2. This compact little set is by far the best operating set I have yet handled. Having had nearly 15 years' wireless experimenting, I have naturally handled many sets.

As to results obtained, these exceeded anything like expectations. Cape Town (750 miles) comes in at good strength on H.F. and detector. With note magnifier added, signals are too loud for 'phones. The power of Cape Town is the same as 2LO, so these results are far better than could be hoped for. JB (Johannesburg), with ¼kw. in the aerial, comes in quite loud on two valves, his distance being 740 miles. Shipping comes in with a roar. 5XX comes in with fair 'phone strength on three valves. Three a.m. one morning I managed to pick up KDKA on three valves at good 'phone strength. All high-power Morse stations come in well, and I can get them any time of day or night on two valves.

Hoping you will find this interesting, and congratulating you most heartily on your design of a thoroughly reliable and efficient set.

Yours truly, PERCY F. SYMONS.

Windhoek, S.W. Africa.

And this one :

SIR,—About three weeks ago I purchased the envelope containing particulars regarding the "All Concert Receiver," and wish to give you my results.

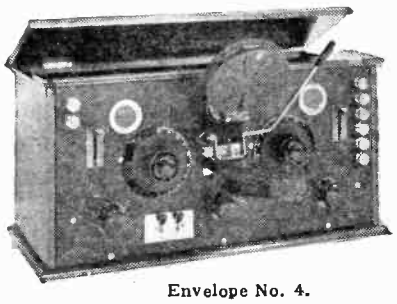
Without any wavetrap I am able to tune in 2BD at excellent loud-speaker strength, and with very slight interference from 5NO.

OTHER RESULTS: Radio-Paris, loud-speaker. 5XX, good; 5NO, excellent; 2BD, excellent; 5SC, good: these are all the B.B.C. stations which I have bothered with so far. Le Petit Parisien, loud in 'phones. Vox Haus? (woman announcer), fair loud-speaker. Hamburg, good loud-speaker. Breslau, fair loud-speaker.

I have had many more foreign stations than these, but have not heard their call signs.

HENRY R. MYERS.

Durham.



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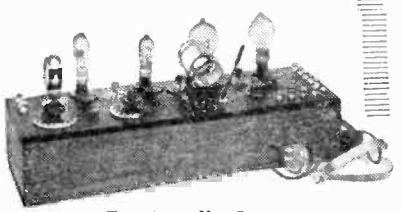

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